GEOGRAPHY II FORM SIX

FULL NOTES

POPULATION AND DEVELOPMENT

POPULATION STUDIES.

Is the general activities carried out for the purpose of acquiring knowledge concerning to various factors influencing population and population distribution

POPULATION

Number of people occupied in certain locality.

POPULATION IN GEOGRAPHY

Refer to distribution of living organisms in a certain geographical location. “Organism” human population.

Is the study of demography

Demography:- Scientific study of human population

Growth :- Increase and decrease in population

Density:- Ratio between number of people and a given area

Distribution:- General settlement pattern movement as well as the aspects of economic and social development

POPULATION DYNAMICS

Is the change in number of people in given area. Either increase or decrease caused by fertility, mortality and migration

DEVELOPMENT-Changing from low stage to more advanced one in all aspect of life i.e socially, politically, economically, culturally.

POPULATION & DEVELOPMENT

Population is related to the development process and environment. Population is both the means and goal of all development.

It is reproductive resource that transforms resources in the environment to bring development.

Population can have negative or positive effects to the development

SPECIAL POPULATION TERMS

Aging Population

It's a population in which the number of old people (above 64 years) is higher than other age groups. Old people can give some advice to the young people and can do light work like scaring away birds from the gardens.

Aging Population has the Following Consequences:-

1. Small size of labor force hence the resources are not utilized effectively.
2. Changes in the pattern of consumption, i.e. goods for old people are on higher demand like hats, medical facilities, big trousers, long dresses, walking sticks etc.
3. Increase in dependency ratio. The number of old people is greater than the working group hence dependency ratio increases.
4. There occurs labor immobility since the old people are immobile compared to the young people who keep on moving from place to place.
5. Decline in demand for goods that are consumed by young people e.g. dolls, nursery school facilities, small dresses etc.
6. Retardation in the development process due to conservativeness of the old people and lack of revolutionary ideas of the young people which would lead to transformation of the society.

Life Expectancy

It's the number of years that an average person born in a given area may expect to live (The average age at which people die).

Child Mortality Rate (CMR)
Number of deaths occurring to children aged between 1-5 years. This measure expresses the proportion of survivors per thousand children born alive.

Infant Mortality Rate (IMR)
It's the number of deaths occurring to children born alive but under one year old per thousand live births during the same year.

$$\text{IMR} = \frac{\text{No. of Children}(0-1) \text{ x } 1000}{\text{No. registered live births per year}}$$

General Fertility Rate (GFR):-
Proportion of children born alive per thousand women in the reproductive period in a year

$$GFR = \frac{\text{No. of in one year x 1000}}{\text{Mid year population of women aged } (15-49)}$$

Reproductive period is a child bearing age for women 15 – 49.

Fecundity:-
It refers to the ability of a woman to conceive. Bongaarts (1976) estimated that the maximum number of children an average woman can produce is about 15 if she stars bearing as soon as possible after menarche, which occurs between 12 and 14 years and continues till menopause in the middle or early 40's (15 – 49 years).

Child – Women Ratio (CWR):-

Ratio computed from the number of children aged 0-4 divided by the number of women of a child – bearing age usually 15 – 49 years and is usually expressed per 1000. Only on rare occasions children of 0 – 9 years can be used.

$$CWR = \frac{\text{Children aged } (0-4)\text{years}}{\text{Total number of women aged } (15-49) \text{ years}} \text{ x } 1000$$

Dependency Ratio
Is the ratio of that group of the population which is unable to meet its own needs (younger age groups (0 – 14) and the older groups (65 years and above) to the number of people in the working age.

$$\text{Dependancy ratio} = \frac{\text{Population aged } 0-14 \text{ \& 64 and above x 1000}}{\text{Population aged between 15 and 65}}$$

Sex Ratio (SR)
It's a specific measure of the sex composition of population. This is defined as the number of males per 100 females in a population.

$$SR = \frac{\text{Number of males in age sex}}{\text{Number of females in the same age sex}} \text{ x } 1000$$

In many parts of the world more males are born but because of endogenous and exogenous factors, after one to several years the difference appears whereby more males die than females. Sex ratio determination at certain age group is also affected by misreporting old ages. Males tend to report older ages than female for prestigious purposes.

FACTORS INFLUENCING POPULATION DISTRIBUTION AND DENSITY

There are several factors influencing population distribution and density in the world and these can be divided into physical and human factors.

Physical **Factors:-**

1. **Relief (Topography):** Where the slope is steep there is low or no population due to poor soils and nature of the land but where there are gentle slopes or flat surfaces there is high population since the soils are good and mechanization can take place easily. Highlands normally attract population due to good soils, rainfall, cool climates and being free from floods. But some low lands, which tend to flood usually, have low population since people avoid settling in those areas.

2. **Climate:** Areas with reliable rainfall like the North West Europe have attracted high population, but where there is poor rainfall like in the deserts there is low population. Also areas with very high or very low temperatures do not attract population while the areas with moderate temperature attract high population.

3. **Vegetation:-** In areas where dense vegetation is difficult to clear like in the Tropical rainforest of Amazon basin and the Congo basin as well as the Rufiji valley and mangrove forest along the coastal areas people are discouraged to live leading to sparse population or no population at all. Dense vegetation hinders penetration or communication and development. Conversely, the areas in which vegetation has led to the development of fertile soils, people are attracted since they grow crops after clearing for cultivation especially in the temperature deciduous forest and temperature grassland areas like the Paris basin.

4. **Soils (Edaphic Factors):** Thin, infertile or badly leached soils discourage settlement since they cannot support agriculture. Examples are the Lake District and Scottish Highlands where there has been severe leaching. Equatorial areas also discourage settlement due to soil leaching which causes decline in fertility. Good soils attract population; for example in the Nile Basin and the Southern slopes of the Kilimanjaro Mountain.

5. **Mineral and Energy Resources:** The areas with mineral and energy resources attract population, for example, the land of South in West Germany, and Southern parts of West Africa where there are rich mineral deposits like Diamond, Oil, etc.

6. **Natural Hazards:** Areas that are prone to natural hazards like floods in lowlands, earthquakes, tornadoes are avoided by people. But this is not always so since some areas which experience frequent floods like the fertile plains of Bangladesh and volcanic areas of Java and Indonesia are highly populated.

7. **Biological Factors like Diseases and Pests**: People like settling in areas which are free of diseases and pests. These will have high population like the highlands of Tanzania which have healthy climate like Arusha etc. But areas with incidence of diseases and pests infestation like mosquitoes that cause malaria, Tse-tse flies and locusts discourage population settlement like the central parts of East Africa. In Tanzania the worst affected areas are the western and southern districts like Mpanda and Liwale respectively.

8. **Human (Anthropogenic Factors):** These include culture (tradition, religion) economic structure, transport and communication and politics.

9. **Social – Cultural Aspects:** Some tribes have a tradition of going to continue to reproduce in the same area to create clans. In time, these areas become overpopulated and hence highly fragmented like the Kilimanjaro among the **Chagga people.** Traditional beliefs like superstitions can make people avoid living in certain areas due to the fear of risking their life. Also areas where social services are readily available, like in towns there are high population unlike the rural areas where social services are poorly available.

10. **Economic Structure:** People tend to settle in areas where there are economic opportunities like in towns due to the presence of trade and industries. Urban industrial areas like the rand in South Africa are densely populated. But the areas with poor economic base have low population since people avoid settling in those areas.

11. **Political Factors:** Areas with political stability and peace attract population but where there is political instability tend to avoid. These areas face depopulation due to conflicts like in Sudan, Somalia, and Democratic Republic of Congo. Also the policies especially on resettlement schemes so as to solve the problem of overpopulation influence population distribution in the country. **For example** the government can decide to establish new settlement areas and force people from the overpopulated areas to come and settle. Also the establishment of colonial rule like in Tanzania led to the concentration of people in the most productive areas leading to low population in other areas.

12. **Transport and Communication:** Areas which are served with transport and communication attract high population since they can transport their goods to the market areas. But areas which are poorly served with transport and communication like Western parts of South Africa and China have low population. These areas are remote and hence are not accessible.

POPULATION DISTRIBUTION (STUDY CASES)

Population Size, Composition and Distribution

Since independence, Tanzania has conducted four censuses in 1967, 1978, 1988, and 2002; these have been the main source of population data. These censuses have indicated that the population of Tanzania increased from 12.3 million in 1967 to 17.5 million in 1978 and reached 23.1 million in 1988, also to about 35 million in 2002. During this period, the population growth rate was estimated at an average of 3.2 per annum during the period between 1978 and declined to an average of 2.8 per annum between 1967 and 1978 and declined to an average of 2002 percent per annum between 1967 and 1978 and declined to an average of 2.8 per annum during the period between 1978 and 1988. The 1988 and 2002 censuses indicate that there is a variation between the regions, for example at a regional level the estimated annual growth rates ranged from 1.4 percent (Mtwara) to 4.8 percent (Dar es Salaam.)

Tanzania has a young population. According to the 1988 Population census, about 47 percent of the population is aged below 15 years, and 4 percent aged 65 years and above. The 2002 census also showed that the young are more than the old. This youthful age structure entails a larger population growth in the future, as these young people move into their reproductive life irrespective of whether fertility declines or not.

Tanzania's labor force, defined as the economically active persons in the 15 to 64 years age group, has been growing steadily since 1960. From 1960 to 1993 for instance, the average annual growth rate of the country's labor force was 2.8 percent and it is projected that during the coming years, it will grow to 3.0 percent. Tanzania's economically active population was estimated to have risen from 7.8 million in 1978 to 11.3 million in 1990. The 1990/91 Labor Force Survey (LFS) showed that out of an estimated labor force of 11.3 million, males and females constituted 49.8 and 50.2 percent respectively.

An important feature of the population profile is its spatial distribution over the national territory and its rural – urban migration patterns and trends. The analysis of population distribution by district carried out on the basis of the 1967, 1978, 1988 and 2002 census results indicate that about two – thirds of the population distribution ranges between 4 persons per square kilometer as observed in Liwale district to 383 persons per sq. Km. observed in Chakechake and 282 found along the slopes of Mount Kilimanjaro. About 79 percent of

Tanzanians still live in rural areas (majority of whom are women) though the urban population has been growing at a rapid rate of more than 5 percent per annum over the past three decades.

Components of Population Growth

The main components of population growth in any country are **mortality**, **fertility** and **net migration**. In Tanzania, fertility and mortality are the most important factors influencing population growth at national level. Previous censuses have shown that net migration component has been negligible.

Mortality rate has declined substantially in Tanzania over the decades. The main contributing factors to the decline are improved access to health care and better environmental sanitation. The crude death rate (CDR) is estimated to have environmental sanitation. The crude death rate (CDR) is estimated to have fallen from about 22 per thousand in 1967 to 15 in 1988. Infant mortality rate (IMR) per 1000 live births is estimated to have declined from 170 (1967) to 115 in 1988 and then to 88 in 1996 (TDHS, 1996). In the same period, the less than five mortality rate per thousand live births, declined from 260 to 137. The declining mortality is reflected in the rising life expectancy at birth from a level of about 40 years in 1967 to about 50 years in 1988. Inspite of this decline, mortality still remains high by world standards. Maternal mortality rate (MMR) is still high. The 1996 TDHS shows that the MMR is estimated at 529 maternal deaths per 100,000 live births.

The fertility rate in Tanzania is estimated to have declined slightly over the past decade. At 1996 fertility level, a Tanzanian woman will give birth to an average of 5.8 children during her child – bearing years. This implies that the total fertility rate (TFR) has declined from 6.4 (1988) to 5.8 (TDHS, 1996) births per woman with significant regional and educational differences. For example in 1996, Mainland Tanzania recorded 6.3 and 4.1 births per woman in rural and urban areas respectively. Differences related to education are inversely much wider. Fertility rate for women with no education is 6.4, with primary education 5.4 and with secondary and higher education 3.2 (TDHS, 1996).

High fertility level observed in Tanzania is an outcome of a number of factors including:-

1. **Early and nearly universal marriage for women**. For example, the median age at first marriage for women aged 25 – 49 is 18 years and by the age of 20, over 67 percent have married at least once (TDHS, 1996). The 1971 Marriage Act stipulates a legal minimum age at marriage of 15 years for females and 18 for males; and
2. **The absence of effective fertility regulation within marriage**: For example, the contraceptive prevalence rate is currently estimated at 16 percent among women aged 15 – 49.

Other underlying factors contributing towards high fertility and rooted in the socio – cultural value system include:-

1. Value of children as a source of domestic and agricultural labor and old – age economic and social security for parents.

2. Male child preference; This is perpetuated by men.
3. Low social and educational status of women in society which prevent them from taking decision on their fertility and use of family planning services
4. Large age differentials between spouses which constrain communication on issues related to reproductive health.

Rural – urban migration has been a main feature of migration in Tanzania for many years. The increase in rural –urban migration has led to increasing rate of urbanization, especially in major urban centers like Dar es Salaam, Mbeya, Mwanza, and Arusha. The proportion if population living in urban areas increased from 5 percent in 1967 to 13 in 1978 and 21 percent in 1988. Between 1978 and 1988, the urban population for Tanzania increased by 53 percent. These are variations alone contained about 25 percent of the total urban population in 1988. The unprecedented migration of people from rural areas increase the burden on already over- loaded public services and social infrastructure especially in the squatter areas, which stimulate the flourishment of communicable diseases like tuberculosis, cholera and malaria. Rural –rural migration also contributes to the regional and district level variations in terms of population pressure over resources. These variations are demonstrated by differences in population densities between districts, wards and villages. The general observation is that population increase has not been in line with the land area available for human use.

Population and Development Interrelationships

Rapid population growth is one of the primary obstacles to development.

In the short run, its effects may appear marginal, but it sets into motion a cumulative process whose adverse impact on various facets of development might turn out to be very significant over the medium to long term. This is because population factors impinge on development and the welfare of individuals, families, communities at the micro level and at the district, regional and the national level as whole at the macro level. The effects and responses to population pressure interact at all these levels.

Rapid population growth tends to increase outlays on consumption, drawing resources away from saving for productive investment and therefore tends to retard growth in national output through slow capital formation. The strains caused by rapid population growth are felt most acutely and visibly in the public budgets for health, education and other human resources development sectors. Food requirements for the rapidly growing population also mean that of the gains from increased agricultural production are eroded.

Adverse economic effects due to rapid population growth are shown explicitly by looking at projection of future population and the costs of providing social services. If the 1978 – 1988 inter – sensual population growth of 2.8 percent per annum does not decline, then costs for the provision of health services will rise annually but without improvement in either the quality or coverage of the current services.

Population and development influence one another. The influence may be positive or negative depending on other mentioned demographic factors interact and create the following problems:-

1. The rapid growing young population demand increasing expenditure directed to social services such as education, health and water.
2. The rapidly growing labor force demands heavy investments inhuman resource development as well as development strategies which ensure future job creation opportunities;
3. Rapid population growth in the context of poverty reduces the possibility of attaining sustainable economic growth.

NIGERIA

In 1991 population was estimated to be 116,926,000 and population density of 127 persons/km^2 in which 65% live in urban areas, and 35% live in rural areas. The population distribution of Nigeria is uneven such that there are areas with high population densities and areas with sparse population density. The variation has been contributed by:-

1. **Physical Factors**

(i) **The variation in climate such that some areas have favorable conditions**. Also the nature of climate has influenced the distribution of population depending on the nature of the activities. In the North pastoralism dominates and some irrigation takes place while in the South crop production like, oil palm, takes place. Where the rains are not adequate like in the middle belt Population is also low.

(ii)**Soil variation** since some areas have good soils, which can support agricultural production while others are having poor soils like the middle belt.

(iii)**Mineral deposits** such that more people are found in the areas mining takes place unlike the areas which are poor of resources.

(iv) **Water Supply** also has influenced the population distribution. There are many people near the river valleys due to the supply of water for irrigation and for pastoralism especially in the north. The existence of swamps especially in the Niger delta has led to sparse population.

2. **Biotic Factors**

(i) **Vegetation** also influences population distribution in the country. For example where there are mangrove swamps like in the Niger delta people are discouraged to settle.

(ii)**Some areas are infested with tsetse flies** like in the middle belt have sparse population while areas which are free of tsetse flies and diseases encourage high population density.

3 **Human Factors**

(i) **Political factors:** Nigeria is the country of political instability since there are frequent civil wars. So, there have led to some people keep on moving from some places with conflicts to places which are at least having peace. During the wars many people die.

Also, recently the government has encouraged a wider spread of settlement by developing transport systems, mining centers, extending power supplies and agricultural activities in the under populated areas (which can still support more population).

(ii) **Presence of towns** also attracts many people; hence there is high population in towns compared to rural areas. This has been due to rural – urban migration. They go to towns since they expect obtaining job in the industries and other economic sectors. Also in towns they expect to get some social amenities like cinema, educational services, medical services etc, which lack in the rural areas.

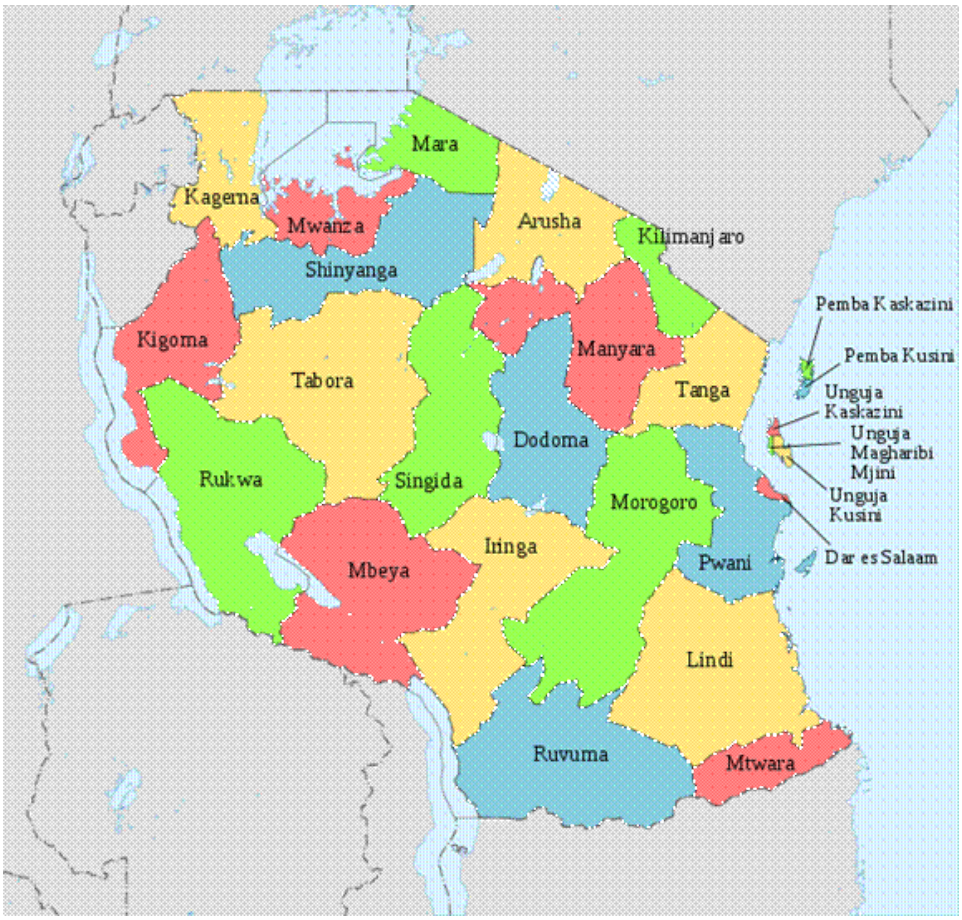
(iii) **Transport and communication** has influenced population distribution in Nigeria. There is high population where transport and communication services are available. For example along the railways, roads and around the ports.

(iv) **Historical factors** have also influenced population distribution in Nigeria. For example the middle belt has been affected by slave raiding during the Trans – Atlantic slave trade to depopulation and hence how densities of population in the areas, apart from other factors like poor soils.

(v)**Tribalism** (ethnicity has also affected population distribution in Nigeria). Each state is dominated by one tribe (ethnic' group) such that these groups are always in conflict leading to political instability. For example the Ibo occupy the South East, where there are cities of Ibadan, Lagos, Oyo and Oshogbo. The Haussa are in the north in the towns of Kano, Maiduguri and Sokoto. The Yoruba occupy the South West where there cocoa farms.

(vi) **Religious factors** also have contributed to the nature of population distribution in the country. For example Muslims are concentrated more in the north while most of the Christians are in the South. Such religious diversity has also contributed to the existing civil wars in Nigeria.

Diagram (Map):-



People per square Km

KEY:

i) Tabora, Rukwa, Lindi, Ruvuma. (9-16)

ii) Singida, Mbeya, Iringa, Morogoro, Pwani (15-30)

iii) Mtwara, Tanga, Dodoma, Mara, Kagera, Shinyanga, Mwanza (30-80)

iv) Kilimanjaro (80-250)

v) Pemba (250-300)

vi) Dar es Salaam (300-980)

Population Distribution/Density of Tanzania

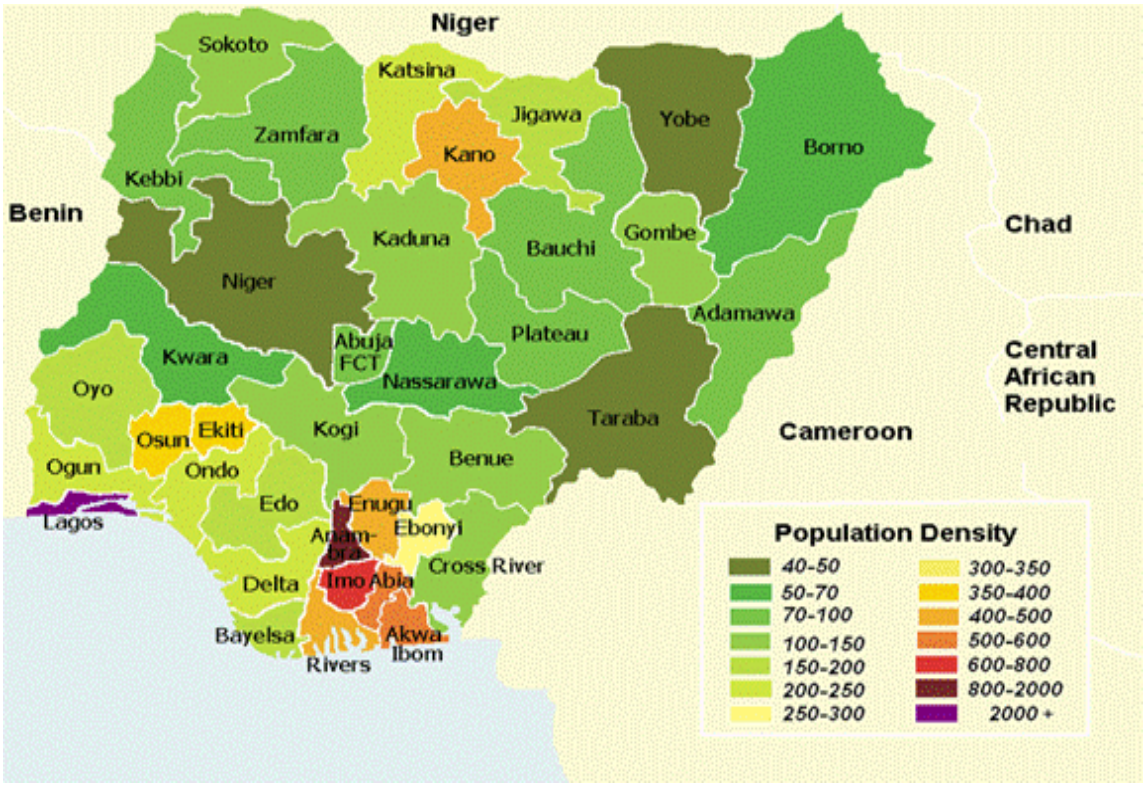
EXAMPLES OF VARIATION IN POPULATION DISTRIBUTION IN NIGERIA

1. **High population density** is found in areas where climate, soils, and which relief (terrain) are favorable) like The South Western Nigeria which has highly urbanized cocoa lands of Yoruba, Southeast Nigeria where there is a palm belt and industries in Iboland, North Central Nigeria in the Haussa land where cotton and groundnuts are grown. These areas have the density ranging from 200 people per square kilometer to 500 people per square kilometer.

2. **Moderate population density** is found in areas fringing the densely populated areas especially on the more marginal lands. These are better served by roads, railways, and river transport.

2. **Sparse population density** is found in areas like Bornu state in the North eastern states which the climate is driest in the country, the middle belt area where the soil poor (laterite soil) and infested with tse tse flies and the Niger delta where the climate is hot and humid with swamps and mangrove forest which make the area unsuitable for human settlement

Diagram (Map)



CHINA

In 1989 population was estimated to be 1,097, 432,000 in which population density was 115 persons / km2. 21% of the population lives in urban areas and 79% in rural areas.

GREAT BRITAIN

In 1989 population was estimated to be 56,658,000 in which population density was 232/km2. With 92% livings in urban areas while the remaining 8% in rural areas.

POPULATION DATA

Refers to the information pertaining to population concerning some economic, social and demographic matter

Sources of Population Data:-

There are divided into primary and secondary data sources.

Primary (Traditional) Sources:-

1. Periodic national censuses.
2. Vital registration systems which deal with vital events like births, deaths, marriages, divorces and migrations.
3. Sample surveys and inquiries.

Secondary Sources of Population Data:-

There are the most widely used sources of population data. They include tall types, published reports, unpublished reports and statistical abstracts.

VITAL REGISTRATION OF PERSONS:-

This involves the registration of events like births, deaths marriages. This is a basic source of data of a population. The registration of births is used to calculate the birth rate of a country. It is also used to determine the number of persons added to a community over a period. Such figures are lacking in rural areas because numerous births are not registered. Registration of births is common in towns because children are mainly born in hospitals and birth certificates are demanded on registering children in schools. Deaths of babies are used to calculate infant mortality rates. The registration of all deaths assists in determining the number of people that are departing the population in relation to the births and this helps in economic planning. The registration of newly married couples assists in estimating the number of parents in a country. Registration of refugees is vital in knowing the rate of their inflow into a country.

In most developed countries vital registration systems are quite developed but in developing countries like in East they are not yet well developed. However, at present most population data for the majority countries are obtained from censuses, which are usually conducted at ten – year intervals.

CENSUS

This is a process of collecting, compiling and publishing demographic, economic and social data pertaining to a specified time or times to all persons in a country or delieated territory.

Characteristics of Censuses

Censuses have the following characteristics:

1. **Universality within a specified territory**: Ideally for the census to be universal it must cover the whole territory or country and all people residing in the country or including those who are absent if it is dejure census. Whenever this proportional of the population that has been covered. But there is not any country that covers all people since many people tend to be absent and some are reluctant to give information etc.
2. **Periodicity:** Regular periodicity or interval is highly necessary in censuses. Hence censuses are taken at certain interval like after every ten years etc. Specified interval helps to analyze the data in a more dimensional way. Also UN recommends that censuses should be taken at regular intervals in order to get comparable information with a fixed sequence. For example in Tanzania censuses were taken at an interval of ten years from 1948, 1957, 1967, 1978, 1988. The subsequent was expected to take place in 1998 but it took place in 2002. The delay was due to financial constraints.
3. **Specificity:** They are for a certain country, territory or category of people in the country and for certain purpose like for political or economic planning.
4. **All persons (Individual Enumeration):** They involve counting of the number of persons in certain specified country or territory and every individual to be listed separately together with their personal characteristics.
5. **Simultaneity:** They take place at the same specified time throughout the country or territory. This helps in producing comparative and logical censuses. E.g. in Tanzania the 1967, 1978, 1988 censuses were assumed to be taken on the 26/27 date midnight of August. More often enumeration sometimes does not need to be completed on the same date but the official time remains the midnight. Nonetheless, the more the time is used in enumeration the more difficult it becomes to avoid omissions of enumerations.
6. **Census is costly** since they need resources and time in enumerating the population.

Types of Census

These can be categorized either according to approach of undertaking the census or according to the time interval with which the censuses are conducted in the country or territory.

According to Approach:

A Census can be either **de jure** or **de facto**.

De jure census is the one in which the people are counted according to their usual place of residence where only permanent members of household are counted. The weakness of this type is that it regards people as if they are static while they are dynamic.

De facto census is the one in which the people are counter wherever they are found on the day of enumeration, that is, all people who stayed in the household for the night are counted.

Census, therefore, gives a population profile. From census data the main characteristics of population as well as the level of socio – economic development of countries are revealed.

According to the Time Interval:

Quinquennial census refers to the census carried out after every five years, while **decennial census** is the type of census carried out after every ten years.

The Objectives of Modern Censuses:-

1. To provide a complete account of all members of a country by age and sex. The age and sex distributions are so important for socio – economic planning which help in estimating births, deaths, and growth rates.
2. To obtain the detailed statistics on the size, nature and distribution of the labor force. This concerns the economically active people in the population in terms of industrial activities, employment status, skills and levels of specialization.
3. To determine the literacy and illiteracy rates of the population in the relevant age groups. This provides information on the distribution of the literate population in different educational and technical fields and the scientific and the technical capacity of manpower.
4. To provide social and economic information on household and housing conditions such as occupancy, type of ownership and availability of household facilities.
5. To provide the complete picture of all places and persons, villages, wards and households for the whole country. Such picture is useful in planning development projects and in organizing nationwide and other sample surveys. Hence, population data is used for facilitating national planning of public programs such as determining the number of school places and teachers, location of hospitals and water sources and other service center, and the employment of the population.

Limitations of Censuses

Expenses: Censuses are very expensive since they involve training of manpower, transport, food and other operations for their undertakings.

There are problems of omissions of some of the members especially those who tend to be absent during counting and poor coverage, Enumeration becomes a big problem where the society has members who are nomadic or semi – nomadic.

There are problems of misreporting especially of ages and underestimations of some of the aspects of population characteristics.

These are the errors, which make censuses fail to depict the true picture of the population.

Population data is submitted so late to the Bureau of Statistics:-

Transport problems and remoteness limit the process of enumerating the members of the country. Some places are so remote that the personnel are discouraged from going of those areas.

Political factors can cause problems in counting the people especially where there are ethnic groups, which are conflicting like in Rwanda and Burundi.

Poor framing of questions creates fear among the individuals who in turn fail to provide true information about their families.

Low literacy levels and poor co-ordination limit the processes of undertaking censuses.

Censuses tend to be inaccurate because of too much estimation, which end up giving vague information. Also, vagueness comes about when the data are sent to the demographic headquarters while there occurred a lot of changes in population like number of people as well as sex- ratio.

SAMPLE SURVEYS AND INQUIRIES

In the absence of adequate capital to undertake censuses, some countries conduct national sample survey based on representative samples of the total population to secure desired information. Sample surveys are fairly representative because they seek the percentages of, for example, men, women, youth, farmers and doctors in a population. A sample survey involves a small number of people and it is therefore possible to use more detailed questionnaire and interviews that offer more accurate information. Sample surveys are usually carried out to provide information on various topics, e.g. fertility and people's attitudes to family planning, breast – feeding, as well as on the demographic and health situation of a country. These are regularly carried out by the country's bureau of statistics. Sample surveys are the cheapest sources of population data.

4.2 POPULATION (DEMOGRAPHIC) STRUCTURE

Population structure refers to a composition in terms of proportion of people according to certain status categories such as age, sex, educational level, marital status, labor force (skilled or unskilled), ethnic status, household characteristics, health, citizenship, rural or urban category as well as economic status. Age – sex structure is commonly used in studying the population structure of a country. Population structure is influenced by the birth rates, death rates, marriage status and rates, incident of migration, structure of the labor force, level of education, economic level and political aspects.

Representing Age - sex Structure:-

Age-sex structure is represented by diagrams known as **population pyramids**. Long term changes in fertility and mortality as well as lesser influences, such as persistent in – or out –

migration, wars, and epidemics are reflected in their shape. Model pyramids provide guidelines against which actual population may be judged.

Importance of Age – sex Pyramids (or Population structure):-

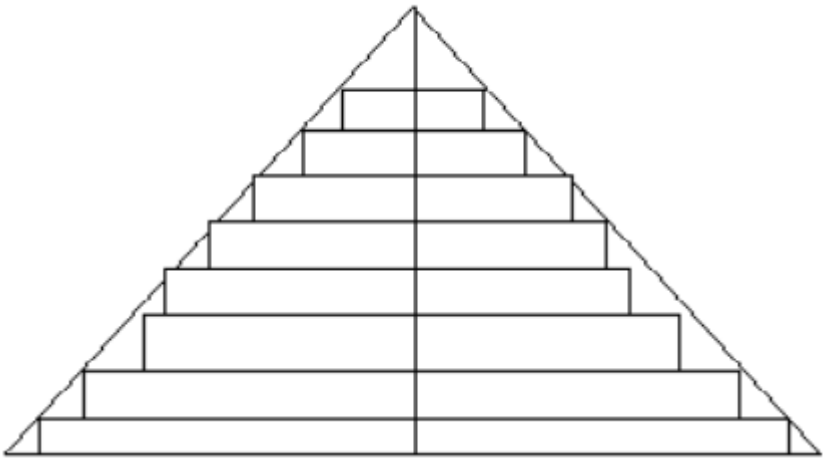
By studying the population pyramids, it is possible to interpret the population characteristics of any country. They will reflect:

1. Population size of the country.
2. Age – sex proportion.
3. Dependency ratio which can be high or low.
4. Level of economic development whether more advanced or less developed.
5. Fertility and death rates.
6. Population growth rate whether high or low or stationary.
7. Life expectancy, which can be either high or low.
8. Effects of natural disasters like wars, diseases and migration.
9. They also help in determining the country's future demographic trend and possible outcomes or problems.
10. Can help in the formulation of population policy like family planning in case it learnt that there are so many children who are born each year while the economic is poor.
11. It can facilitate the planning process for social and economic development. For example the government can plan for the type and range of distribution of welfare services needed for the population.
12. It can influence the patterns of purchasing and consumption, the size and characteristics of the labor force.

MODEL AGE – SEX PYRAMIDS

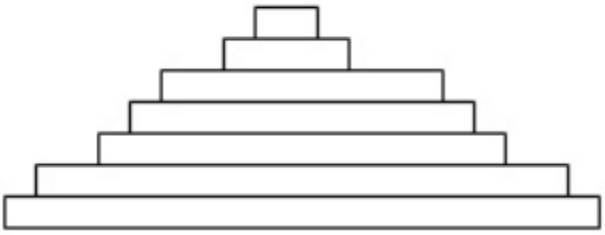
Stationary Pyramid

This has straight sides demonstrating stable fertility and mortality over a long period of time. Death rate is high because of poor living conditions and poor technology. Birth rate is also high because of low education, high demand for children, polygamy etc. Hence the rate of population growth (BR – DR) is very low.



Progressive or Expansive Pyramid:-
These are bell- shaped (with concave sides). The base of the pyramid is wider to indicate that the proportional of children is higher than any other population category. Hence there is high dependency ratio, low life expectancy, high birth rate and death rate (infant mortality rate). As children are not productive the development is low and the government's budget has to be spent on education for the children.

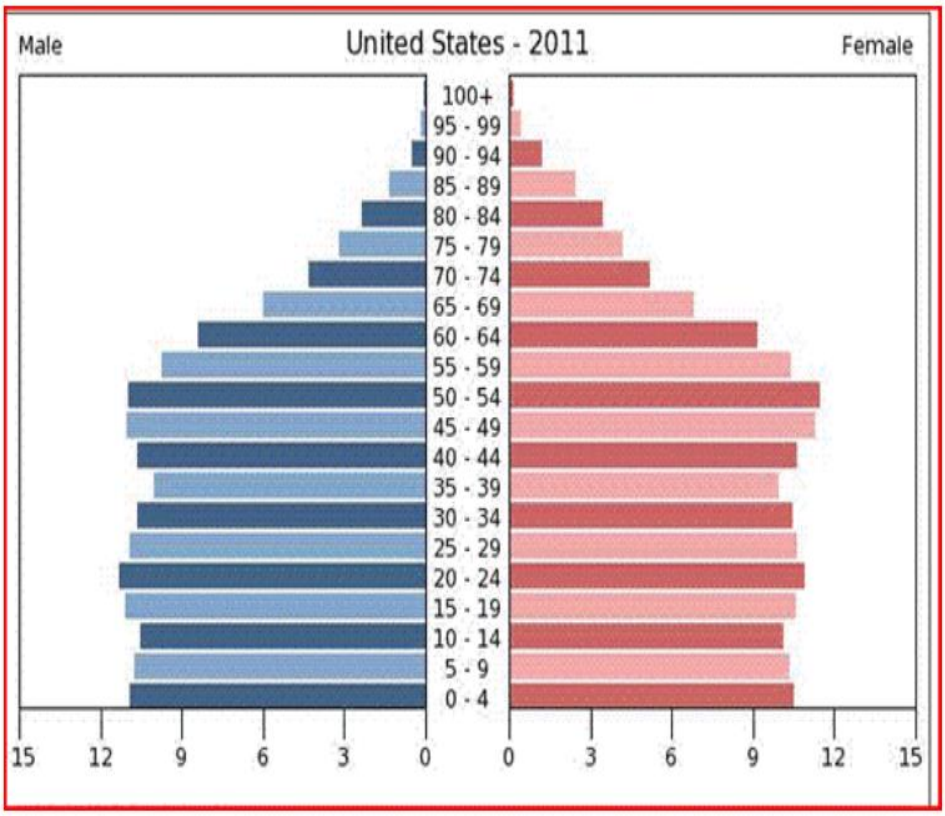
This structure is a characteristic of many African countries like Kenya and Tanzania.



Late Expansive Pyramid:-

The pyramid has convex sides showing that the death rates have begun to decline due to improved standard of living and technology followed by family planning and advancement in education. Population growth rate is declining. The narrow base shows that the birth rates are declining. The middle portion bulges to indicate that more people live to middle age and even to older ages and hence the life expectancy has increased. Argentina is under this stage.

Diagram:-

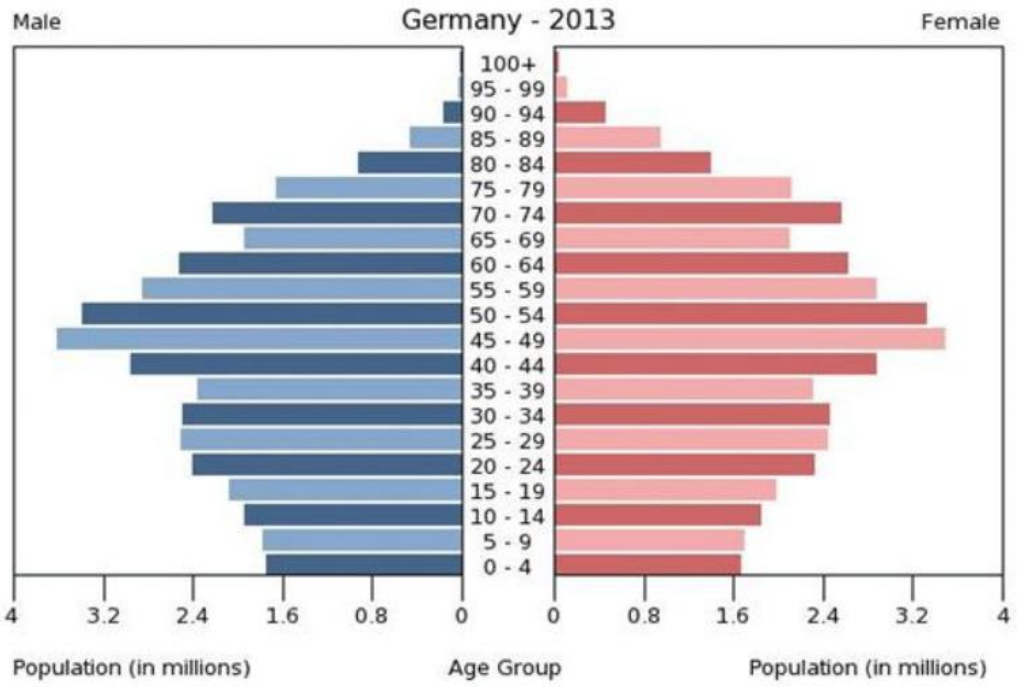


Regressive (Contractive) Pyramid:-

The base is very narrow because of low proportion of children. This has been due to low birth rate as a result of very strict birth control, high level of education, advanced economy and social awareness, good food and care. This is the model for countries with high economic development level like Sweden, UK and Japan. The population growth in these countries is very low:-

1. The post reproductive group is in a larger proportion due to high life expectancy, low birth rate, low infant mortality rate and low death rate.
2. There is a problem of aging of the population, which in turn leads to the problems of the increase in the dependency ration.

Diagram



STUDY CASES

Population Trend in Tanzania

Population of Tanzania tripled from 7.7 million in 1948 to 23.1 million in 1988. By 1984 population estimate were about 21,710,000 from 17,512,610 people according to the census of 1978. Between 1967 -1978 the population increased by 5.2 million people. This was a 42.2% increase within 11 years. And this represents annual growth 3.2%. Between 1978 -1988 the annual population growth rate was 2.8%. On the basis of this growth rate the population of Tanzania was projected to be about 33 million by the year 2000. All in all, according to 2002 census, the population is about 35 million. t can therefore be concluded that population in Tanzania is rapid and this has some impacts on resources as follows:-

1. **Land fragmentation** due to population pressure like in Kilimanjaro fragmented and cannot allow mechanization or large – scale cultivation.
2. **Over utilization** of resources like overfishing leasing to scarcity of fish, deforestation due to cutting of vegetation, exhaustion of minerals due to excessive mining and loss of wild animals. Deforestation has led to erosion in some areas. Land problems have been accelerated by the need for more food, housing requirement and recreational amenities.
3. **Food shortage** due to the fact that population growth is such much rapid that it does not keep pace with the level of capital investment in agriculture which is characterized with low level of technology.
4. Following the food shortage Tanzania has been forced to **incur some costs on importing food**, E.g. importation of maize, wheat and rice.

5. Rapid population growth has **increased the dependency ration** in the country. As a result more efforts are concentrated on meeting some immediate needs of the young population rather than investing in fundamental economic sectors.
6. Rapid population growth has led **to stress on facilities** like housing, water supply, electricity, health care and communication services.
7. **Scarcity of land** in different places especially in rural areas has forced people to migrate to towns or other places. Coupled with migration aspect some of the people have been pushed to marginal lands where production has been low.
8. Rapid population growth has led to **unemployment**.

TANZANIA'S RESPONSE

1. As a result of unemployment and mushrooming number of loiterers Tanzania put in place the Human Resource Deployment program (Nguvu Kazi) 1983, the control of government expenditure (Kubana matumizi) programs (Early 1980's) in order to avoid the over use of resources and services.
2. Establishment of some resettlement schemes in Arusha China and some parts of Tanga and Morogoro. This was undertaken for the sake of reducing a number of people in the areas, which were having high density.

Does Tanzania have some Population Pressure?

What is Population Pressure?
It is a situation in which the number of population is greater than the carrying capacity of the land and its resources. In this case the resources are fewer than the number of people and hence cannot satisfy the needs of the people in that particles . Population pressure is related to overpopulation. At a national level, Tanzania seems to have no population pressure. This is the case when one relates the available area of land to the population of the country at large. Nonetheless population pressure can be said to exist only at local levels such as family or regional level. For example the Chagga land has got a population pressure unlike other parts of central Tanzania, which are still under populated. Rufiji basin is also under populated and can support more population.

Therefore population pressure in Tanzania is not all that much a problem since it can be solved. The success can be achieved once Tanzania embarks on strategic development of agricultural by tapping the potential land, which is lying idle like Rufiji basin. There should be a great focus on investing in the rural areas by opening up the virgin land and establishing irrigation schemes so as to encourage people to settle in rural areas rather than flooding the urban areas.

Factors for Population Pressure Different places:-
Population pressure can be brought about by the following factors:

1. **Fertility of soil**, which attracts people in certain area. People go to settle in those areas for carrying out agricultural activities. Examples are the Netherlands and the Southern slopes of the Kilimanjaro Mountain.

2. **Availability of minerals** in certain area, which also attracts a big number of people.
3. **Healthy climatic conditions** especially in the highland areas where there is cool with low diseases incidence.
4. **Availability of water solders and constant supply of water** like along the river banks of the Nile valley.
5. High growth rate as a result of **high fertility or birth rates** and **immigration.**
6. **Cultural aspects** like land inheritance and tenure can lead to population pressure. Some tribes continue staying in areas that belonged to the forefathers and are continue staying in areas that belonging to the forefathers and are reluctant to shift to other places.
7. **Scarcity of arable land** can make people concentrate on the available small piece of land to carry out their agricultural activities
8. **Poor policy on population control**. The policy has control of population growth and distribution as well as land ownership. But where the policy is poor there occurs population pressure problems.

Impacts of Population Pressure:-

1. It leads to inadequacy in social services like medicine and education opportunities as well as water supplies.
2. It leads to unemployment due to the excessive number of people who are more than the available economic sectors.
3. It can cause deforestation since people clear vegetation for establishing settlement or cultivation.
4. It can lead to mineral exhaustion as a result of over exploitation where mineral deposits are small.
5. Population can also cause land degradation especially soil erosion after clearing vegetation.
6. There can occur on outbreak of diseases due to prostitution and environmental pollution like water and air pollution.
7. It can restrict or hamper the development of industries by posing the locational problems. When there are so many people becomes problematic to locate heavy industries in a particular area.
8. Population pressure leads to the problems of poor housing such that many people can share one room. This can turn facilitate the spread of contagious diseases.
9. Unemployment caused by population pressure can lead to the prevalence of crimes and increase in prostitution.
10. Decline of resources leads to the occurrence of poverty in a particular place or country.
11. Cultural deterioration also can take place in the areas with population pressure.

What should be done?

1. There should be family planning programs focusing on birth control.
2. The government should establish resettlement schemes which can lead to the shifting of people from the overpopulate areas to the under – populated areas like Rufiji basin and central parts of Tanzania.
3. Establishing irrigation schemes, which can attract people from the over – populated areas.

4. Establishing land tenure system so that people can concentrate on their own pieces of land rather than migrating from place to place and lead to the occurrence of population pressure in the destination areas.
5. Providing profound and viable 'education to the people so as to resign them from cultural aspects, which force them to continue reproducing, and remaining in the same place inherited from the forefathers.
6. Establishing other economic activities rather than depending on agricultural. People should engage themselves in other activities like trade and fishing.

4.3 POPULATION DYNAMICS AND QUALITY OF LIFE

Population dynamic refers to the changes in population over time. Populations are dynamic, that is their numbers, and distributions, structure and movement (migration) constantly change over time and space. The components of migration change include:

1. Natural change as result of births and deaths.
2. Migration change as a result people moving in or away.

Population change is an example of an open system, where there are inputs, processes and outputs:-

1. Inputs include: births and immigration.
2. Processes include:

(a) Natural change.

(b) Migration

(c) Total population

3. Out puts include deaths and emigration.

The total population of an area is the balance between the two forces of change: Natural change and artificial change (migration). Natural increase or annual growth rate is the difference between the two forces of change: Natural change and artificial change (migration).

Natural increase or annual growth rate is the difference between birth rates and death rates. The rate of the Natural increase is the difference between crude Birth Rate (CBR) and Crude Death Rate (CDR). It is obtained by the formula (Natural growth rate CBR – CDR=Migration) and it can be expressed as a percentage.

The rate of natural increase (RNI) for Africa is 3.0 which are higher than the world average of 1.7. For other selected regions RNI is as follows: Asia (1.8), North America (0.7) and Europe (0.2). This means that population in Africa is growing at a higher rate than that of the other continents.

Even the regional growth of population varies e.g. It is highest in West Africa (3.3) and the lowest in Central Africa, with 2.0. Countries with highest Natural increase are Kenya (4.1), Libya (3.6) and Algeria (2.9) each, while those with the lowest are Reunion (1.2), Cape Verde (1.3) and Mauritius (1.5).

High Natural increase rates are due to lowering of child mortality, although other factors such as improved health services also extend the average life expectancy.

Fertility and Birth Rates:-

These also account for population dynamics. Fertility is the occurrence of live births in a population. It is measured by **Crude Birth rate** (CBR) which is calculated by taking the total number of live births divided by the total population in a given year then multiplied by 1000 or 100.

It is called Crude Birth Rate because it includes all ages and both sexes in the development and attempt has been made to reach women at risk. Its weakness is that it is too general and hence in some respects it is not a good measure of fertility. Africa has the highest levels in the world compared to other selected regions, it has a CBR of 43 per thousand, whereas North America has 13, Asia has 26 and Europe has 12 per thousand.

The world average CBR is 26 per thousand, while Southern Africa has 31 per thousand. Western Africa has the highest fertility rate in the world. Normally the birth rate ranges from 10% in developed countries and 50% in the developing countries. In calculations the mid year is used since the population will have been considerably exposed to mortality and hence one can avoid underestimation or over estimation.

Why high fertility rate?

1. Improved health measures and medical services.
2. The percentage of women married at younger age is higher in the Sub – Saharan Africa compared to the Northern Africa.
3. Some communities in Africa recognize high fertility as an important requirement for a successful family. Moreover, they consider having many children as a potential source of labour and social security for their aged parents.

Birth Rates / Fertility Rates:-

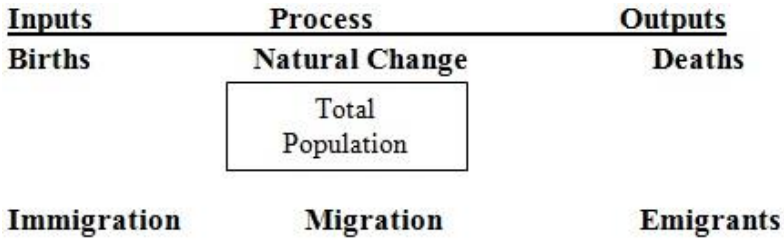
Birth Rate is the number of births per 1000 of the population. Birth Rate is a measure of fertility. Physiological capacity of a woman to conceive and given birth to a child, regardless of whether is a live birth or a still birth is called **Fecundity**. Lack of fecundity is called infecundity or sterility. Infertility on the other hand, refers to the inability of a woman to bear a child and this includes those who cannot give a live birth to a live baby. Infertility can be primary or secondary. Primary infertility is also referred to as involuntary childlessness. Secondary

infertility can also involuntary. For instance when a woman has had two children and is now unable to have more due to biological or health factors. It is called secondary since it is caused by a second factor after the previous births.

Mortality Rate and Death Rates

Mortality rate is the occurrence of deaths in a population. It's one of the major causes of change in the population size. Mortality is measured in terms of **Crude Death Rates** (CDR), which refers to the number of deaths per year per 1000 of the population.

Crude death rate is very high in Africa. In the period between 1990- 1995 the average Crude Death Rate (CRD) was 13 per 1000 against the world average of 9 per 1000. In the same period the average CRD of Asia was 8 per 1000 and Europe was 10 per 1000. In Africa most countries have the CRD between 6 per 1000 to 21 per 1000, except in the small Islands such as Reunton, Mauritius the Seychelles and Cape Verde where the CRD is less than 6 per 1000.



In general, mortality rate is declining. This trend is obvious in towns and cities where health facilities are better and living standards are higher than in the rural areas.

Hence

Birth rates and death rates account for either the increase or decrease in population respectively. High birth rates and low death rates contribute to the population growth. Generally, birth rates in the world declining as more and more people are practicing birth control. Wealth and education are the best contraceptives; the richer and better – educated people have fewer children.

General Fertility Rate (GFR)

Which refers to a number of live births in a specified period (year) divided by the average number of women with child bearing age (15 – 49) expressed per 1000 is taken to be a more refined rate than the Crude birth Rate because it is applied to consideration women at risk by giving birth and in so doing it eliminates cost of distortions caused by variations in age structure.

$$\text{GFR} = \frac{\text{No. of births in a year}}{\text{Female population aged } (15-49)} \text{ x } 1000$$

However, it is still not such refined measure because it takes very little account of age patterns of marriage or patterns of fertility. To eliminate this limitation, more refined measure is used which

is the **General Marital Fertility Rate (GMFR).**

$$\text{GMFR} = \frac{\text{Births married women } (15-49 \text{ years})}{\text{Married women at } (15-49 \text{ years})} \text{ x } 1000$$

In this case married women are used because they are actually exposed to giving birth.

Age Specific Fertility Rate (ASFR)

It's the number of live births occurring to women of a particular age group per year expressed per 1000 women.

$$\text{ASFR} = \frac{\text{Births of women in age group}}{\text{female in that age group}} \text{ x } 1000$$

NB:

Despite the declining trend of birth rates at a global level, the global population is ever increasing due to the following reasons:-

1. **Economic Factors:** In LEDC's most of the people recognize that children can be a source of labor in the farms, small trades for earning money, for begging and providing support to the elderly parents.
2. **Soil Factors:-**

(i) Little use of birth control in LEDC's due to low education or ignorance and negligence.

(ii) Some tribes take it as a sign of prestige such that having 6 to 10 children in a family is normal.

(iii) Early marriages: Traditional or religious attitudes may militate against change or may make conditions worse. Birth control is forbidden by the religious institutions like the Catholic Church which condemns the modern methods of birth control like the use of condoms.

In rural areas due to low level of education the people are conservative and hence rigid in accepting the new methods of family planning.

3. **Political Factors:** Government failing to finance family planning programs because of poor economic levels.

POPULATION MIGRATION

(Population Movement)

Population migration refers to the movement of people from one place to another, which can involve either temporary or permanent change of residence. It can also involve seasonal movements like trans humance in the Alps and Himalayan areas or daily movement like people

commuting from urbanized villages to city centers for business or jobs in the offices and studies. Migration affects population distribution and population structure.

Why People Migrate?

Migration can occur due to the influence of either PUSH factors or PULL factors.

Push factors are the factors that force people or a person to move out of a place to another place. The people or person in this movement might not have been satisfied with the conditions prevailing in certain place. Pull factors are the factors that attract people into a place. Pull and push factors include physical, economic, social, political, and biological.

Physical Factors

Climate
Good climate like having enough rains, moderate temperature attract people into a place while poor climatic conditions like shortage of rain fall, extremely high temperatures and extremely low temperature force people away or do not attract people into a place. E.g. people cannot be attracted to live in very cold region like very high mountain areas of Himalaya and Kilimanjaro.

1. **Edaphic (soil) factors**: Areas with good soils attract people for example the villages of the Ganges River, Yang tse Kiang, Hwang HO and the Nile have attracted people while areas with poor soils force people away from a place.
2. **Relief**: The areas, which are free from floods like highlands, attract people while the areas, which experience floods like lowlands force people away. Also, people go to places with gentle slopes for easy cultivation and leave place with steep slope since they are prone to erosion.
3. **Presence of natural resources** like mineral attract migrants like the rand in South Africa while the exhaustion of mineral or absence of minerals force people away from those places.
4. **Natural hazards** like earthquakes, volcanic eruptions, floods and storms, etc people away from a place while the absence of these natural hazards attracts people to a certain place.

Biological Factors:

1. The area which is free from diseases and pests attracts people but where pests and diseases are predominant people move away to other place. For example there are common movements of people from the central parts of Tanzania due to tse-tse fly infestation of other with healthy conditions like the southern highlands of Tanzania, etc.
2. People, especially farmers, can migrate from areas, which have been invaded by destructive weeds to areas, which are not highly affected by destructive weeds.

Economic Factors:-

Lack of income opportunities can force people out of the place to other areas while availability of income opportunities attracts people. This is manifested by rural – urban migration. For example industries in towns attract people from rural areas to urban centers.

Social Factors:-

1.The presence of relatives in certain place can attract people into a place. One can decide to go to certain place because of the presence of the brothers, uncles, sisters, etc.

2. Lack of social amenities in certain place can force people make people move away while the presence of social amenities attract people into a place. For example, availability of electricity, medical services, transport and entertainment attract people in towns and absence of these aspects in the rural areas forces them out of villages to urban areas.

3. Social conflicts, enmity, witchcraft etc force people away from a place.

4. Overpopulation forces people move a place to other areas, which are not overpopulated while under population in areas, which are having potential resource, can attract people.

Political Stability:

1. Where there is peace due to stable political system people are attracted to move into those places while places with political problems force people away. For example, people move away from areas with civil wars like Rwanda and Burundi areas with peace like Tanzania. Also, tourists like visiting the countries, which are peaceful and avoid the countries, which are full of political fracas or turmoil.
2. Also, the government can encourage people to the settlement schemes so as to solve the problems of overpopulation or under population or under utilization of resources.

Characteristics of Migration

1. **Migration is Selective**
2. This means that in certain circumstances and at certain times particular persons or groups are more likely to migrate than others. Such migration selectivity is known as differential migration.

Important differentials are age, gender and social status:

1. **In terms of age**: Young people between 20 to 34 are more mobile due to economic reasons. Most of these move to urban areas in search of economic opportunities. Old people are more involved in urban- rural migration due to retirement.
2. **In terms of gender:** Males are more mobile at longer distances while females are more mobile at short distances. In rural urban migration young males are more involved than young females.

3. **In terms of social and economic status:** Rural dwellers are more mobile than urban dwellers due to economic differences between these categories of people. Nomadic pastoralism are more mobile than sedentary pastoralism. The rich can travel longer distances internationally and more frequently involving high costs while poor people travel shorter distances due to economic capacity.

Also, people who move as refugees are those who have experienced problems like floods, earthquake, wars, volcanic eruptions etc. Likewise some move as students, researchers, traders etc at different times and circumstances. Hence, not all people move at the same time. It is certain category of people who move at a particular time depending on certain obtaining circumstance. Therefore, it suffices to justify that migration is selective.

1. Most of migrants are poor since they have been forced to move to other place in search of economic opportunities.
2. Migration occurs in stages. This means that one short movement from one place leaves a vacuum to be filled by another short movement of population from beyond. In this way population progresses in waves (stages) towards the eventual goal.
3. Migration is two-way process since each movement in one direction has a compensatory movement in the opposite direction.
4. During migration the number of persons going a given distance is directly proportional to the number of opportunities (pull factors) and inversely proportional to the number of intervening factors: if no then it is most likely that no one will move to that place.
5. Most migrants travel shorter distances and the number decreases as the distance increases, so it illustrates distance decay.

Classification of Migration

Classification of migration is based on several criteria.

Criteria Type of Migration

1. **Boundary** Internal Migration, which involves the movement within the country and can be categorized into out-migration and in-migration. This can be rural-urban, urban-rural, rural – rural and urban – urban migration. External (international) migration, which involves people moving from one country to another country like labor migration from Mozambique, Malawi to South Africa in the mining areas; from Italy to Switzerland; nomads from one country to another country like the Maasai from Tanzania to Kenya.
2. **Duration:** Temporary migration like students going for studies outside the country or to other place within the country, trans humance which is a seasonal movement of farmers with their animals etc. Permanent migration which involves the total change of residence from one place to another place like people going to urban areas from rural areas, or going to rural areas from urban areas etc. It can be either international or local migration.
3. **Volition (Preference):** Voluntary migration, which is caused by someone's desire to move from one place to another place for example skilled laborers going to another countries for better salaries; to open new areas, retiring to warmer climatic conditions and going to town for better social amenities like medical services, schools, entertainment,

commuting to job places in town from villages etc. Forced migration due to political conflicts like refugees moving from Rwanda to Tanzania, slave trade like movement of African to Americas, overpopulation and environmental problems.

4. **Government Plans:** Planned migration due to the attempt by the government to reduce uneven development and solve the problem of overpopulation as well as to speed up the development of people like the establishment of Ujamaa villages in Tanzania and resettlement schemes adopted in different parts of the world for solving the problem of overpopulation and opening up the areas which were lying idle.

International Migration

It is a Migration that involves the movement of the people from one country to another. It can be permanent or temporary (short term). If one has been going to certain country so sequentially it is called chain migration. Short term migration has increased due to expansion of tourism, and millions of holiday makers, especially North America, Japan and Europe, now spend holidays abroad. The movement from the country is called emigration while the movement into the country is called immigration. International migration can be voluntary like job seekers such as doctors and nurses going to USA from Britain, students going for further studies and tourists.

Involuntary international migration includes aspects like:

1. Movement of slaves from Africa to North and South America.
2. Movement from refugees from Rwanda to other neighboring countries following the genocide in 1994, refugees from Afghanistan to Pakistan following the American attack on terrorism in 2001. Fleeing of a large number from Ethiopia due to famine.

Hence, international migration can be caused by economic, political, religious, cultural, and environmental factors.

Internal Migration:

It's the movement from one place to another place within the individual country. Distinction can be made between in-migration is the movement into a particular place like a region, a district etc within the country while out-migration is the movement away from the district, region etc to another place within the country.

Normally in Africa people move from poorer areas to relatively richer places where living conditions are better in order to increase their incomes. Some move because of avoiding punishments due to crimes they have committed or they escape from enemies and witchcraft. Four patterns of migration can be identified in Africa. They include:-

Rural – urban Migration:

This involves people moving from rural areas to urban areas in search of non – agricultural employment which is more paying (or expectation of getting job opportunities), better social amenities like medical services, education, reliable water supply, efficient transport and entertainment .

Most of the migrants are young and energetic people and especially males. The main centers of attraction are ports, industrial zones, and national and region capital cities. For example, in Nigeria School leavers and apprentices migrate to Ibadan and Lagos cities with expectation of getting jobs. This creates major employment problems for the government.

Impacts of Rural – urban Migration

In the source regions (rural areas) there occur the following consequences:-

1. Rural depopulation due to the movement of especially young people to the urban areas. As young people leave the rural areas old people, women and children are left. Hence, there occurs a problem of labor shortage and inefficient production.
2. Economic decline in rural areas because the resources are not utilized due to labor shortage. For example most of the land lies idle leading to agrarian crisis or agricultural failure.
3. Shortage of food supply (food crisis) because of poor agricultural performance, which in turn leads to starvation or famine, health deterioration and deaths.
4. Breaking of family and cultural bonds in the rural areas.
5. It can have positive impacts like creating room for environmental conservation in the rural areas and reducing the problem of overpopulation or population pressure in rural areas.

In the destination regions (urban areas):

1. It causes overpopulation and overcrowding. These in turn bring about the problems of poor housing coupled with the development of Shantytowns or slums, congestion in transport facilities and land degradation.
2. There occurs the problem of unemployment since people are more than economic sectors.
3. It leads to inadequacy in the social services like supply of pure and safe water, medical services, food supply, etc
4. Environmental pollution due to poor waste management like poor sewage disposal, excessive generation of wastes etc.
5. Cultural deterioration due to mixture of people from different areas with different cultural background.
6. Rise of immoral activities and different vices like crimes, prostitution, corruption, burglary, etc.
7. Industrial decline since rural areas no longer supply enough raw materials for the industries in towns.
8. Emergency of informal sectors like food vending, peddling done by the hawkers like 'The Machingas' in Tanzania, "Jua Kali' in Kenya.
9. Emergency of street children in towns caused by prostitution or poor marriage bonds as a result of economic crisis in town. There are so many street children in Africa and are called as CHOKOLA in Kenya.
10. Introduction of rural cultural in towns like witchcraft or superstition. Etc

11. Rural – urban migration can have positive impacts in that it can lead to the supply of labor in the industrial sectors and hence it can stimulate industrial development.
12. Another positive impact can be the expansion of market for goods produced in different economic sectors.
13. Infusion of technology that come along with the people from rural areas. This technology can be utilized for developing Appropriate Technology Industries.

Addressing or Solving the Problems of Rural –urban Migration

1. Elimination or reduction of income differentials between rural and urban areas. This can be done by investing the capital in the rural areas. Investing in rural areas can encourage some people in urban areas to move to rural areas.
2. Creating many other small urban centers so that some people can go to those new centers. These can reduce overpopulation in one town and stimulated economic development as well as environmental soundness.
3. Enacting strict policies, which restrict unnecessary massive movement of people from rural areas to urban areas.
4. Providing social services in rural areas, which are comparable to those given in urban areas such as good and effective medical services, education and electricity.
5. Setting good prices for the agricultural crops so that people can be encouraged to continue working in rural areas rather than rushing to towns for non – agricultural activities which are more paying than agricultural activities.
6. Transport and communication systems should be improved so as to facilitate the movement of goods, people and information flow.
7. There should be strict programs on population control in rural areas so that the rate of birth can be contained within sustainable limits.

Urban – rural Migration

Is the migration in which people move from urban areas to rural areas. This is also called counter urbanization. It is rare in Africa but now common in the developed countries where many people like staying in the countryside within the sub urbanized villages.

1. People go to rural areas to avoid air or noise pollution in the urban centers.
2. Other people go back to rural areas after retirement since they find it difficult to cope with vagaries of the urban life.
3. Unskilled people from rural areas can find it difficult to secure jobs in towns hence can decide to return to rural areas.
4. In the developed countries, people are encouraged to go to rural areas by the supply of necessary social and economic amenities, which are also available in towns.
5. The government can encourage or force people to go to rural areas to open up the potential land lying or to solve the problem of population pressure in towns.
6. The outbreak of terrible and moribund diseases in towns like meningitis, cholera and AIDS can force people to rural areas.
7. Lack of safety due to vandalism or hooliganism and burglary as well as frequent conflicts and social tensions can force people to run away from urban areas to rural areas.

8. Lack of space to locate industries and other large – scale economic sectors can lead to urban rural migration since these need large space.

Problems which can be caused by urban – rural migration can include:

1. Outbreak of conflicts with the old residents because of encroaching into their pieces of land or land deprivation.
2. The rise in the house prices and hence leading to the problem of housing.
3. More traffic congestion in the rural areas which can cause problems of delays, etc.
4. Land degradation like soil erosion as well as deforestation can occur.
5. Interference with culture in the rural areas leading to moral deterioration.
6. Decline in agricultural activities since most of the arable land turns into residential areas and industrial centers.
7. Increase in pollution like air pollution, noise pollution and water pollution.
8. Increase of crimes and other vices which are common in urban areas.

Advantage of Urban –rural Migration:

1. It can stimulate utilization of resources in rural areas. People can provide labor to work on the land lying idle like in the Rufiji basin, exploiting minerals, etc.
2. It reduces population pressure in towns and leads to the environmental improvement hygienic conditions.
3. It reduces the burden facing the government in terms of providing social services even to people who are idle.
4. Reduces the problem of beggars in urban centers.
5. It facilitates the general economic development in rural areas and reduces the economic gap between rural and urban areas.

Rural – rural Migration
This is the movement of people from one village to another village. One shifts to another village which is more economically advanced, more peaceful, to avoid witchcraft, running away from enemies or to follow his or her relatives.

Urban – urban Migration:
It's the movement of people or person from one town normally less developed to another town, which is normally more developed. For example one can move from Tanga to Arusha, Morogoro to Dar es Salaam, etc

Consequences (Impacts or Effects) of Migration;-
The consequences of migration can be either negative or positive both in the origin (where people or migrants come from or source region) and in the destination (where people or migrants go to).

In the Origin

Negative Consequences Include:-

1. Depopulation of people leaving old people who cannot produce at all and hence labor shortage occurs and the population structure is affected.
2. Drain of skills or technology from the source regions leading to poor resources utilization.
3. Decline in the production process since resources are not utilized fully due to the shortage of labor following the exodus of young and energetic people.
4. Poor food supply and hence deterioration of health.
5. Low life expectancy since people left in the source region suffer the problem too young.
6. There occurs an increase in poverty in the source regions especially rural areas.

Positive Consequences Include:

1. Migration can bring about redistribution of population and solve problem of overpopulation. In this aspect the government can decide to move people from overpopulated areas to under populated areas through establishing resettlement schemes or villages.
2. Planned migration can facilitate provision of services and labor manpower mobilization. For example, establishment of Ujamaa villages in Tanzania is a good example of planned migration through which people were made to settle in areas where they could easily for get some assistance from the government and be mobilized easily for the viable development of resources available especially land.
3. Migration has advantage of creating space or more room for industrial expansion particularly if the industries in question are supposed to be located in areas, which are not overpopulated.

In the Destination

Negative Consequences Include:

1. There occur problems of overpopulation and overcrowding leading to pressure for resources.
2. Famine occurs due to shortage of food supplies since there are too than many people.
3. The problem of unemployment occurs because people are more than the available economic sectors.
4. Alarming rise of crimes and many other social vices like drug abuse, prostitution, burglary, killings etc.
5. Spread of diseases by the migrants such as Ebola by people from Congo to Uganda, AIDS etc.
6. Environmental degradation due to over exploitation of resources and poor environmental management.

7. Inadequacy of economic and social services like medical services, marketing places, poor housing etc.
8. Low life expectancy because of unhygienic conditions, poor nutrition as well as poor medical services.
9. Transport problems like congestion, traffic jams, which cause delays and accidents.
10. There occurs the rise of uncontrolled informal sectors like food vending, woodcarving, kiosks, and drug trafficking.
11. Inordinate increases in the number of some of whom are not having genuine problems but are just jobless people.
12. It limits the chance of industrial expansion due to lack of space caused by overpopulation.

Positive Consequences:

1. It promotes the supply of labor that can be used in exploiting or harnessing the idly lying resources like minerals, land, water bodies, etc.
2. It can encourage or stimulate the diffusion of technology into the destination from other areas. The people who migrate possess different skills of different environmental orientations. These can be spread into the destination and help in the utilization of local resources.
3. Migration can lead to the expansion of market for the local goods in the destination regions.
4. It can encourage intensification of agricultural activities as a result of the reduction in the size of arable land.
5. It can stimulate the growth of towns (urbanization) and the associated advantages.
6. Development of strong defense against external enemies.

Outline the Problems Associated with Population in the World

1. Low level of technology in the developing countries leading to poor and unsustainable resources utilization.
2. Environmental problems like floods, drought, soil erosion, earthquakes, volcanic eruptions, storms, pollution, deforestation etc that pose adverse effects on population.
3. Social problems like crimes, congestion, prostitution, theft and street children as well as poor social services like medical treatment and housing due to overpopulation. Other social problems include gender imbalance in which women are marginalized in many important social economic sectors of the country, illiteracy, unemployment, etc.
4. Rapid population growth that exceeds the potential capacities of resources.
5. Resource exhaustion caused by over exploitation for economic development.
6. Political instability characterized by frequent wars that have brought massive deaths and movement of people as refugees and tribalism like in Kenya and Nigeria which causes civil wars.
7. Some areas are overpopulated due to uneven distribution and rapid population growth caused by either high birth rate or migration.

8. Poverty as a result of poor economic performance caused by low technology and unnecessary massive migration.
9. Transport and communication systems are poor in many countries especially the developing world leading to low mobility, low industrial development and poor trade.
10. Spread of diseases like AIDS and cholera.

11. Excessive migration from rural areas to urban areas leading to depopulation in rural areas and overpopulation in urban areas.

Discuss how population problems can be mitigated:-

Manpower Development in Tanzania

Manpower development is one of the ways geared towards solving population problems as well as economic and environmental predicaments. Manpower development involves the strategies of improving the potentially viable capacities among the individuals in the country in order to make use of resources more rationally and sustainably. Strategies of manpower development in Tanzania include:

1. Training centers like vocational centers for imparting various skills to people like carpentry, plumbing, computer training, commercial studies and masonry. Examples of centers for manpower development are LITI in Morogoro, Tengeru in Arusha, Uyole in Mbeya, ADEM (formerly, MANTEP) in Bagamoyo, and National services camps like Mafinga in Iringa.
2. Adult education programs like workshops, evening classes and seminars have been used to give skills and experiences to people in Tanzania.
3. People are also being educated through public media like radios, Newspapers, Television, Internet services, books from libraries etc.

MANPOWER MOBILIZATION IN TANZANIA

Manpower mobilization is the process of organizing or gathering people together so that they can use their potentials in doing different development activities in the country or certain community.

Why do we need to Mobilize Manpower?

1. To be able to utilize the resources sustainably in order to avoid exhaustion or destruction.
2. To improve efficiency in the production process.
3. It facilitates the process of combating environmental problems by encouraging the adoption of environmental conservation measures.
4. Manpower mobilization facilities supervision and evaluation of different activities.
5. It encourages the advancement of technology since people can be trained easily once they are mobilized.

6. Also, it becomes easy to help or assist people once they are mobilized. They can be given services like medicine, transport, etc without incurring unnecessary costs.
7. Manpower mobilization facilities industrial development since it assures a reliable labor supply in the industries and other economic sectors that influence industrial development.

8. Manpower mobilization leads to increased people's participation in the decision making process that cover different economic activities.

Strategies of Manpower Mobilization in Tanzania

1. Through establishing ujamaa, villages under socialist policy introduced by the late Mwalimu Nyerere. Being in villages people could work together and get services more easily.
2. Introduction and reinforcement of Manpower deployment policy (Nguvu kazi) in which all people were supposed to work rather than loitering in the streets aimlessly. In this case, anybody who was seen roaming about without work was put to task. Each person was supposed to move along with him/her bearing an identity card or any document verifying card or any document verifying that he/she is not a loiterer and hence his/her movement is justifiable.
3. The government also decided to employ people in the public sectors so as to serve for the development of the community or the country as a whole. For example some people are employed in the industries, construction activities, hospitals, schools, etc.

4. Conscripting people in the National service camps like Mafinga, Mlale, Ruvu and Masange in order that they can produce and help in the building of the nation.

1. The government is encouraging people to form groups so that they can be given loans that can be used as capital to be invested in different economic sectors. For example PRIDE AFRICA and Mama Mkapa's Trust Fund that offers equal opportunity for all are geared towards financing people so that they can engage themselves in different economic activities so as to facilitate the general development of the country while fighting against poverty. Coupled with this is the relaxation of condition in security the credits.
2. There has been establishment of small market places for small traders like the Machingas complex e.g. at Makumbusho area and near Karume stadium in Dar es Salaam.
3. Establishing small Scale Industries like SIDO in which local people are involved in the production. Example of SIDO can be drawn from Gerezani in Dar es Salaam. Most of these industries use appropriate technology that utilizes local skills.
4. Provision of education and special training to people so that they can be ready to face different challenges with confidence and strong determination while having clear direction of their efforts.

Problems Facing the Mobilization of Manpower in Tanzania

1. Lack of capital to be invested in different economic sectors where human labor will be employed. For example, there are no enough industries to absorb skilled labor from universities.
2. Manpower is largely semi – skilled due to poor learning environments. Some centers are not having enough learning facilities and even the instructors or teachers are not well qualified.
3. There is a problem of migration involving movements of unskilled labor from rural areas to urban areas. These stay jobless in town and are reluctant to go back to the rural areas. Hence, the people who remain in rural areas are old ones, young women and children who cannot be mobilized effectively in the production process. Also, skilled labor is not enough due to the movement of the educated people to other country the aspect called 'brain drain'.
4. Also, low support from the government as well as poor or unclear policies or manpower mobilization.
5. Political problems, which involve conflicts or misunderstanding, make the process of mobilization become difficult.
6. Poor transport and communication make the process of mobilizing manpower become difficult
7. Decline in resources, diseases, and environmental pollution discourage mobilization of manpower in Tanzania.

4.4 POPULATION GROWTH AND ITS SOCIAL AND ECONOMIC PLANNING

Population growth is calculated by taking into account the birth rates and death rates. Hence, it can be calculated as the Natural Population Growth o Numerical Population Growth.

Natural Population Growth (Annual Growth Rate or Natural Increase) is the difference between the Birth Rate and the Death Rate. Population due to migration is excluded since it forms the artificial increase.

$$\text{GFR} = \frac{\text{No. Of births in a year}}{\text{Female population aged (15 – 49)}} \times 1000$$

Natural Growth Rate = CBR – CDR – Migration.

The population growth rate is expressed as per thousand or percentage. But it is usually expressed as percentage. For example if the CBR is 52 per 1000 and the CDR is 14 per 1000. Then the Natural Population Growth Rate is:

$$= \frac{CBR - CBR}{1000} X \quad 100$$

$$= \frac{52 - 14}{1000} X \ 100$$

$$= \frac{38 \ X \ 100}{1000}$$

= 3.8%

Numerical Population Increase is the actual (absolute) increase of the number of people in an area within a given period. It is calculated by getting the difference between two consecutive censuses. It can be expressed as a percentage.

For example country x had a population of 10, 942,702 in 1969 and a population of 15,327,061 in 1979.

Year	**Total Population**
1979	15,327,061
1969	10,942,705
Inter – censual numerical population increase 1969 - 1979	4,485,356

Hence the 1969 – 1979 inter – censual growth rate.

$$= \frac{The\ population\ Increase \quad x \quad 100}{Initial\ Total\ Population}$$

$$= \frac{4{,}485{,}356 \ x \ 100}{10{,}942{,}705}$$

= 4.4 %

Numerical population growth is important because it gives the realistic (or absolute) increase of population in a country. The country concerned can base its economic planning on such absolute figure unlike the natural population growth, which is calculated from a sample representative of a thousand people.

Factors Influencing Population Growth:-

1. **Fertility:** While there is high fertility there is high population growth like in Kenya. This can even lead to population pressure in some areas. While where the fertile rate is low the population growth is low. Fertility varies among women Nutrition, health services, and traditional customs (like prolonged breast – feeding, sexual abstinence following the child birth and polygamy: and socio-economic circumstances like education and the level of economy.
2. **Mortality:** Where there is low mortality rate there is high population growth and where there is high mortality rate there is low population growth.

Population Growth Trend

1. **Global Trend**: The major trend of population growth has been a decline in the current time from a peak 2.1% per annum in 1965 – 70 to approximately 1.7% in 1992 (WB). But, still there continues to be more persons 9about 150 people per minute or about 96 millions per annum) added to the total population than ever before in the human history. There has been generally low or no population growth in some areas and high population growth in other areas. Recent evidence has shown that fertility rate in economically developing countries have at least begun to decline. But the decline pattern has been very complex such that in East Asia the decline in fertility is rapid, in the sub – Saharan Africa is very limited and moderate in the Latin America.
2. **Regional Trends:** There exists a distinction between developed countries and less developed countries. At present the average population growth rate for developed countries is 0.64% per annum and for the developing countries is 2.07%. Therefore there is high rate of population growth or expansion in the developing countries especially in the Sub – Saharan countries like Tanzania, Nigeria and Kenya. This rapid population growth or expansion is referred to as population explosion.

The causes of rapid growth rate (population explosion) in these countries include:-

1. **Cultural beliefs** which include:-

(i) **Sex preference**: Some people consider giving birth to girls only as incomplete hence they continue getting more children with the hope of getting a male child.

(ii) **The need for more children as sign of prestige or measure of manhood and womanhood**. Also many people feel secure when they have many children since they will not get problems in their old ages.

(iii) **Early marriages** also encourage women having many children from their young ages to menopause (45-49 years).

(iv) **Polygamy** has also led to the high rate of child bearing and some men regard polygamy as a measure of manhood and self esteem.

(v) **Naming of relatives** is another cultural factor. The couples like getting sons and daughters in order to name their parents and other important relatives in the clan.

2. **Health services:** Improved health services have led to the decline in death rate. With improved health services there has been a great control of diseases like malaria, small pox, etc. The life expectancy has been increasing and infant mortality rate has also declined leading to the increase of fertility.
3. **Availability of food:** With improved farming techniques people can produce surplus food hence their reproductive capacity has increased due to improved health. People also are not worried since they feel that they can feed more population as a result of high food production.
4. **Modernization:** Youth nowadays mature faster than before due to improved nutrition. Due to early maturity they become parents very early and hence start getting children. The provision of better social amenities like water, roads and schools has improved the standard of living of the people, consequently causing a decline in the death rate and increase in population growth rates.
5. **Religion:** Religious ideas influence the patterns of individual fertility behavior. Some religious do accept artificial methods of birth control saying that they are quite abominable before God and hence they encourage or advocate natural methods like abstention from sex, which are less effective in birth control. Examples are Roman Catholic and Muslims who say that people should use their common sense instead of banking their ideas on the use of condoms as proper ways of control. They encourage people to love and respect God so as to control the rate of birth in a natural way.
6. **Economic factors:** Due to poverty people like having many children so that they can provide cheap labor. This is common among the Nyamwezi, Ruira, Konongo, and the Sukuma.

Generally, the population growth in these countries is unsustainable.

Why unsustainable?

Answer:

Unsustainable population expansion is the population growth, which does not permit smooth social and economic development as well as environmental soundless.

Population expansion in the developing countries is unsustainable because the rate of increase in the number of people is faster than the economic development such that the available resources do not satisfy the existing number of people.

The fast expansion has led to the occurrence of overpopulation in different places leading to the problems of pressure for land leading to land fragmentation, resource exhaustion like mineral depletion and deforestation, large scale vegetation depletion has led to desertification, environmental pollution has increased, decline in sanitary conditions leading to the outbreak of diseases like cholera and meningitis, unemployment, occurrence of famine, low life expectancy (high death rates), prostitution and the spread of (HIV) AIDS.

Social services are not enough for example due to a greater number of people medical services are not adequate, chances for higher education are not enough distribution of energy and power services is not effective etc. There industrial decline because most of the money that could be invested in industrial development is directed to the support of increased months in terms of buying food. This causes the deceleration of the economic growth. But population expansion can be a blessing in the developing countries due to the fact that:-

1. It can lead to the availability of labor that can open up the under populated areas where resources are lying idle like the Rufiji Basin. What is important is to control the population distribution.
2. It can lead to the expansion of market for different goods especially food stuffs. This can in turn encourage the development of trade and industries.
3. It can encourage the improvement of science and technology especially in agricultural activities.

ZERO POPULATION GROWTH

Is experienced in the areas where there is no population growth due to the balance between birth rate and death rates. Death rates and birth rates are low and population does not fluctuate. Recently, several, of the industrialized including Sweden, Switzerland and Japan, have been producing insufficient number of children to maintain the overall numbers. This means that the children are born to balance the number of people who have died. It is estimated that zero growth will be the norm in Europe by 2010, in North America 2030, in China by 2070, in South East Asia and Latin America by 2090 and Africa 2100.

Impacts of Population Growth

A growing population can be an 'asset' or a 'liability" that is it can have positive or negative impacts as follows:-

Positive Impacts:

(i) It can provide labour for utilizing the resources living idle in the under populated areas. When the resources like water, land, mineral, fishers and wildlife are utilized judiciously through proper management can contribute to national development. Also people can cooperative in undertaking some measures for environmental conservation.

(ii) It can encourage improvement in science and technology. For example when population grows people can be forced to change agricultural systems from extensive shifting cultivation to intensive sedentary cultivation. And these changes can involve the use of scientific methods for the sake of getting high production and advance in technology.

(iii) Population can enhance industrial and trade development since it can provide market for different goods to both industrial and non – industrial.

Negative Impacts:-

(i) Population growth can create pressure for scarce resources leading to over utilization and exhaustion.

(ii) It can lead to soil erosion and deforestation because of the increased need for food, settlement areas and recreational amenities.

(iii) It can lead to the increase in environmental pollution and complicate the conservation and waste management activities.

(iv) There occur high incidents of crimes exacerbated by unemployment and pressure for resources.

(v) It leads to the increased number of beggars especially in towns.
(vi) Inadequacies of social services like medical treatments and education.
(vii) Spread of diseases due to high rate of pollution accelerated by population growth as well as immoral deeds like prostitution usually accompained with the increase in population.

POPULATION POLICY

Population policy refers to the statement, laws or regulations enacted so as to attain some demographic goals. It is a deliberate effort by the government to influence the demographic goals. It is a deliberate effort by the government to influence the demographic factors (population dynamics) like fertility, mortality and migration. Thus the ultimate goal of the population policy is to influence population size, composition, distribution and growth. The policy also tends to take into consideration the relationship between population and development as well as its impact on the environmental condition.

Population policy can be explicit or implicit:-

1. **Explicit population policy** refers to the document or clear statement issued by the governmental department and its commissions, which is intended to control population growth and raise the standard of life of the people in the country. Explicit polices can also stem from the laws, policy declarations by a party or directives issued by the President of a country. Explicit laws are well stipulated and strictly followed or reinforced. Such policies prevailed in China where the limit in the number of children was set and incentives were given to all those who could follow while penalties were given to those who did not follow. Other countries with explicit policies are Sweden and England. Hence the explicit policy is the elaborate statement, which spells out its rationale, objective, goals, targets, policy programmes and implementation.

2. **Implicit population policy** refers to particular laws, regulations or statements, which may have direct or indirect effect on population growth. Implicit policy is not as elaborate as explicit since it is some how unclear and cannot be easily understood leading to failure in terms of implementation.

All in all, the population policy whether explicit or implicit has the ultimate aim of influencing a country's population size, composition, distribution and growth.

CASE STUDIES

POPULATION POLICY IN TANZANIA

Foreword

The revised version of the 1992 National Population Policy (NPP) has been necessitated by the need to accommodate new developments that have taken place nationally and internationally and which have a direct bearing on population and development. Domestically, the economy moved significantly away from being centrally planned to a market economy with increasing dominance of the private sector which plays a more active role in population and development issues. Furthermore, in April 1997 the Government unveiled new Development Vision.

The country's population growth rate of 2.8 percent per annum has had on adverse effect on development. Though not the only obstacle to development , it aggravates the situation and renders remedial measures more difficult. Rapid population growth has tended to increase outlays on consumption, drawing resources away from savings for productive investments and therefore retarding growth in national output through slow capital formation. In particular, rapid population growth as aggravated the problems of poverty, environmental degradation and poor social services. Furthermore, the problems of sexually transmitted diseases including HIV/AIDS and those facing specific segments of the population like children, youths, the elderly and persons with disabilities have become widespread.

The policy has the goal of influencing other policies, strategies and programmes that ensure sustainable development of the people and promoting gender equality and empowerment of women. It will be implemented through a multi-sectoral and multi – dimensional integrated Government Organizations (NGOs), the private sector, communities and other agencies within and outside Tanzania in implementing the policy. Indeed, individuals, political parties and other organized groups in the civil society are expected to play an active role to ensure attainment of policy goals and objectives.

The principal objective of the country's development vision is to move Tanzania's away from poverty and uplift their standard of living. The Policy therefore, gives guidelines for addressing population issues in an integrated manner. In thus recognizes the linkages between population dynamics and quality of life on the one hand, and environmental protection and sustainable development on the other. Its implementation will give a new dimension to development programmes by ensuring that population issues are appropriately addressed.

Preamble

Prior to adoption of the explicit national population policy in 1992, Tanzania pursued implicit population policies and programmes. These policies and programmes were reflected in actions taken by the government in dealing with various issues pertaining to population. These included policies and programmes such as settlement schemes of early 1960s, villagization programme of

mid 1970s, provision and expansion of free social services (health, education and safe water), literacy campaigns, provision of family planning services as part of MCH services, limiting employment related benefits (such as tax relief) to four children, and paid maternity leave of 84 days at most once in every three years, and census taking after every ten years. As the economic crisis became severe during the 1980s, the gains achieved ealier, especially in social sectors could not be maintained.

It is in part of this context that in 1986 the Government started the process of formulating a national population policy. By 1988 a draft policy document was ready for discussion by various sectors of the population. This process was finalized in 1992 when the final version of the population policy was adopted, and was followed by the Programme of Implementation in 1995.

The thrust of the policy was to provide a framework and guidelines for the integration of population variables in the development process. Moreover, it provided policy guidelines, which determined priorities in population and development programmes. These were designed to strengthen the preparation and implementation of socio – economic development plan.

To some extent, the 1992 National Population Policy took onboard goals and objectives of the past population programmes. However, new developments that have taken place nationally and internationally have necessitated its revision.

PRINCIPLES

Principles to Guide Policy Implementation

The implementation of the population policy is guided by the following principles:

1. Consideration of regional and district variations with regard to the level of socio – economic development;

2. Adherence to the development vision, which among other things emphasizes the role of the market in determining resources allocation and use;

3. Continued democratization of the political system with its attendant political pluralism as symbolized in the emergence of various political parties / actors and mushrooming of independent mass media;

4. Thrift exploitation of the country's non – renewable resources taking into consideration the needs of future generations; and

5. Recognition and appreciation of the central role of the government, NGOs, private sector, communities and individuals in population and development.

The policy also reaffirms the ICPD principles as embodied in the Plan of Action to the effect that:

1. All human beings are born free and equal in dignity and rights. Thus, every human being has the right to life, liberty, security and responsibility;

2. People are the most important and valuable resources of any nation and all individuals should therefore be given the opportunity to make the most of their potential. As such, all individuals have the right to education and health;

3. The family is the basis of society and, as such, it should be strengthened. It is also entitled to receive comprehensive protection and support; and

4. All couples and individuals have the basic right to decide freely and responsibly the number and spacing of their children as well as to have accessibility to information, education and means to do so.

JUSTIFICATION OF THE POPULATION POLICY

This policy takes cognizance of the achievements, constraints and limitations of implementing past population policies as well as new development and continuing challenges.

Achievements

The achievements of both implicit and explicit past population policies included the following;

1. Considerable awareness of population issues particularly those related to reproductive health and child survival by the masses of the people. For example, fertility, infant, and child mortality has declined overtime;

2. The adoption of an explicit population policy in 1992, which recognized the links and interrelationships between population, resources, the environment and development;

3. Expansion and/or introduction of population studies in institutions of higher learning in the country;

4. Increased number and capacity of NGO's engaged in population related activities including advocacy and social mobilization, service delivery and capacity building; and

5. high knowledge and the use of contraceptive methods among both men and women and male involvement of family planning which has increased contraceptive prevalence from about 10 in 1980s to 16 in 1996.

Constraints and Limitations

The constraints and limitations that were encountered during the implementation of the past population policies included the following:

1. Inadequate human and financial resources;

2. Poor information communication systems;

3. Non- establishment of planned institutional arrangements;

4. Policies which mainly addressed family planning and child spacing activities coupled with reliance on the Government for implementation;

5. Placing more emphasis on meeting demographic targets rather than the needs of individuals, male and female and;

6. Inadequate recognition of the causal relationship between poverty, population environment, gender and development.

New Development and Continuing Challenges:-

Since the adoption of the Population Policy in 1992, there have been new developments arising from national and international developments.

These include the Tanzania Development Vision 2025 and international conferences including the 1992 Conference on Population and Development (ICPD), the 1995 Fourth World Conference on Women (FWCW), Copenhagen Social Summit of 1995, the Istanbul City Summit of 1996 and the 1997 World Food Summit. These new developments have necessitated changes in approaches and policy orientation so as to address:-

1. Population issues in a holistic manner in development plans as well as recognizing the roles of other partners – civil society, NGOs, and the private sector.

2. Poverty in its broad dimensions including inequalities in resource use and allocation between women and men and various social groups;

3. Discriminatory and harmful socio – cultural practices against men and women;

4. Issues related to reproductive health and reproductive rights;

5. Interrelationship between population and sustainable development;

6. Basic needs of the people; and

7. Problems of crime, poverty, unemployment, poor infrastructure etc, associated with growing levels of urbanization.

Other challenges, which have also necessitated review of the policy, include:

1. Increased forms and levels of female violence: sexual abuse, neglect and abandonment of children;

2. Need for more and high quality education and training at all levels;

3. High prevalence of STDs including HIV/AIDS;

4. High levels of adolescent pregnancies;

5. Increasing unemployment due to poor economic performance and labour force growth;

6. High maternal, infant and child mortality;

7. Rapid and unplanned urban growth; and

8. Low status accorded to women in society.

Major Concerns in Population and Development

The major concerns of the population policy encompass the following areas; population and development planning issues; equality, equity and social justice; natural resources and food production; information and databases; and advocacy. In this regard there is need:

1. To allocate more resources for literacy, health and education services with a view to increasing their quality, accessibility and availability.

2. To fully sustainable exploit the natural resources in order to boost the economy and also to ensure sustainability of the resources and environment;

3. To expand the agricultural production to meet the demanding food requirements;

4. To ensure availability of up to date and comprehensive data and information for national and effective planning as well as or programme formulation and implementation; and

5. To adopt gender perspective in development planning and to formulate programmes those enhance full participation of special groups in society.

PRIORITY ISSUES

Based on the concerns expressed in chapter four, the Government has identified a number of priority issues that this policy will address as follows:-

1. Integration of Population Variables into Development Planning:-

The integration of population variables into development plans and policies is yet to be fully realized. This is due to a number of factors including:

(i) Inadequate commitment and recognition of the relationship between population variables and development;

(ii) Use of short term programmes, which do not adequately address long – term issues;

(iii) Limited capacity building at national, sectoral and district levels;

(iv) Uncoordinated policy formulation due to lack of a long term vision; and

(v) Unavailability of up-to-date, comprehensive sex and age disaggregated data.

2. **Population Growth and Employment:** Due to high population growth in Tanzania, the labour force has been increasing. The present working age population constitutes about 50 percent of the total population, most of whom are unskilled. This expansion aggravates the already difficult problems of the meager economic activity in the country. Measures taken to restructure the economy such as reducing the size of the Government through retrenchment, employment freeze and promotion of the private sector which uses capital intensive production techniques have resulted in widespread unemployment.

3. **Problems of Special Groups in Society:** Children and youths, the elderly and people with disabilities are among groups in the society, which need special programmes to facilitate their full participation in socio – economic development. Refugees as another special group in the society requiring special attention and measures to forestall the negative impact of their influx in the country.

In this policy, children and youths are defined as those aged below 25 Years. This group constitutes 65 percent of the Tanzania population. Severe budgetary cuts to the social sector have aggravated the problems of children's accessibility to quality health and education services. Retrogressive cultural practices and breakdown of family and societal norms have exposed children to problems such as malnutrition, child labour, abandonment, prostitution and sexual abuse. In addition, the scourge of HIV/AIDS has led to an increasing number of orphans and possibly of street children. Low productivity, shortage of basic needs and lack of employment opportunities in rural areas have force young people to migrate to urban areas in hope of getting employment but the majority of whom end up in frustration because they cannot find jobs they often become loiterers, thieves and drug addicts.

According to 1988 census, old people aged 65 years and above account for about 4 percent of the population. The problems facing the elderly include loneliness, low income, dwindling respect and lack of access to health services, and in some areas being murdered on account of misguided beliefs in witchcraft.

In Tanzania, the number of people with physical and mental disabilities is not known. Among the problems facing people with disabilities include: stigma, discrimination, lack of training, employment, and assistive devices such as wheel chairs, Braille books, crutches and artificial limbs.

Since independence, Tanzania has hosted a considerable number of refugees from other African countries. The greatest number entered the country in 1994 from Rwanda and Burundi following political disturbances. Most of these refugees were settled in Kagera and Kigoma regions. Among the problems associated with refugees are deforestation, increased crime rate, break out of epidemics and deterioration of social services as well as internal security.

4. **Gender Equity, Equality, and Women Empowerment**: Gender

Gender refers to the roles of men and women that are socio – culturally determined. It influences the relationships between men and women in all spheres of interaction. Thus, gender inequality in the society arises when gender roles, responsibilities and resources are unequally distributed between men and women. In Tanzania, women's participation and contribution to development have been hampered by discriminatory socio – cultural practices and other laws, regulations and procedures pertaining to childhood socialization, access to and control of property and inheritance as well as participation in formal educational and employment sectors.

For most women, their economics, family and social roles are closely intertwined with their reproductive roles. The task of bearing and rearing children, in addition to constituting health risks, threaten family welfare by imposing excessive domestic chores to mothers. For young girls, early child bearing tends to impede their educational advancement, skills acquisition and career prospects in the formal sector.

Efforts so far made by the Government to rectify gender inequality include setting up:-

1. Ministry of Community Development, Gender and Children;

2. Women Development Fund to sensitize and train women at grassroots level in entrepreneurship skills in the informal sector and agriculture, directive to District Councils to allocate 10 percent of revenue to women;

3. Affirmative action in the political arena which ensures that at least 15 percent of members of parliament as well as 25 percent of counselors in local Governments are women; and

4. Policies to encourage the formation of NGOs to address issues of gender and empowerment of women.

Reproductive Health

Reproductive health as defined by WHO and ICPD, is a state of complete physical, mental and social well being in matters related to reproductive system including its functions and processes. This implies the right to have a satisfying and safe sex life, the capability to reproduce and the freedom to decide if, when and how often to do so.

Since 1974, the Government has been providing 75 percent of reproductive health services through the MCT/FP clinics; these operate as units in hospitals, health centres and dispensaries. In Tanzania, reproductive health encompasses four major components: family planning, safe motherhood, child survival and STDs/HIV/AIDs.

With respect to quality and accessibility of reproductive health services, limited and inadequate trained staff, equipment and supplies contribute to poor ante – natal, and post – natal services: TDHS (1996) revealed that, though 98 percent of pregnant women attended ante – natal services, only 47 percent of deliveries took place in health facilities.

Similarly, there is high unmet need for family planning services (24 percent) which require outreach programmes. This situation calls for training of service providers, equipping health facilities with basic essential equipment and expanding reproductive health services to communities through community based approach where various community resources members are used (CBDs, TBAs).

Studies have shown that more than 95 percent of the population is aware of HIV/AIDS. Among those who are aware 35 percent of women and 34 percent of man believe that there is no way to avoid AIDS or that they do not know if there is any way to avoid AIDS (TDHS, 1996).

According to the National AIDS Control Programme (NACP), reported AIDS cases in 1990 were 22,084 and the number grew to 88,700 by 1996. Although the epidemic has spread to many regions of Tanzania, Dar es Salaam, Mbeya, Kilimanjaro and Kagera are the most affected.

The most vulnerable persons are the adolescents/youths who are sexually active. The 1996 TDHS reveals that at age 15, 19 percent of girls compared to 9 percent of boys have had first sexual intercourse. And by age 18, this sexual involvement rises to 62 percent of girls and 48 percent for boys.

The prevalence of female circumcision also known as Female Genital Mutilation (FGM), is confined to only certain regions of the country and is estimated at 18 percent (TDHS, 1996). The proportion varies by region, from less than 1 per cent in Arusha. These practices are more prevalent in rural (21 percent) than urban (10 percent) areas; they take place at the ages of 5 years and below (9 percent), 6-10 years (30 percent), 11-15 (32 percent) and at the ages of 16 years and above (15 percent).

Infant and child morbidity and mortality rates are still high. Major causes of infant mortality include diarrhea diseases, malnutrition, malaria, anaemia, respiratory tracts infection

and HIV/AIDS. In order to further reduce the morbidity and mortality, efforts will be made to increase immunization coverage and strengthening management of childhood illness.

There is a remarkable increase in the proportion of the elderly people with reproductive health problems. Some of the problems which need to be addressed include menopausal discomforts and reproductive track cancers. There is therefore, need to establish and provide reproductive health services for the elderly.

Men have a key role to play in reproductive health issues. However, intended efforts have not been adequately made to involve them fully. Hence, it is crucial to ensure male involvement in reproductive health activities.

ENVIRONMENTAL CONSERVATION AND SUSTAINABLE DEVELOPMENT

Environmental Conservation

Natural resources base includes forests, land, wildlife, aquatic resources and minerals. About 50 percent of the total by grassland and scrub and only 6 – 8 percent is cultivated. Aquatic resources include Lake Victoria, Tanganyika and Nyasa and a variety of other small lakes, swamps and flood plains, forming a major wetland resource. Marine resources include fish stocks, coral reefs, sandy beaches, mangroves, marine grasses, salt resources and other biodiversity. Wildlife is an important part of Tanzania's resource endowment; about 25 percent of the total land area is designated as protected areas, including forest reserves.

These protected areas form the major tourist base. Energy and mineral resources are other important components of the resources base. The major energy resources are fuelwood, hydropower and coal. There is also potential for natural gas, solar energy and wind energy. This natural resources base is deteriorating. The underlying causes for this deterioration include land degradation (caused by deforestation, overgrazing, etc) and pollution in towns and the countryside, loss of biodiversity and inadequate environmental awareness. Other contributing factors include rapid population growth, land use, inappropriate land use practices, inadequate financial resources and low involvement of stakeholders in environmental management programmes.

Inadequate integration of environmental concerns in the planning process also contributes to the deterioration of the natural resources base.

Water and Sanitation

Water supply is crucial to ensure sustainable economic and social development of human activities and thus human welfare. Realizing the importance of water, Tanzania adopted a 20 years programme in 1970 with the goal of supplying clean and safe water to all people within walking distance of 400 meters from the homes. However, accessibility to water and sanitation services is still poor. There is evidence to suggest that the water supply services have been declining since 1978. A sharp decline in the proportion of households using piped water was

noted during the 1978/88 decade as compared to the 1967/78 period in both rural and urban areas. This decline is often compensated by a rise in the proportion using wells, especially traditional ones outside the compound. According to the 1996 Ministry of Water report, 48 and 80 percent of the rural population have access to safe water and sanitary facilities (pit latrines), respectively. In urban areas, about 69 percent of the population is served with safe water, about 75 percent have pit latrines and 10 percent have sewage connections. The main problems affecting the water and sanitation services in Tanzania include inadequate funds for construction of new and maintenance of existing water and sewerage systems, and destruction of water catchment, areas; and inadequate water harvesting techniques and facilities. Other factors include low awareness among decision – makers, planners, and sanitation; socio-cultural values and lack of appropriate working tools.

Overcrowding in urban areas also contributes to inadequate access to clean and safe water supply and proper waste disposal facilities. To tackle these problems, the Government has formulated a programme to ensure access to safe water to all and proper waste disposal facilities. To tackle these problems, the Government has formulated a programme to ensure access to safe water to all and proper sanitary facilities to about 95 percent of the population by the year 2002.

Agricultural, Food and Nutrition

Agricultural is an important sector to the economy of Tanzania.

According to the 1997 Tanzania Agricultural Policy, the sector contributes 60 percent of the export earnings and accounts for 84 percent of the labour force. Performance indicators show that growth rates have been fluctuating over the years with a general trend of decline. For example, between 1965 and 1970, annual growth rate was about 4.5 percent, decline to 0.6 percent during the period 1981 – 1985 but it improved to 3.9 percent in 1996. Food production constitutes the main source of food security particularly in the rural areas. However, it is estimated that about seven million people in the country are chronically food insecure. Also, about 40 percent of the population lives in drought and flood prone areas and hence face transitory food insecurity and malnutrition.

Malnutrition has been closely linked with various disabilities such as reduction of physical and mental capabilities and therefore affects the productivity and educational capabilities of individuals. According to 1996 TDHS, malnutrition is the primary cause in more than 50 percent of all deaths of children aged 1 – 4 years.

Education, Data Collection, Research, and Training Education;-

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Education, Data Collection, Research, and Training Education;-

Human resources development, particularly education, is a critical ingredient in a country's development process. Primary school dropout rates have increased overtime since the early 1980s. Current completion rate is 67 percent and enrolment rate for primary school pupils has gone down from 90 percent in 1982 to 74 percent in mid 1994.

Tanzania's education system still provides few education and training opportunities to the youths after completing their primary education. While the total enrolment in primary schools represents 78 percent of all primary school age children, the transition to secondary school is only 17 percent. Unfortunately, the situation is now worse that it was during the 1960's. For example whereas in 1963, 29.2 percent of primary school leavers entered secondary schools (public and private), this proportional declined gradually to 3.4 percent in 1984. However, there was a gradual rise to 10.5 percent in 1988 and to 14.6 percent in 1995. Currently, about 83 percent of primary school leavers entered secondary schools education. These primary school leavers are forced into adult life when they are still too young. Girls in particularly marry early and start bearing children. In addition, quality of school performance has deteriorated. For example, from 1993 to 1996 less than 25 percent of Form IV students obtained division I – III passes in their secondary school 'O' level examinations. Also, over half of all primary school leavers got scores below 20 percent in their Standard VII School leaving examinations.

Basic and post literacy programmes were integrated in the education system in early 1970s and successfully implemented up to the mid 1980s. Thereafter, public enthusiasm and official support towards adult literacy started to wane off. This lack of official support resulted in the allocation of inadequate financial, material and human resources, leading to low enrollments and attendance in these programmes. As a result literacy level has declined from over 90 percent in 1979 to 68 percent in 1997 and, among the low income families; the literacy rate is 59 percent.

Data Collection, Research, and Training

In most recent years, Tanzania has witnessed a growing recognition of the need for more accurate, comprehensive and timely statistical data. The driving force for improving the data collection operations of the Government has come from individual ministries which have become increasingly aware that in – depth studies containing both quantitative and qualitative analyses are essential for rational and effective planning and decision making process. Although population censuses have remained the major sources of population data, they have been supplemented by national surveys including Demographic Survey conducted in 1973, and Demographic and Health Surveys, demographic estimates relating specifically to fertility and mortality as well as family planning and health – related data were obtained.

Vital registration in Tanzania is not complete since it has so far covered 66 out of 113 Mainland districts. The exercise has remained a legal rather than a statistical operation possibly because of lack of attention and interest as well as obvious omission of some of the events which are not being registered. Research is confined to the leading national institutions of leading and foreign research institutions. They are conducted to meet mainly academic and individual/ institutional requirements rather than development planning.

The training in demography and population studies was introduced in the institutions of higher learning in the late 1980s. The University of Dar es Salaam, Mzumbe University and the Institute of Rural Development Planning (IRDP), Dodoma, have been offering courses in demography and population studies at various levels, and of late, integrating the topic of gender.

Advocacy and Information, Education and Communication (IEC)

Implementation of the 1992 National Population Policy did not achieve much due to lack of support particularly in areas of gender equality, equity and empowerment of women, and the integration of population, variables into the development programmes. Advocacy and IEC shall be used to shape attitudes and promote behavioral change in population issues.

GOALS AND OBJECTIVES OF THE NATIONAL POPULATION POLICY

Goals of the Policy

The main and overriding concern of the population policy is to enable Tanzania achieve improved standard of living and quality of the life of its people. Important aspects of quality of life include good health and education, adequate food and housing, stable environment, equity, gender equality and security of individuals. The main goal of the policy is to influence policies, strategies and programmes that ensure sustainable development of the people. **The sub – goals of this main goal are to contribute to:-**

1. Sustainable economic growth and eradication of poverty;

2. Increased and improved availability and accessibility of high quality social services;

3. Attainment of gender equity, equality and social justice for all individuals;

4.Harmonious relationships among population , resources utilization and environment; and

5. Improvement, availability and timely dissemination of population information.

Objectives of the Policy

1.To harmonize population and economic growth;

2. To promote an integrated rural – urban development;

3.To promote employment opportunities;

4. To promote gender equity, equality, and women empowerment;

5. To transform socio – economic and cultural values and attitudes that hinder gender equality;

6. To enhance proper upbringing of children and youths;

7. To promote the well- being of the elderly and people with disabilities;

8. To improve the capacity of the country to address refugees problems;

9. To promote public awareness on individual sexual and reproductive health and rights;

10. To promote and expand quality reproductive health care services;

11. To increase agricultural production;

12. To improve nutritional status of the people;

13. To promote integrated and sustainable use and management of natural resources;

14. To improve the preparedness and management of disasters and emergencies;

15. To ensure adequate supply of safe and clean water;

16. To encourage the private sector, NGOs and religious organizations to invest in provision of education;

17. To promote and provide equitable and quality education;

18. To improve population data collection and research, and their timely,

19. To improve training in population issues;

20. To create an enabling environment that will facilitate acceptance of population issues namely; reproductive health, population and development and gender concerns; and

21. To mobilize necessary resources for implementation of the National population Policy

STRATEGIES

Based on the identified priority issues, the following strategies will be adopted to achieve the National Population Policy goals and objectives.

Integration of Population Variable in to Development Planning

1. Integrating population variables in development planning;

2. Creating awareness to the masses of the link between population, resources, environment, poverty eradication and sustainable development;

3. Building the capacity of planners at district and national levels in mainstreaming population issues in development plans with gender perspective;

4. Encouraging the private sector and local communities to be actively involved in initiating, implementing and financing population programmes;

5. Improving productivity of small scale farmers and industries; and

6. Promoting non- agricultural production in rural areas.

Population Growth and Employment

1. Creating enabling environment for investors in all sectors, especially in the rural areas,

2. Promoting self – employment opportunities in the informal sector;

3. Providing labour market information to employers and job seekers;

4. Promoting labour intensive industrial development; and

5. Promoting viable family formation

Problems of Special Groups in Social:-

The Elderly:-

1. Encouraging the private sector, NGOs and religious organizations to invest in provision of social service especially health for the elderly;

2. Establishing social security measures that address problems of the elderly; and

3. Encouraging traditional community based support networks to the elderly.

Children and Youths

1. Encouraging the private sector, NGO's and religious organizations to invest in provision of social services for the children and youths;

2. Development talents and capabilities of children and youths; and

3. Development policies and laws that support of family stability.

People with Disabilities

1. Encouraging the private sector, NGO's and religious organizations to invest in provision of social services for people with disabilities;

2. Developing talents and capabilities of people with disabilities;

3. Establishing social security measures that address problems of people with disabilities; and

4. Developing National Policy on People with Disabilities.

Refugees

1. Establishing preparedness plan for handling refugees.

Gender Equity, Equality, and Women Empowerment:-

1. Promoting participation of women in decision making;

2. Increasing awareness of the society about the importance of education for all children especially the girl child, and boys under difficult circumstances;

3. Promoting women employment opportunities and job security;

4. Eliminating all forms of discrimination and gender based violence;

5. Encouraging women and men to participate equally in household chores;

6. Ensuring mainstreaming of gender concerns in development plans and policies;

7. Carrying out advocacy activities on gender and population issues; and

8. Advocating the value of the girl child and boys under difficult circumstances and creating a conducive environment for strengthening their image, self- esteem and status; and

9.Promoting societies positive gender knowledge, attitudes and practices.

Reproductive Health

1. Promoting measures to eradicate harmful traditional practices including female genital mutilation (FGM);

2. Sensitizing the public on the benefits of productive health to all individuals;

3. Promoting and expanding the scope of reproductive health advocacy, IEC programmes;

4. Encouraging the participation and involvement of communities in the provision of reproductive health care services;

5. Improving the quality and efficiency of reproductive health care delivery system;

6. Establishing specific reproductive health services to cater for the adolescents, youths, men and the elderly;

7. Offering comprehensive reproductive health services addressing neglected problems including infertility, STDs, post- natal care, and abortion complications; and

8. Improving immunization coverage and strengthening management of childhood illnesses.

Environmental Conservation and Sustainable Development

Environmental Conservation

1. Integrating environmental considerations in developments plans;

2.Promoting an integrated approach to planning and management of natural resources;

3.Preventing and controlling environmental degradation; and

4.Promoting disaster management skills / techniques.

Water Sanitation

1. Rehabilitating existing water and sanitary systems;

2. Exploring and exploiting new potential water sources; and

3. Promoting disaster management skills/techniques.

Agricultural, Food and Nutrition

1. Ensuring accessibility and ownership of land to small holder farmers;

2. Promoting modern farming practices and improving appropriate agricultural technologies and infrastructure;

3. Extending credit facilities to small- holder farmers;

4. Ensuring food security at national and household levels;

5. Enhancing food and nutrition education to the community;

6. Eradicating cultural barriers to improvement of nutritional status;

7. Controlling micronutrients deficiencies; and

8. Controlling protein energy micro nutrition

Education, Data Collection, Research, and Training Education

1. Encouraging community participation in the provision of quality education;

2. Facilitating participation of the private sector, NGOs and religious organizations to invest in the provision of education;

3. Promoting and ensuring equitable distribution of education opportunities in order to correct gender and regional imbalances;

4. Improving the teaching – learning environment ;

5. Providing universal primary education to all children; and

6. Reducing illiteracy rate.

Research, Data Collection and Training

1. Intensifying efforts in the collection, processing, analysis and timely dissemination of population information;

2. Promoting the use of information on population in the planning process;

3. Undertaking training programs for personnel in the field of data collection, analysis and research in population and development; and

4. Promoting on the job skills training in population.

Advocacy and Information, Education and Communication (IEC)

1. Coordinating population advocacy efforts by Government and development partners to ensure efficiency in the implementation of the National Population Policy;

2. Promoting debate on population issues among decision makers and parliamentarians through population for a;

3.Strengthening participation of NGO's in advocating population issues;

4. Establishing an institutional framework to co-ordinate the population IEC and advocacy activities through the three levels of individual, group and mass communications;and

5. Improving the quality of advocacy and IEC interventions through capacity building and by developing culturally acceptable IEC materials.

CHINA

Population

China is generally said to be overpopulated since it has insufficient food, minerals and energy resources to support its high population. It is the most populous in the world followed by India. The people in China frequently suffer from natural disasters e.g. drought, floods and famine as well as diseases.

They are also characterized by low incomes, poverty, poor living conditions and high levels of emigration. By 1990, 23% of the world's population lived in China.

Why China Experienced High Rates in 1950's?

1. The government encouraged high birth rate under the philosophy that "a large population gives a strong nation" and hence people were encouraged to have as many children as possible. This was called as pro- natal approach and there was confidence that China could feed her population however rapidly it increased.

2. At the same time death rates were falling due to improved food supplies and medical care.

Population Control in China

1. During the 1960's the population increased by 55 million after every three years.

2. The rate family planning programmes were introduced in the 1970s in which the government encouraged family planning services, which could promote maternal and child health benefits as well as economic and ecological advantages. The slogan 'Later, longer, fewer was introduced and this implied later marriage, a longer interval between births and fewer children. The family planning services were community based. By 1975 the average family size had fallen to three children. But the government still considered it as too big.

3.In 1979 the anti – natalist – one child- per family policy was introduced by the government. With this policy the government hoped to reduce natural increase to zero by the year 2000 and hence avoid the population growth beyond 1200 million.

Fulfilling that the following was done:-

1. The single child policy offered specific incentives for parents only having one child and penalties for those who had more than one child. Glory Certificates were introduced and these entitled a couple and their child to various financial, employment, educational and other benefits in exchange for promise to have no further children after the first – born . (A child could have free education, priority to housing, pension etc.)

2. Abortion become compulsory

3. Marriage was set to 22 years for males and 20 years for females, the couples were pressurized to accept official promoted norms and more over application could be made for some people who wanted to marry or seek permission for having a child.

Constraints to the Policy:-

1. In rural areas the policy faced resistance since some feared that by accepting the policy there could reach a time when the society could have too many dependent old people and too working young people.

2. In many rural localities the single – child policy has never been strongly enforced and in 1987 the government began to relax in enforcing the policy. Following the resistance, the people in rural areas were allowed to have two children but urban dwellers to maintain a single child.

However, despite all these attempts to reduce population the number of people has been growing and the population is higher than what was intended and will continue growing up to above 1500 million before 2025.

POPULATION CONTROL IN UK

Britain is the home of industrial revolution hence it witnessed a high natural increase in population between 1760 – 1880. This economic prosperity led to the decline of death rate since there was an improvement in medical care, improved sanitation and water supply, improved food production (in quality and quantity), improved transport.

From 1880 to date birth control programmes were introduced so as to slow down population increase. The birth rates were kept low through family planning, which included the use of contraceptives, sterilization, abortion and government incentives for smaller families. Lower birth rates were also due to the influence of increased industrialization and mechanization which led to the influence of increased industrialization and mechanization which led to the need of fewer labourers, increased desire for material possessions (car, holiday bigger homes) and less desire for larger families, education and emancipation of women enabling them to follow their own careers rather than being solely child – bearers.

The impacts of birth control are that the population is aging (consisted of old people and fever young people). The aging of the population will later bring problems in labour supply since the old people will not be able to work effectively and even reproduce well.

POPULATION AND RESOURCES

Population and resources are so interrelated since they both affect each other. Human life depends on the ability of the resource to sustain it and human has some impacts on the existence of sustainability of the resources. So the number of people, distribution of population, the structure of population, the ability of the resource to sustain it and the techniques of production used are so important aspects when considering the population and resource relationship.

On this basis the area can be said to be having optimum population or over population or under population. This depends on the extent to which the resources are used and the way in which they are used.

Optimum Population

It is the population in which the number of the people is in balance with the available resources. In this state when the population is working with all the resources there will be the highest per capital economic returns – i.e. the highest standard of living and quality of life. Optimum population can be maintained if the exploitation of new resources or development of other forms of employment keeps pace with the increase in population. If the population becomes too large the law of diminishing returns starts to operate.

Overpopulation

Overpopulation occurs where there are too many people in relation to the resources and technology locally available to maintain in ‘adequate’ standard of living. Bangladesh, Ethiopia,

parts of China, Brazil, and India are said to be overpopulation as they have insufficient food, minerals, and energy resources to sustain their population. They often suffer from localized natural disasters such as drought and famine.

They are characterized by low incomes, poverty, poor living conditions and often-high level of emigration.

Overpopulation is caused by:-

High Birth Rate, Immigration

These depend on the factors like availability of resources like fertile land and mineral deposits, traditional attitudes (caused by low education) among the societies of regarding that a big number of children is prestige or assurance for labour in the future, outbreak of wars in the neighboring areas, improved health services etc.

Effects of Overpopulation

1. **Increase in the dependency ratio**: This means that number of young population who can't work is larger than the working population.

2. **Pressure for resources**: Large number of people press strain on resources like land leading to land fragmentation, mineral and forest causing exhaustion and hence slowing down of development.

3. **Unemployment**: Too many people cannot be absorbed in the economic sectors and hence a big number of people remain jobless.

4. **Emigration**: People migrate from the areas with high population to areas with low population where there is no pressure for resources. For example people are moving from Kilimanjaro to other parts of Tanzania like Morogoro and Tanga.

5. **Poor housing and health services**: Overpopulation brings about the problem of housing whereby the houses are poor overcrowded. This problem is so common in Dar es Salaam especially Manzese, Kariakoo, Ilala, Buguruni and Vingunguti.

6. **Decline in the life expectancy**: The life- span decline because of the problems like poor health services, poor food. Therefore, people die even before reaching old age. Ignorance of the people, unsanitary conditions and lack of financial resources has contributed to the decline of the life – span.

7. **Slowing down of industrial growth**; this occurs due to unskilled labour and poor market since majority of the people have poor income. Also, people can't work properly due to poor health.

8. **Increase in Crimes**: As a result of unemployment incidences of crimes increase. For example in areas of high population theft and killings are common.

9. **Easy spread of Diseases**: When the population is high diseases spread very rapidly. AIDS has been a common problem due to prostitution, which has been taken by some jobless girls or women as a source of income.

10.**Increase of Beggars**: Beggars also increase due to unemployment and this is a common problem in Dar es Salaam.

11. **Overpopulation**: Causes the problem of congestion in the streets, hospitals, schools and transport vessels.

How can the Problem of Overpopulation be solved?

Population Problems

Population problems in the undeveloped countries:-

1. Low level of technology which inhibits agricultural efficiency and the development of industries. Because of low technology in these countries resources are not used property and the traditional methods are still predominant.

2. Under- population is another problem. In some areas good resources are lying idle due to the low population that can utilize those resources for example Brazil and Congo.

3. Unbalanced development: This manifested by the imbalance in the level of development between the rural and urban areas. The urban areas are more developed than rural areas as a result of differences in the technological levels. Rural areas are characterized by low level of technology, which leads to poor production.

4. Poor food supply due to agricultural performance. Agricultural (agrarian) crisis has been caused by low level of technology, overpopulation, under population, poor agricultural policies, poor capital availability, poor transport system, poor education services leading to mass scale illiteracy, and natural hazards like drought, floods and global warming. Also, food crisis is caused by restlessness of people like the refugees, marginalization of women in the ownership of land, etc.

5. There is low life expectancy due to poor health services, poor sanitation, poor nutrition, poor medical services, early marriages and diseases like HIV-AIDS, malaria, meningitis etc.

6. There are housing problems especially in the urban areas where there is overpopulation. In the urban areas the number of people is too large to accommodate such that some houses are overcrowded and some other people are homeless. Rural – urban migration has greatly added to the magnitude of this problem.

7.There is low per capital income since many people are not employed due to the fact that the economic sectors are fewer than the number of people especially in towns. In rural area poor production due to the use of low technology has contributed to the predominance of low income per capital. Worse still, the crops produced in the rural areas face the problems of poor marketing system (low prices), poor storage facilities, pests and diseases that lead to great losses etc.

8. Population is migratory (restless). People especially the young are always on movement to urban areas leading to rural depopulation and agricultural decline.

Solutions to the population problems in the underdeveloped countries

1. There should be infusion of capital, probably in form of foreign aid, to finance development in these countries.

2. There should be improvement in the marketing system both locally and internationally by giving good prices to the farmers.

3. Educating farmers and inculcating in them modern skills of production.

4. Improving transport and communication so as to open up the areas which are under populated.

5. There should be control of population growth by keeping low or encouraging the decline in birth rate through family planning programs and delays in marriages.

6. Formulating and reinforcing strict and practicable policies on economic and social development. Policies should focus on enabling people to utilize resources rationally thereby organizing their activities while considering the necessity of improving the environment.

Population Problems in the Economically Advanced Countries

Underdeveloped countries do not have monopoly of population problems though their problems are more wide spread and more difficult to solve. It is , however, worthwhile to note the problems of industrial and urbanized countries, some of which are becoming increasingly more serious. These problems include:

1. **Ageing of population**. Is a serious problem in the advanced countries like U.K. due to low birth rate, low death rate, and high life expectancy there is an over-increasing proportion of older people in the population. Hence there will be fewer people to support the elderly. The elderly people are dependent on small working, population. Ageing leads to problems like provision of pensions and other extra health services, pose financial problems and economic decline.

2. **Small work force**, Due to low birth rate labour force expands very slowly while industrial and other employment opportunities continue to multiply. As the work force is well educated there is a problem of unskilled labour since the majority of workers are skilled. Hence, the workforce is relatively small while wages are high. Hence, there has been migration of workers from countries like Italy, Yugoslavia, Turkey and Greece to Germany and Switzerland where there are insufficient workers.

3. **Rural depopulation**. There is movement of people from the rural areas to urban centers since the urban centers provide amenities such as shops, entertainment, better medical services, water supply, education which cannot be matched with the country districts. Employment is usually easier to find in urban areas than in rural areas. In some areas farms are even abandoned. Hence, the rural areas suffer a decline in the living standards if no mechanization is used.

4. **Urbanization problems**. As the urban areas expand the pressure on transport, water supplies, sewage and refuse disposal grows. The industries produce smoke and chemical, which cause air and water pollution. There problems of traffic congestion and noise pollution. Tension created due to urban problems lead to far higher incidence of mental illness than in the developing countries. Another problem is the decrease in the arable land due to the urban sprawl. This leads to the decline in agriculture.

5. **Environmental problems** like acid rain in Germany due to industrialization are another problem that leads to soil pollution.

Problems Common to both LDC's and HDC's

1. Uneven distribution, uneven development, overpopulation and under- population exist in both categories.

2. Resources are not evenly distributed.

5.1 AGRICULTURAL DEVELOPMENT

Economic activities are so varied. The term industry is used to cover a wide range of economic activities, which may involve making, supplying or delivering goods and services of a number of people.

Types of Economic Activities (Industries)

Primary Industries (Activities)

The simplest form of industries concerned with extraction of raw materials to be supplied to the other industries. Examples are Farming, Forestry, Fishing and Mining.

Secondary Industries (Activities)

These include both manufacturing and processing industries. In this category the raw materials are assembled or manufactured into finished goods. They are divided into two groups.

1. **Heavy Industries**

   These are the industries, which produce heavy goods like metal goods, heavy chemical, locomotives and shipbuilding.

2. **Light Industries**

   These are the industries, which produce light goods, example are like Textiles, making of electrical equipment, plastic goods, cosmetics, electronic gadgets, and toilet articles.

   They involve re-processing of the partially manufactured goods to make more complex products like watches, radios, computers, books, clothes etc.

   (i) Food processing, car assembly, manufacturing and building are secondary industries.

Tertiary Industries (Activities)

They are not a part of manufacturing at all but the industries whose jobs involve providing goods and services for the public. Examples are transport, trade, tourism, and entertainment, catering (hotel services) medicine (doctors).

Quaternary Industries (Activities)

These include people who provide specialist information and expertise to all the above sectors i.e. primary industry, secondary and tertiary industries. Example is research, design engineering (designers), and computer programming grown in summer in the region. In the wheat zone cotton, maize, potatoes, sugar beet, soya beans, peanuts, flax and tobacco are also grown. Nonetheless, Gargen vegetables are grown all over the country.

In the North and Northwest Grasslands Pastoral farming is dominant. Sheep, goats, cattle, horses and camels are reared. This area is too dry for arable farming since the amount of rainfall is

usually below 500mm. In most parts of humid China, pigs and poultry are principal animals raised.

The Western Part

Is also too dry but there is farming around the oases (oases farming).

AGRICULTURAL (FARMING)

What is Agriculture?

Agriculture refers to a fundamental human activity, which involves cultivation of crops (arable farming) and domestication of animals (Livestock husbandry). It is categorized as primary industry since it involves the production of raw material that can be used by other industries.

IMPORTANCE OF AGRICULTURE

1. **Food production** for both people and animals. For example in the Corn Belt in America most of the maize produced (about 70% of the total production) is fed to the animals in the farm and the rest is used for other purposes including food for human being.

2. **Provision of raw materials** of production. For example, cotton production is very important for the manufacturing of clothes in the textile industries. In Tanzania cotton is grown in Mwanza and other regions and has been a great dynamo to the development of textile industries in Tanzania like MwaTex, Friendship textile mill, MuTex, Mbeya Tex, Karibu Textile Mills in Dar es Salaam etc.

3. **Employment creation** for the population which is growing fast. Some people are employed in the agricultural sector as laborers, managed etc.

4. **Income generation** for the government and individuals. The country can get foreign currency by exporting some cash crops like tea and coffee. Kenya for example exports tea to other countries like America, Tanzania etc where it is used for blending with other tea because of its high quality.

5. **Provision of clothing materials** as a result of growing fiber crops like cotton etc, which are later, used in the textile industries for manufacturing clothes.

6. It helps man to live settled life in village rather than wandering from place to place in search of the basic life necessities.

7. **Generation of capital** that can be invested in other sectors of the economy.

FACTORS INFLUENCING AGRICULTURAL DEVELOPMENT (FARMING)

There are several factors which affect agricultural development and these are as follows.

1. **Climate:** Climate influences agriculture through the impact of rainfall, temperature and wind.

   • **Rainfall:** Where there is adequate rainfall a variety of crops can be grown. But where there is poor rainfall agriculture tends to have poor performance. For example, in arid areas like desert, regions agriculture is usually poor due to lack of rainfall. Rainfall also affects distribution of crops. Crops, which need high rainfall like bananas, will be grown in areas that experience high rainfall like the coastal lands of east Africa and highland areas. The crops that need slight rainfall (like cotton and wheat) will grow in the areas, which experience little (slight) rainfall.

   Rainfall also can affect agricultural by causing destruction of crops and human settlement. This happens when there are floods. Floods are very common in Bangladesh and lowlands of China. Apart from floods heavy rainfall can cause soil erosion leading to the reduction of arable land and other property. These predicaments associated with climatic vagaries can lead to poor agricultural performance.

   • **Temperature:** Temperature affects germination of the seeds, growth rate and length of the growing season as well as soil development.

   In warm areas plant growth takes place very fast unlike in the areas where the temperatures are very low like the tundra regions and highlands. Hence, moderate temperature like in Western parts of Europe encourages crop production and animal husbandry while where there temperature extremes (that is very high temperature or very low temperatures) agriculture tends to fail. If the area has very low temperatures the soils are frozen and hence lead to poor growth of crops and where the temperature is very high like in the tropical deserts the soils are very dry because of excessive evaporation hence discouraging plant growth and animal husbandry.

   Microbial activities are also efficient where the temperature is high leading the high rate of organic decomposition and hence the addition of organic matter to the soil.

   Optimum temperature for each crop encourages plant growth. Some crops need cool conditions and hence will be grow in areas which have cool conditions and hence will be grown in areas which have cool climate. Other crops need high temperatures and hence will be grown in the areas that have high temperature.

- **Wind:** Wind effects physical damage to crops especially when there are stormy winds like tornadoes, hurricanes etc. It can also cause soil erosion especially where the surface is bare usually in the desert and semi desert areas. Wind also accelerate evaporation and hence loss of water from the soil. However, wind also help in the pollination process and seed dispersal.

2. Edaphic (Soil) factors

Soil also influences agriculture both positively and negatively. Good soils, which are fertile and deep, encourage positive development of agriculture while poor soils, that is, infertile soils discourage agricultural development.

Soil also determines distribution of crops over space. Crops which need acidic soils will grow in the areas which have acidic conditions while the crops which need slight alkalinity will grow in the areas which have alkaline soils like the halophytic plants which grow in the areas with saline soils.

3. Topographic (Relief)

Nature of the relied affects agriculture either positively or negatively. For example on steep slopes or hilly areas mechanization is difficult while where the area has gentle slopes or flat surface mechanization can be carried out easily. The prairies of Canada have been developed into extensive wheat cultivation because of the gently sloping undulating surface, which has allowed easy mechanization. The undulating surface also has made soil drainage take place very easily.

Flat areas facilitate transportation of crops from the forms to the storage or market places. Mountainous areas pose problems of transportation. Altitudes influence the variation in temperatures such that high altitudes with very low temperatures limit agricultural activities. Low lands are prone to flooding; hence, they discourage the development due to being free of floods.

Aspect is another topographical factor. The slopes, which receive more people sunshine and reliable rainfall are conducive the development of agricultural while the slopes which do not receive enough sunshine and experience rain-shadow effect (dryness) are not conducive for agricultural development.

4. Economic Factors

Capital availability can influence agricultural development. The places where people have high capital modern farming can easily take place due to investment in new and sophisticated

agricultural facilities like tractors etc. But where farmers have low or poor capital agricultural tends to be poor due to poor level of investment.

5. Marketing system

Good marketing system encourages agricultural development while poor marketing system discourages development of agricultural. Price fluctuation in farm products is a big problem in the development of agriculture. Most farmers are discouraged due to the price fluctuation or low prices especially in the developing world. If prices are stable and are high, farmers can produce more and more so as to raise their living standards.

6. Social Factors

a). Divisions of labor: In some societies most of the work in the farm is done by women and children. This results in poor performance of agricultural activities.

b). Tribal customs also affect the rearing of animals and growing of crops. For example some tribes keep large number of animals for prestigious purposes while others for marriage purposes. They do not keep them for sale in order to improve their family life standards.

c). Religious beliefs affect much agricultural development. For example the Muslims do not keep pigs since they believe that pigs are not clean animals.

d). Ownership and inheritance of land. This encourages land fragmentation since the increase in the number of family members forces the family heads to divide the land into small plots. Such land, which has been fragmented into small plots, cannot allow easy mechanization.

e) Transport and communication (infrastructures)

f)Social services such as water, school, power, health services.

7. Technological Factors

Where there is advanced technology, agriculture is also more advanced because of the use of the scientific methods. But where farmers have low level of technology due to low education agricultural performance is usually poor. This is caused by domination of traditional farming methods that employ simple tools and techniques.

8. Biotic Factors

These include the influence of animals and plants on the agricultural development. They can have both positive and negative effects as follows:-

a). Some animals and birds destroy crops and cause great loss to the formers. Other animals like lions attract livestock in the farms or in the grazing areas. But animals can also facilitate pollination in plants and encourage production of fruits.

b). Weeds also compete for food with crops leading to low production. Sometimes the weeds produce poisonous chemicals and end up killing the crops.

c). There are some insects and fungi, which attack crops and lead to great destruction and losses in the farms. Sometimes insects help in the pollination process in plants.

9. Demographic Factors

These are related to changes in population. The rapid expansion of population poses a problem of pressure for land leading to poor development of agricultural. Population pressure can cause land fragmentation and bring problems in applying mechanization in the farms, which are, after all, small in size. Sometimes due to the increase in population the farmlands are changed into settlement areas leading to the reduction of the size of the arable land.

Like wise, population expansion has brought the problem of high dependency ratio. This is due to the fact that the number of children and old people is greater that the young and energetic people. This has negative impacts on agriculture since children and old people are not effective or efficient in the production process.

Population is also very migratory. There is high movement from rural to urban areas. The rural areas are left unattended because of lack of labor after the flow of the young people to the urban centers has taken place. This is a big problem in the Least Economically Developed Countries (LEDCs) and is indeed of grave concern to all the governments and their people. It is a problem that needs being addressed since it is 'time bomb' that has fatal effects to the society.

10. Political Factors

Where there are clear policies on agriculture associated with strong support by the government, agriculture develops very fast unlike where there are poor policies and weak support from the government. In European counties agriculture has developed positively in many areas due to the government involvement as well as formulation of clear agricultural policies. Likewise, the success in tea production in Kenya has been due to the strong support by the government.

When the government is not serious even farmers are discouraged since they cannot get a well – coordinated marketing system especially when it comes to exporting the cash crops.

FARMING AS A SYSTEM

Farming is a considered as a system because it has inputs, Processes and Outputs.

Inputs

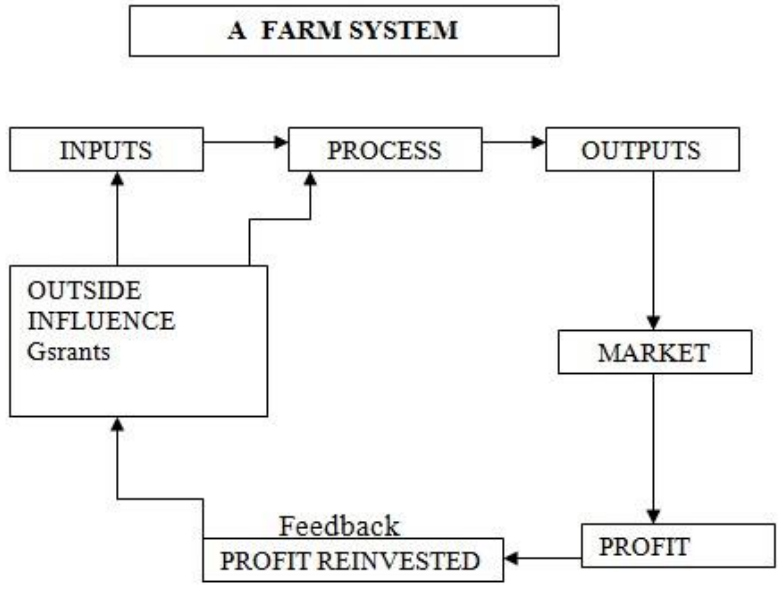
The components, which go into a system and these, include both physical and human inputs. Physical inputs are like soil and climate (Rainfall and sunshine). Human inputs include fuel, chemicals, capital, experts, advice, technology, buildings, stock(cattle) and outside influences like grants.

Processes

These are the activities that take place in the farm so as to bring about products. They involve activities like clearing the land, cultivation, sowing, applying fertilizers, weeding, spraying, thinning, pruning, harvesting, processing, packing artificial insemination, milking feeding the animals irrigation etc. They are done in the farm.

Outputs

These are the products of the system. They include animal products like milk, hide, wool, fur, mohair, feathers, butter, meat, cheese etc. And crops like eye, barley, maize, rice, oats, potatoes, sugar meet, apples, Guavas, etc. The output can be either stored for human consumption or sent to the market to be sold for profit. The profit gives the farmer feedback in terms of the nature of the farming activity. The profit can be reinvested in a more advanced agriculture, but all depend on the farmer's decision



Feedback

Include profit new information and technology etc. These can be reinvested into a farming system for further production.

CLASSIFICATION OF AGRICULTURE (TYPES OF FARMING SYSTEMS)

Agriculture (Farming) can be classified according to a number of characteristics as follows:-

i. According to Specialization

In this category there are systems like Arable farming which involves crop production; Pastoral farming which involves livestock keeping and mixed farming which involves both crop production and animal farming.

ii. According to Land Use Intensity:-

This includes systems like:

a. Intensive Farming

In which large amount of capital and or labor are applied to the small piece of land including the use of scientific methods of production so as to get high production. Horticulture is a good example.

b. Extensive Farming

This system takes place where large areas of land are worked by small labor force. This usually requires the use of modern machines. It takes advantage of economies of scale that producing highly on a large area using low labor costs.

iii. According to Economic Level and Purpose:

This category includes systems like;

-Commercial farming where production systems is intended for sale.

-Subsistence farming in which the produce is basically for food in the family.

iv. According to Nature of Land Tenure

Under this category farming systems can be identified as:-

a. Nomadic Farming

This is whereby people move from place to place in search of pasture and water supplies. In this system there can be included shifting cultivation (Migratory agriculture) and transhumance. Transhumance is a seasonal movement of people with their animals in search of pasture and water. In differs from nomadic farming in that there is permanent settlement. Nomads are the people keep on wandering from place to place in search of their basic needs for sustaining their life. In Africa nomads are like Fulani of West Africa and the Maasai of East Africa.

b. Semi – nomadic Farming (Semi – sedentary)

Is an intermediate farming system between sedentary and nomadic farming in which a farmer has started to settle and does not move for long distance. A farmer now practices mixed farming where livestock farming and crop production are carried out.

c. Sedentary Farming

Is the farming system, in which farmer does not move and has established a permanent settlement. The farmer grows crop and keeps animals. Cash crops are also grown for obtaining other necessary materials whose availability will need cash.

v. According to Methods of Production

a. Shifting Cultivation (Slash and Burn)

This is a system which involves the cultivation of a farm till the soil gets exhausted then a peasant moves to a new piece of land, clears it and cultivates. In this case a peasant does not expect to return to the original land.

b. Rotational Bush Following

It is the system of farming in which a piece of land is cultivated such that on getting exhausted the farm is left idle to regain its fertility. When the farm remains idle the forest or grass occupies the land to allow restoration of fertility in the soil. Meanwhile a farmer cultivates another piece of land but expects to return to the former land when the current land is exhausted and the former land is replenished (regains its fertility).

c. Factory Farming

The system practiced where the livestock are kept inside small units to produce high outputs at competitive prices.

d. Plantation Agriculture

This is a system in which farming take place on a large area (large estate) characterized with a high level of organization, administration and technology (Mechanization). Normally one type of crop is grown Plantations are basically monoculture in nature.

e. Analysis of Farming Systems

Farming systems are numerous but they can be categorized into arable farming systems are pastoral farming systems.

f. Arable Farming Systems

There are various arable farming systems and this range from traditional to modern arable farming systems. They include, Extensive subsistence farming systems.

A. SHIFTING CULTIVATION

Shifting cultivation is a system in which a peasant keeps on shifting from one area to another as result of soil exhaustion. In this aspect a peasant cultivates certain piece of land until the soil is exhausted then shifts to a new piece of land where he clears and cultivates. It is common in Africa, Tropical and Central America and South East Asia.

Farming is on self, sufficient basis in terms of food production. It is also called migratory or slashes and burn farming. Shifting cultivation has been given different names in different places; Milpa in Central America, Roca in Venezuela , Masole in the Democratic Republic of Congo, Shena in Sri – Lanka, Chitemene in Zambia and Ladang in Malaysia.

Characteristics of shifting cultivation.

1. Sites are selected in the virgin forest and therefore tend to be fertile.
2. Simple tools are used like hand hoes because of low technology.
3. It involves slash and burn of the bushes and grass so as to be able to cultivate using simple tools.
4. Few crops are grown most of them being starchy crops and no animal keeping.

5. It is practiced where there is low population for easy shifting.

6. It is practiced do not have permanent settlement since they expect to move any time.

7. The land is owned communally such that no one claims possession of certain piece of land.

8. It is associated with low production and low level of economy with little chance for improvement.

9. Production is for subsistence use since there is no surplus for sale.

10. Cultivated areas are usually scattered and small in size. This can bring problems of organization or management.

Advantages

1. The system is not costly since simple tools are used in the production process.

2. A farmer is assured of fertile soil due to the clearing of the virgin forest.

3. Food supply is assured since the family cultivates on self- sufficiency basis.

4. Family labor is used in the production process. This contributes to cheapness of the system.

5. Ashes add fertility to soil.

6. Inter cropping ensures the supply of a variety of crops though the yield is usually poor.

Disadvantages

1. There is low yield and hence no surplus for sale leading to low life standard or poverty.

2. Poor land use encourages deforestation and soil erosion.

3. Poor diet since most of the crops are starchy and animal farming is discouraged.

4. The system cannot apply where there is high population.

5. The use of fire kills micro-organisms in the soil.

6.Scattered nature of farms and their small size pose problems of organization and mechanization.

Decline in Shifting Cultivation

Shifting cultivation began declining as a result of the increase in population, advancement in technology, engagement in other economic activities and the influence of the government policies, which insists on stopping shifting cultivation, and embark on intensified sedentary agricultural activities.

B. ROTATION BUSH FALLOWING

Is the system of farming in which peasants cultivate a certain piece of land till it gets exhausted and then leaves it for a certain period to regain its fertility. It differs from shifting cultivation in that the farmer is settled and hence the farms are rotates rather than crops. It is therefore a simple form of sedentary farming.

The following period can range from 2 to three years depending on the density of population of the areas.

This system takes place after shifting cultivation fails to perform well due to the increase in population. As population increases a farmer is restricted to smaller area and hence is forced to settle and produce with more advanced technology.

Characteristics of Rotational Bush Fallowing

1. Farmers are settled but the farms are the ones, which are rotated (Cultivated rotation or in turns).

2.Simple tools are also used though slightly more advanced than in shifting cultivation.

3. There is also the use of slash and burn methods due to low technology.

4. The communities can engage themselves into other activities like fishing and hunting.

5. It uses the technology, which is more advanced than shifting cultivation.

Advantages

1. Since people are settled they engage fully and effectively in the production process. There is no time wastage as it is shifting cultivation.

2. Slash and burn involved in the farm preparation adds fertility to the soil especially nitrogen.

3. Fallowing involves gives room for the improvement of soil terms of fertility and encourage the recovery of vegetation, which was disappearing.

4. It takes place where there is high population unlike shifting cultivation.

5. Because of being settled the farmers can engage themselves into other activities like fishing, hunting so as to get a variety of food products and other necessary materials.

Disadvantages

1. There is low production because of the use of low technology and simple tools.

2. Slash and burn can lead to environmental degradation as well as loss of biodiversity.

3. There is poor trade among the communities due to lack of surplus.

Intensive Subsistence Farming System

Is a system that involves cultivating on a small area using advanced technology to get high yield. This system takes place where there is high population and where there are possibilities of using animals or chemical manure to maintain fertility.

A farmer does not only produce food crops but also cash crops. The system is best developed in and practically confined to the monsoon lands of Asia (China, Japan, Korea, India, Pakistan, Sri-Lanka etc).

Crops grow include Wet paddy, Sorghum, Soya Beans, Maize, Sugar cane and vegetables. The farmers can carry out barter trade because of surplus production. Manual labor is used intensively.

Reasons for Changes in Agriculture from Extensive Subsistence Systems to Intensive Subsistence Systems

1. The changes from extensive subsistence systems to intensive subsistence systems have been caused by the following factors.

2. Decrease in the size of the arable land due to the increase in population.

3. Advancement in technology enabled people to produce highly on small areas.

4.Insistence from the government on encouraging people to live a settled life rather than a nomadic life. The governments also like leaving some areas for forest conservation.

5.Growth of trade has made agriculture change from subsistence to commercial farming following the need to raise the standard of living among the people.

6. Shifting cultivation is threatened by other activities like timber and ranching projects who are invading the arable land, Extensive commercial arable farming systems.

C. PLANTATION AGRICULTURE

It is a specialized commercial cultivation of cash crops on a large area. Plantations are sometimes called ESTATES. They are common in many parts or Asia, Africa and tropical and sub-tropical America. Initially they were managed by the people from the colonizing countries, but recently the many governments of different respective countries have taken control. Main crops include tea, coffee, cocoa, palm oil, banana, rubber, sugar cane and sisal.

Characteristics;

1. Farms are highly organized and scientifically managed.

2. It is monoculture (involve growing of one type of crop)

3. The farms are large and which can be 100 to 400 hectares and above.

4. It needs large labor supply.

5. There is the use of advanced technology (mechanization) for example there are processing factories like decorticators and coffee pulpers as well as hulleries.

6. The farms can be owned by the government or companies.

7. Plantation agriculture is capital intensive in the sense that it needs high capital to establish.

Advantages

1. The quality of crops and yield is high (Surplus is produced).
2. Diseases and pests are controlled to keep damage at minimum and raise output.
3. It is efficient due to the use of machinery.
4. There is effective use of land.
5. There is steady supply of crops for the market.
6. It provides employment
7. It is also provides housing facilities, schools and health care.
8. The people around get new technology in agriculture.
9. Plantations encourage industrial development.
10. Stimulate the development of infrastructure and communication system.
11. Contributes to the generation of government revenue.
12. Promotes the living standard of the people.
13. It makes the country well known worldwide.

Disadvantages of Plantations

1. It is mono cultural and this leads to soil degradation.
2. Large areas are cleared encouraging desertification.
3. Most crops grown are sent overseas.
4. The formers concentrate on cash crop production rather than food production.
5. Local people are often exploited.
6. It encourages labor immigration leading to social problems.

7. They suffer price fluctuation in the world market.

8. They suffer high capital for investment and hence they are expensive to establish.

9. Mechanization can lead to unemployment since machines start doing what could be done by several people especially cultivation and harvesting using the combine harvesters.

10. Plantations can also lead to unevenness in the level of development within a country. The areas around plantations develop faster than areas far away from the plantations.

Limitations of Development of Plantations in the Developing Countries:

1. Low capital for investment and they are expensive to establish, hence poor countries suffer.

2. Land is becoming smaller and smaller due to population exploitation.

3. Mismanagement of fund by the government as well as poor agricultural policies.

4. Poor transport and communication is another hindering factor. There are poor reads and transport facilities posing problems in the distribution of farm inputs and products.

5. Frequent civil wars such as in Rwanda, Burundi and Nigeria discourage this type of agriculture.

6. Climate vagaries like drought, too much rain fall, frost action especially in the margins of subtropical areas and destructive stormy winds discourage the development of plantation agriculture.

7. Frequent fires destroy crops. This is a common problem in tropical regions.

8. Price fluctuation in world market.

9. There is rapid growth of population which leads to pressure for land and land fragmentation.

10. Low technology among the people is another hindrance for the development of plantation agriculture in the developing countries.

11. Some areas like the Congo basin have dense and impenetrable forests. Therefore, people are automatically discouraged to waste time clearing these areas for plantation agriculture.

12. Rapid deterioration of soils especially in the tropical and equatorial areas due to leaching.

13. Prevalence of diseases and pests that attack crops discourage farmers.

EXAMPLES OF PLANTATION CASH CROPS

1. COTTON

Requirements

1. Temperature should be over 25^0 C (Warm temperature) it needs an annual rainfall of 800-1000mm. Rainfall should be concentrated during the early growing season. The picking season should be dry.

2. The soil should be fertile and well drained, e.g. black cotton soils of Sukuma, locally known as 'IBYSHI'.

3. It needs abundant labor during the picking season.

Production

1. It is grown on small of the size between 2 to 4 hectares.

2. The cultivation process largely done by hand although in some areas the farms are larger and ox- ploughs or tractors may be used.

3. Cotton is planted either in ridges or on flat hand.

4. Most picking is done by hand.

Answer

1. In Tanzania: Mwanza, Bukoba, Musoma, Tabora, Shinyanga, Kigoma, Tanga.

2. In Kenya, cotton is grown in Nyanza District.

3. In Uganda cotton is grown in Buganga District.

Processing

1.After picking, cotton is sorted by hand and then graded, into AR = the best grade, uncontaminated. BR = Cotton (Left overs)

2.Then the farmer sells cotton. Cotton is then transported to the ginnery where seeds are separated from the lint and the lint is compressed into bales of 182kg. Then the lint is sold for being used in industries.

3.Cotton in Tanzania led to the development of industries like the Urafiki textile Mill, SunguraTex, MwaTex, KilTex, (Arusha), MbeyaTex, and MuTex in Musoma.

By Products

Seeds are crushed and squeezed to produce oil, Margarine.

Problems Facing Cotton production in Tanzania

1. Unreliable rainfall.

2. Loss due to disease and insect pests that attack crops in the farms.

3. Decline in fertility that leads to the fall in yields.

4. Poor transport and communication.

2. TEA

Requirements

Tea grows best under the following conditions:

1. Relatively cool temperature of about 100â,’c

2. Rainfall from 1000 to 1300mm hence is confined to altitudes 1500 to 2000m.

3. It needs a sloping land.

4. Well drained soils which are slightly acidic, deep and fertile

5. Much cheap labor especially during the picking period.

Growing Areas are:

Usambara, Iringa, Mbeya in (Tanzania), Kenya highlands especially Kericho, the slopes of Ruwenzori in Uganda, Also in Malawi, India, Sri Lanka, Java, China and Japan

Preparation and Planting

Tea can be propagated by seed or vegetatively by cutting or budding. Young plants are transplanted at the beginning of the rains. Transplanting is done at a spacing of 120cm x 75cm.

Care Given to Crops

1. Young plants should be shaded for few weeks.

2.Mulching should be done in that newly established tea estate to prevent excessive evaporation.

3. Apply fertilizers containing Nitrogen.

4. There should be spraying, weeding, pruning.

Harvesting

1. First picking is ready after three years. But usually it is after four years and the harvesting goes on to 50 years.

2. Plucking goes on throughout the year and the leaves picked are sent to the factory for processing.

Processing

1. The tea leaves are dried in the sun for a day or two to remove moisture.
2. The leaves are rolled to break up the fibers.
3. Leaves are dried again or baked highly over charcoal. They turn reddish brown.
4. The leaves are fermented to remove tannic aced that can affect the flavor.
5. The leaves are roasted and dried over fire until they are black in color.
6. The leaves are sieved to remove stems and other unwanted particles.
7. The leaves are graded and packed for export.

3. SISAL

Sisal is grown for its fiber used for making ropes, string, sacking, carpets, etc.

Required Conditions

1. Need high temperatures ranging between 25^0 C to 30^0C.
2. Slight rainfall (650 – 1250mm)
3. Tolerates a wide range of soil conditions. But it should be well drained.
4. It is drought resistant

Areas

Tanga, Muranga, Machakos and Taita - Taveta in Kenya

Production

1. Bulbils are grown in nurseries and after a year are transplanted in double rows.
2. The cutting of leaves starts after two years and may go on up to 5 and 10 years.

3. The cut leaves are transported by tractors or trucks or rail carts to the decorticators where the leaves are crushed and the fiber is separated from the leaf.

4. The fiber is then washed and dried in the sun.

In sisal estates, cultivation is mechanized but planting, transplanting and cutting are done by hand. Weeding can be either manual or mechanized.

4. PYRETHRUM

Pyrethrum bears white flowers which contain toxic substance called Pyrethrene which is used to manufacture insecticides.

Conditions

1. Fairly high rainfall (1000 to 1500mm), which must be well distributed.
2. It needs a dry spell during the flowering and harvesting stages.
3. It needs cool and moist climate.
4. Altitude between 1800 to 3000m above sea level.
5. It needs fairly fertile soil, well drained, and limed volcanic soils.

Cultivation / harvesting

1. Pyrethrum seeds are first planted in nurseries
2. Then the seedlings are transplanted in rows on the farm
3. Weeding is dome to encourage plant growth by reducing competition for food.
4. Harvesting is done by hand and it takes place after one year.
5. The picked leaves are dried under the sun or over burners.
6. The dry flowers are bagged and transported to factories.

Processing

In the factory pyrethrum is crushed into power and then into active liquid form. Then Pyrethrene is extracted in the liquid form. It is finally containerized for export or local consumption.

Uses of Pyrethrum

Manufacture of insecticides, disinfectants and mosquito coils.

5. SUGAR CANE

Conditions

1. High temperature between 21°C and 27°C throughout the year.
2. It needs abundant rainfall of at least 1270mm, if it grows without irrigation.
3. It needs deep fertile soils which can retain water. The soil must be well drained.
4. It needs flat or undulating land for easy mechanization.
5. They are high need for cheap labor.
6. Infrastructure is required for transporting the cane to the factories.
7. Large capital is required for acquired for acquiring the machinery and other equipment needs for manufacturing processes.

Cultivation and Processing

1. Cutting from old plants are planted.
2. It manure's after 16 – 24 months, depending on the crop variety.
3. Little work is done during the growing period except weeding in the early stages.
4. Before harvesting the field may be set on fire to get rid of foliage, pests, reptiles and other dangerous animals.
5. Then cutting starts using sharp pangas.
6. Sugar cane are loaded on to the trucks and ferried to the factory.

Processing

1. The cane is crushed between rollers and then boiled with lime.

2. Sugar is allowed to crystallize to form the row or brown sugar.

3. Finally brown sugar is refined to give brown and white sugar in different grades.

4. The by – products of crushing are used in different ways: e.g. the cane residue (Bagasse) can be used for furl, manure pr fodder. It can be used for producing paper, fiber boards, or synthetic textiles. Molasses is commonly used to process alcohol and produce fuel alcohol. Sugarcane can be grown on small farms and estates like Kilombero. Also Kenya, America and Australia.

6. COCOA

It's a beverage crop.

Areas

Central America, Ghana, Nigeria, Cote d' Ivories, Cameroon and East Indies

Requirements

1. High temperature to above 25°C

2. High rains at least 1100mm and above without a dry spell.

3. It needs shading to protect it from strong sunlight and strong wind which can destroy flowers.

4. Absence of strong winds. Hence, windbreakers are necessary.

5. Soils should be fertile, deep and well drained. Loamy sold rich in iron and potassium are ideal but light clays are also sustainable.

6. Labor it needs high labor supply.

Cultivation

1. Plants are propagated from seeds. It grown in the forest area of West Africa on small farms and estates.

2. Trees are planted about 3m apart.

3. It needs occasional weeding, manuring, etc. During harvesting the ripe pods are removed from the trucks and branches using a long knife. The crop is harvested twice a year.

Cocoa Processing

1. Splitting of cocoa pods using machetes to get the beans.

2. Beans are fermented (1 week) to remove unpleasant taste and to prevent germination.

3. Then the beans are washed and sun – dried.

4. Dry beans are bagged and transported to the factory.

5. Then they are cleaned, roasted and husks are removed to remain with "coco nibs"

6. Then cocoa nibs are ground into powder, ready for consumption.

7. The powder can be used for making chocolate.

In Ghana

The Southern part is the major cocoa producing area. The greatest concentration is the cocoa triangle formed by towns like Accra, Kumasi and Takoradi.

7. OIL PALM

1. It originated in West Africa countries producing include, Nigeria, DTC, Ghana, Cote d'lvore.

2. Uses of palm oil.

3. Palm oil is produced from the palm tree. Also kernel oil is manufactured. The oil is good for cooking.

4. Remnants are used for animal feed and as fertilizer.

5. Also the residues can be used for fuel.

6. It is grown both on small farms and large farms.

Conditions

1. Heavy rains of about 2,030mm which are well distributed.
2. High relative humidity.
3. High temperature to 27^0C and plenty of sunshine.
4. It tolerates a wide variety of soils.
5. Wind brakes should be set up to protect the trees.
6. Manure and fertilizers should be frequently added.

Cultivation

1. After the land is cleaned, the young palms are transplanted from the nurseries.
2. Spraying and weeding are done

Processing

1. After harvesting, he fruits are cooked in streams.
2. Then the pulp is separated from the kernel.
3. The pulp is pressed to extract palm oil and the kernel is crushed to remove the shells.
4. Then the kernel oil is extracted.

8. CLOVES

Conditions

1. High temperature throughout the year.
2. Heavy and reliable rain of not less than 1400mm.

3. Deep fertile soils.

4. High humidity throughout the year.

5. Plenty of cheap labor during harvesting.

Areas

West Indies, Zanzibar, Mauritius

1. It is grown in large plantations

2. Seeds are sown in the nursery bed

3. Seedlings are transplanted.

Harvesting

Just before the flowers open, the buds are picked by hand. This is done twice a year. Harvesting can go on for some 50 years.

Processing

1. The picked dubs are dried, then processed and packed ready for export.

2. Oil of cloves is made and is used in preparing Vanilla flavoring.

3. It is added to sweets, cakes, cigarettes, and chocolates.

4. Oil is used also in the manufacture of perfume, soap and medicine.

9. WHEAT

It is widespread in the temperature zones. It is cultivate in other regions.

Countries

Kenya, Canada, USA, China, Argentina (Pampas), Australia (Australian downs), India Russia (Ukraine stepper), France (Paris Basin)

Conditions

1. Average temperature should not exceed 20°C or fall below-60°C. The weather should be warned during the early period of growth with sunny and dry conditions.

2. It needs slight rainfall from 305mm to 1,015mm.

3. Light clay or heavy loam soil is suitable. The soil should be will drained and fertile.

4. Rolling topography is good because if facilities drainage and the use of machinery.

5. It is produced on a large scale in plantations. It is used for making different species but three major types are commercially cultivated.

10. COFFEE

Is also a beverage crop and is of different species. There are some forty different species but three major types are commercially cultivated.

These include;-

1. Arabica: This type of coffee is the most important in the world trade. It originated from the Mocha coffee native to the Arabian Peninsula. It is grown in the major producing countries like Brazil. It is the least hardy of the major coffee species. It also grows in East Africa.

2. Robusta Is the West African variety which is hardy but yields poorer quality coffee. It can survive even in arid conditions and is diseases – resistant.

3. Liberica. This too is hardy and disease-resistant species. It is indigenous to Liberia and suited to lowland rather than to upland conditions. It gives them heavy yields of moderate- quality coffee. Both Robusta and Arabica are widely grown in Africa, mostly by small holders. They are particularly suitable for making 'Instant coffee' and are gaining greater importance.

Conditions

1. Temperature: Coffee can do well in hot climates with day temperature about 32^0C. But it is usually grown in highland conditions (cool conditions) where the temperatures range from 14^0C to 26^0C (57^0C to 78^0F).

2.It needs high rainfall (1500mm to 2250mm), which is well distributed.

3. Shade is necessary to prevent direct sunlight from affecting the trees when they are still young.

4. Upland conditions 610m to 1830m (2000ft to 6000ft) are preferred.

5. Soils should be fertile and well drainage. Hence, volcanic soils like those of Brazil containing Potash and organic material are the best.

6. It needs protection from the strong wind using windbreakers.

7. These should be a good supply of labor. The harvesting process needs alt of labor since coffee involves hand picking.

Cultivation

Coffee seeds are selected and then propagated or sown in nursery beds 2 to 3 cm deep. After about six months it is transplanted to the field. The plants are positioned 3 meters apart.

The plants are cared for through shading, watering, weeding, manuring, spraying and pruning.

Harvesting

Harvesting may start years after planting but a good harvest starts after four of five years.

Coffee picking is done by hand by removing the ripe berry from the stalk. Picking is selective so as to control the quality of coffee. The harvesting interval is from 7 to 14 days.

Coffee Processing

1. Pulping: Passing the berries through the machine to remove the cover or pulp.

2. Then the beans are fermented. Fermentation can be done by heaping the beans for about for 12 to 24 hours.

3. Curing involve washing and sun drying.

4 . After curing the machines peel off two layers of inner husks. Then the beans are winnowed and graded.

5. After grading they are packed in sacks for export. The importing countries roast the beans and then grind them into powder which is later used to make beverage.

Production countries include: Brazil, Uganda, Ethiopia, Angola, Senegal, Ivory Coast, Mexico, Indonesia, Guatemala, India, Kenya, Malagasy, Cameroon and Tanzania in Mbeya, Kilimanjaro and Bukoba.

11. RUBBER

Conditions for growing rubber:

1. Constant high temperatures of around 27^0C and should not be below 21^0C.

2. Rainfall should be high at least 1525mm to 2540mm. It should be well distributed.

3. It can grow in different types of soils but the ideals soil should be deep, fertile, well drained, heavy and acidic. Cover crops can be grown to reduce soil erosion.

4. Land should be flat or gently undulating but highlands are not suitable. This is because it needs mechanization during cultivation.

5. Plenty of shade during its early stages of growth (this is often provided by inter-planting with banana trees.)

6. It needs a lot labor especially during the harvesting time.

Rubber Cultivation

1. The land is first cleared to establish the estate or small holdings.

2. Majority of rubber trees are propagated by bud grafting. This is done by sowing rubber seeds in damp fertile soil in nursery, where they quickly germinate. After about nine months the young rubber plants are about 6.3 meters (12 inches) high, a bud from a very high yielding parent tree is grafted onto each of the young rubber trees which then are transplanted in rows in the plantation.

Harvesting

Harvesting is done through tapping. The trees are ready for tapping after about seven years. Such a long time makes it difficult to invest a large amount of capital which is required for the establishment of a plantation, because for seven years there is no return on the capital investment. Also, it is difficult to forecast what the demand of rubber will be seven years from sowing the seed.

Tapping of the Trees:-

1. This takes place before day-break because this time the later (white milky liquid) flows best.

2. Tapping consists of cutting a thin bark from the truck of the trees. The latex oozes out into the cup. After few hours the latex ceases to flow out. The cups are emptied and the latex is taken to the rubber factory.

Processing

In the factory, the latex is first diluted with water and then poured into aluminum tanks where it is coagulated by adding small quantities of acetic or formic acid. The solid rubber is then passed through rolled at squeeze out water and produce sheets, which are then cut into standard sizes. The sheets are later dried after which they are graded by holding them to the light to see whether they contain holes or bits of foreign matter such as wood. They are then packed into bales for export.

Areas Producing Rubber

Malaysia, Indonesia, Thailand, India, Sri Lanka, Nigeria, Liberia, Vietnam etc.

Limitations (Drawbacks) of Large Scale Farming in Tanzania

1. Low capital for investment.

2. Land is becoming smaller and smaller due to the increase in population and land degradation.

3. There is poor support by the government.

4. Climate problems like drought and too much rainfall that causes floods.

5. Price fluctuation and especially low prices discourage the farmers.

6. Rural – urban migration lead to the problem of labor supply.

7. Mismanagement of fund set for agriculture as well as poor agricultural policies.

Advantage (Importance of Growing Cash Crops in Any Country)

1. They encourage the development of industries for example the cultivation of cotton can lead to the development of textile industries like Mute, Kiltex, Mwatex, and Friendship textile mills.

2. They countries to the generation of capital and the government revenue.

3. They stimulate the development of transport and communication systems.

4. They lead to the creation employment opportunities.

5. Encourage the improvement of the living standard of the people in the country.

Give an Account of the Agricultural Development in South Africa

Apart from mining of gold, diamond, uranium, platinum, coal, iron and manganese and industrial production, South Africa involves itself in agricultural production. The main crops are maize, which is largely produced in the 'maize triangle' located between Ermelo, Lichtenburg and Lady brand and wheat which is grown in winter in the Southern Cape Province, the Eastern Orange Free State and Transvaal. In the Transvaal wheat is produced under irrigation. Other crops include sugarcane, tobacco, potatoes, cotton and groundnuts.

Farm Organization

There are some estates and small holdings some of which are under irrigation. The areas for cultivation include:

1. The Natal where sugarcane estates are located, Cape Province (Mediterranean) where tobacco, wheat and fruits are grown. The fruits include important grapes (under viticulture), lemons, organs etc. Other areas are in the Orange Free State.

2. Livestock is also important in South Africa. In drier areas sheep rearing, mainly for wool, is important. About two thirds of sheep kept in South Africa are Merino type which yield fine wool. Cattle are reared where rainfall exceeds 500mm a year. Dairy cattle are mainly fond in Southern Transvaal, northern Orange Free State and in south East Cape Province and around big towns such as Johannesburg and Cape Town. About half of all cattle in South Africa belong to African cattle rearers.

FACTORS THAT FACILITATED THE DEVELOPMENT OF AGRICULTURE IN SOUTH AFRICA

1. **Conducive climate** which allows the growth of a variety of crops, the climate ranges from Humid subtropical, continental interior, Mediterranean to Semi arid conditions.

2. Availability of good and **deep soils which are fertile**. The soils are well drained in many areas especially the highlands.

3. **The availability of capital**, which was invested in agriculture, has been another factor. The country is the richest in Africa and capital availability has been easy due to mining and industry.

4. **Fast development of transport and communication**. In the continent, South Africa has the densest network of railway lines and roads. This has also encouraged the development of agriculture since the products and inputs can be transported easily.

5. **Advanced technology** used in agriculture has been another factor. The farming system especially in the estates in mechanized leading to high production.

6. **The government support** has been another factor. The government has been supporting the farmers in terms of financial support and advice.

7. **Labor availability** in the country due to high population. Some of the people are from the other neighboring Africa countries. These offer labor in the estates.

8. **Market availability** due to the development of other sectors like mining, industry and tourism. These press demand for food and hence encourage the development of agriculture.

9. **Water availability** from precipitation and rivers especially the Orange River has encouraged irrigation.

THE PROBLEMS FACING THE FARMING SECTOR IN SOUTH AFRICA

1. **Water shortage**: This is due to the fact that most of South Africa receives little rainfall. The large part especially in the West in semi arid and the rivers do not contain enough water and the dams experience the problem of silting. The water available is not enough and is under high competition posed by other sectors like mining manufacturing industry and tourism.

2. **Labor shortage**: This is due to fact that there is competition from other sectors, which are more lucrative than agriculture. People run away from agriculture and go to the

mining sectors, manufacturing industries and tourism leading to the problem of labor supply in the farms.

3. **The shortage of labor** is also caused by political and social unrest that has been prevailing from long time ago during the Apartheid system. In fact, the problems of apartheid system have not been totally eradicated; there still exists some relics, (vestiges) of apartheid in South Africa.

4. **Severe erosion** since the soil in South Africa is unstable and has been exposed to erosion as a result of overgrazing. Overgrazing has been caused by overstocking.

5. **Land shortage** since most of the land is under mining, towns and manufacturing industries. The land in the western part of the country is dry hence unfit for the rain – fed agriculture except under irrigation.

6. **Unreliable rainfall availability** is another problem. Sometimes the rainfall is not available leading to the occurrence of drought.

7.**There is low capital availability** among the Africans leading to poor investment in agriculture.

What are the problems facing cash crop production in east Africa?

1.Diseases and pests that attack the crops both in the farms and in the storage facilities. Diseases also attach the farmers such that they cannot concentrate on the agricultural activities.

2. Price fluctuation in the world market which tends to discourage farmers.

3. Poor transport and communication systems.

4.Poor climatic conditions like unreliable rainfall which sometimes can be too much or sometimes very little. Long droughts and frequent floods are a big problem.

5. Decline of soil fertility due to over cultivation of the farms and leaching (Refers to the loss of nutrients from the top soil layer as a result of being washed down in solution.)

6. Frequently fires that end up devastating (destroying) the crops in the farm.

7. Conflicts between the cultivators and the pastoralists like in Kilosa (Morogoro in 2000) and among the farmers themselves like in Mara in 2001.

8. Low level of technology associated with the use of simple tools.

9. Rapid population growth, which has forced people to concentrate on food crop production rather than on cash crop production.

What are the causes of land conflicts in Africa?

1. Population pressure that has led to the shortage of land in some areas. This has been due to the rapid population growth.

2. Poor agricultural policy which does not state property on how to undertake agricultural activities.

3. Lack of land tenure such that farmers are not given special land to own.

4. Poverty that makes people keeps on depending on the land rather than investing in other sectors of the economy.

5. Customers and traditions by which the farmers keep on claiming the ownership of land left by the forefathers who were the clan members.

6. Some tribes like portraying their superiority over other tribes.

7. Environmental problems like soil degradation and lack of pasture have made farmers clash when migration to the new areas in search of better land for cultivation of pasture.

8. Colonial legacy in which the foreigners were favored more than the indigenous in the country. For example in Zimbabwe there occurred conflicts between the whites and the natives in 2000.

9. Historical factors.

What should be done to address conflict in Africa?

1. Other activities than agriculture should be created so as to reduce pressure for the land.

2. The farmers should be encouraged to control population.

3. The governments should formulate good policies that can govern agricultural activities. The policies should involve land tenure so that the farmers can have their own pieces of land that are well demarcated.

4. The farmers should be given capital so that they can be able to invest in better agricultural methods in order that they can be able to get high production using a small area or small number of animals.

5. The farmers should encourage settling in one place so that they cannot keep on moving from place to place and cause clashes.

COMMERCIAL MIXED FARMING

It is an intensive farming system in which animals and crops are raised on the same farm. It is one of the most important agricultural forms found in the highly developed parts of the world like North Western Europe, East North America, Parts of Russia and the temperature latitudes of parts of the southern continents. The system was introduced in Africa by European farmers (Settlers). It is evident in most parts of Kenya highlands, specifically central Rift Valley provinces, South Africa, some highlands of Tanzania and Zimbabwe.

Farmers with advanced technology grow crops, which have been carefully selected and keep animals for milk or beef. The farms are cultivated under mechanization and are concentrated along the transportation lines or near large towns and cities where there is market. The crops, which can be grown, include maize, tobacco, wheat, cotton, etc. The proportion of animals in the farm will depend on many interrelated factors like locality of the far, soil fertility, the animal carrying capacity of the land, the market demand prevailing price of crops and animals and the government policies. Commercial mixed farming is capital intensive.

Advantages of mixed farming:-

1. Crops and animals are integrated. Crops are grown for fodder and manure from animals used for encouraging plant growth (Promoting fertility). Hence, less money is needed to buy artificial fertilizers.

2. A farmer diversifies the source of income rather than risking on one type of income source. The income comes either from animals or from crops.

3. A farmer is assured of getting good and balanced diet. This is because of getting both crop and animal products.

4. The use of scientific methods leads to good quality of products.

5. Animals can be used for providing labor in the farm for cultivation and for transportation.

6. A farmer is settled on one place and does not waste time mobbing from place to place.

7. Crop rotation practiced in this system maintains soil fertility.

8. It can take place where there is high population.

Disadvantages

1. A farmer is likely to concentrate on one item only especially animals and forget drops.

2. Close attention is needed for both crops and animals, and especially animals.

3.The system needs high capital to establish but many farmers in the third world do not have enough capital for running mixed farming at a commercial level.

REVISION QUESTIONS

1. State the difference between substance small – scale agriculture and commercial large – scale agriculture.

2. Outline the factors hindering the development of large – scale agriculture in Tanzania.

3. What are the problems caused by large scale farming in any country?

4. What are advantages of plantation agriculture in Tanzania?

5. Show the disadvantages of plantation agriculture.

6. What are the major requirements for the development of plantations, in any country?

7. Show six main characteristics of plantation agriculture.

CASE STUDIES

AGRICULTURE IN CHINA

Historical Background

Agriculture in China can be categorized into two periods that is the period before revolution (1949) and the period after revolution.

Before 1949

The period before 1949 was characterized by unplanned agriculture. It was impossible or difficult to cultivate without modifying the land in one way or another because:-

1. It was either a desert or mountainous or swampy.

2. Population was very high such that three people could share one acre. The farmland was only 11% and thus people had to apply intensive subsistence farming.

3. Farms were extremely small and fragmented.

However, the peasants were able to carry out agriculture though not in an advanced way because of the following natural advantages:

1. Soil fertility that could support plant growth.

2. Climatic variation that allowed a variety of crops to be grown from the north to the south of the country.

3. The growing season was long for crops to thrive into maturity especially in the Tsinling Shan.

4. Cultivation was manual or using oxen due to low technology. Out per worker was very low.

After 1949

Planned agriculture started revolution. During this period there were substantial advancements in agriculture.

Organization of Agriculture

Agriculture was organized in communes, which were established after the overthrow of the feudal government by the communities. Land was then owned communally and the government

encouraged cooperative production. The commune covered the range of economics, social and administrative activities.

The communes were divided into five brigades in whom there were brigade committees that made decisions on their own. Brigades were responsible to the government in the communes. They were responsible for all planning, but left the farming details to the production terms. A Brigade could consist of 3000 people and covered about 200ha. Brigades recorded each member's contribution in the production process.

Brigades were then divided into terms ranging from 10 production terms and above. Production terms were at foot of the hierarchy consisting of 50 families (300 people) responsible for, on average, 20ha. Each production team was responsible for its finances, planting weeding manufacturing and harvesting.

How the Communes Worked

1. Mobilizing manpower for public activities like building of dams dykes, roads, and cultivating the existing land intensively.

2. Diversifying the rural economic activities from agriculture to forestry, fishers, and small industries.

3. It generated revenue, which was later used as capital for further investment in the commune industries.

4. The commune was also responsible for the provision of social services to all rural people especially education, health centers and recreational grounds from commune's own savings.

5. Decentralized rural planning so as to allow mass participation in the planning system for effective production process.

Achievement of the Commune System

1. It has led to the diversification of the China's economy and hence the future is bright.

2. The communes have inculcated the sense of cooperation among the people through the establishment of cooperative projects.

3. It led to the improvement of social services like education, health, electricity, water supply etc.

4. It has facilitated the advancement of technology because of involving the local people. The local people's ingenuity was encouraged in improving tools etc. This stimulated industrial development.

5. China began producing highly leading to food sufficiency despite high population.

6. It has stimulated the development of transport and communication because people cooperate in the construction of roads, bridges etc.

7. Cooperation promotes the sense of equality and social justice among the people.

Launching of Comprehensive National Schemes for River Control

The government took part in the planning and launching of the comprehensive National Schemes for the control of great rivers like Hwang Ho, Sin kiang and Yang tse kiang. River control was aimed at achieving the following goals. Flood control by building dams and dykes, conserving water for irrigation, establishment of hydroelectric power centers, land reclamation and creation of navigable waterways. The schemes were aimed at setting examples for the communes to imitate and develop similar projects.

To further facilitate river control the government the government incorporated these aspects in the First, Second and Twelve year plans. The Twelve Year Plan was launched in 1996 and was aimed at formulating techniques and methods of increasing agricultural output per hectare.

This plan zoned the country into three main belts and set a target of average increase in production per hectare for each belt. To Guide farmers, the Twelve Year plan of development has eight slogans including, Fertilization, Deep laughing, Seed improvement, Close planting, plant protection, soil improvement, tool production and irrigation. This was the adoption of the Green Revolution.

Soil Improvement

New and efficient ways of fertilizing or manuring were devised. Much emphasis was put on the use of compost manure making use of seaweeds and mud from ponds.

Plant Protection

Emphasis was put on the use of pesticides and other chemical for controlling diseases both fungal and bacterial diseases. To achieve this goal large scale chemical factories were established some of them were located at Kirin, Canton, Nanking, and Dairen.

Close Planting

This was encouraged so as to use the land maximally and produce more yields per hectare.

Seed Improvement

Agricultural colleges and research centers were established and were responsible for developing quick-maturing and high-yielding seeds (Green Revolution).

Tool Production and Improvement

Small machines were invented. These were designed and manufactured locally but not so much of tractors and large – scale mechanization. Old simple ones were improved. Local groups of farmers, cooperative and production teams were encouraged to bring their ingenuity (skills) to bear on improving old tools. Hoes and ploughs were improved, simple drills and water wheels were invented.

Irrigation and Water Conservation

These were undertaken mainly by the government through river control schemes and much work of expanding irrigation was done by cooperatives and communes. Expansion was done in two stages:

1. Expansion done simply by extending the existing irrigation area by storage ponds at the head of villages.

2. Building of large earth dams and long aqueducts and large network of channels. This was done by mobilizing much more labor after the formation of cooperatives, production terms and brigades.

The role of river control in the agricultural development can and is summarized as follows:-

1. Floods were controlled to a large extent and agricultural losses were largely reduced in the communes.

2. Water conservation led to the development of irrigation schemes especially in the northern parts of China where rainfall is little.

3. Control schemes about five times the natural farmland was brought under agriculture.

4. It stimulated the development of hydroelectric power centers and creation of navigable waterways. This in turn enhanced the development of industries.

5. It helped in the production of more food leading to self-sufficiency despite high population.

Introduction of Family Responsibility System during the Reformation Period:-

Family responsibility system was introduced in 1979 as a more flexible approach, which encouraged farming families to become more responsible. In this system the land was given to individual farmers in their villages or districts. The farmers then, had to take contracts with the government, which fixed the amount to produce. The farmers were given tools and seeds. After fulfilling their quotas, the profit could be used by the farmers.

The family farm size of the arable land per family is less than a hectare and the cultivation of food grains dominates the agricultural sector.

The family responsibility system encouraged farmers to work hectare and the cultivation of food grains dominates the agricultural sector.

The family responsibility system encouraged farmers to work harder and the immediate effect was an increase in yield. The rural markets thrived and some becomes wealthy. The living standard of most the farmers improved especially those were near the market areas and cities.

Agricultural Regions in China

About three quarters of China's population is engaged in agriculture. The arable land is largely concentrated on the plains and river valleys of humid China. The agricultural regions are as follows.

From the Southern Part to the Yang tse Basin

Rice is a dominant crop and it takes up to 99% of the cultivated land. In the very extreme South of this region where the rain is plenty (2000mm) there are three rice cropping periods and the middle part of this region there are three rice cropping periods and the middle part of this region (with rainfall ranging from 1000mm to 2000mm) is dominated by double cropping where even sugar cane and tea in the hills are grown and the rest especially in the Yangtze valley there is one rice crop in summer and one especially in the Yang tse valley there is one rice crop in summer and one winter crop of wheat or vegetables. This region has

irrigated areas with double cropping of maize, sweet potatoes, tea, sugarcane, cotton, jute, barley, and citrus fruits.

To the North of the Yangtze Basin

Summer and spring wheat dominates up to Manchuria. There is no rice since the area experiences little rainfall ranging from 1000mm to 500mm. Millet and sorghum are also grown in summer in the region. In the wheat zone cotton, maize, potatoes, sugar beet, soya beans, peanuts, flax and tobacco are also grown. Nonetheless, Garden vegetables are grown all over the country.

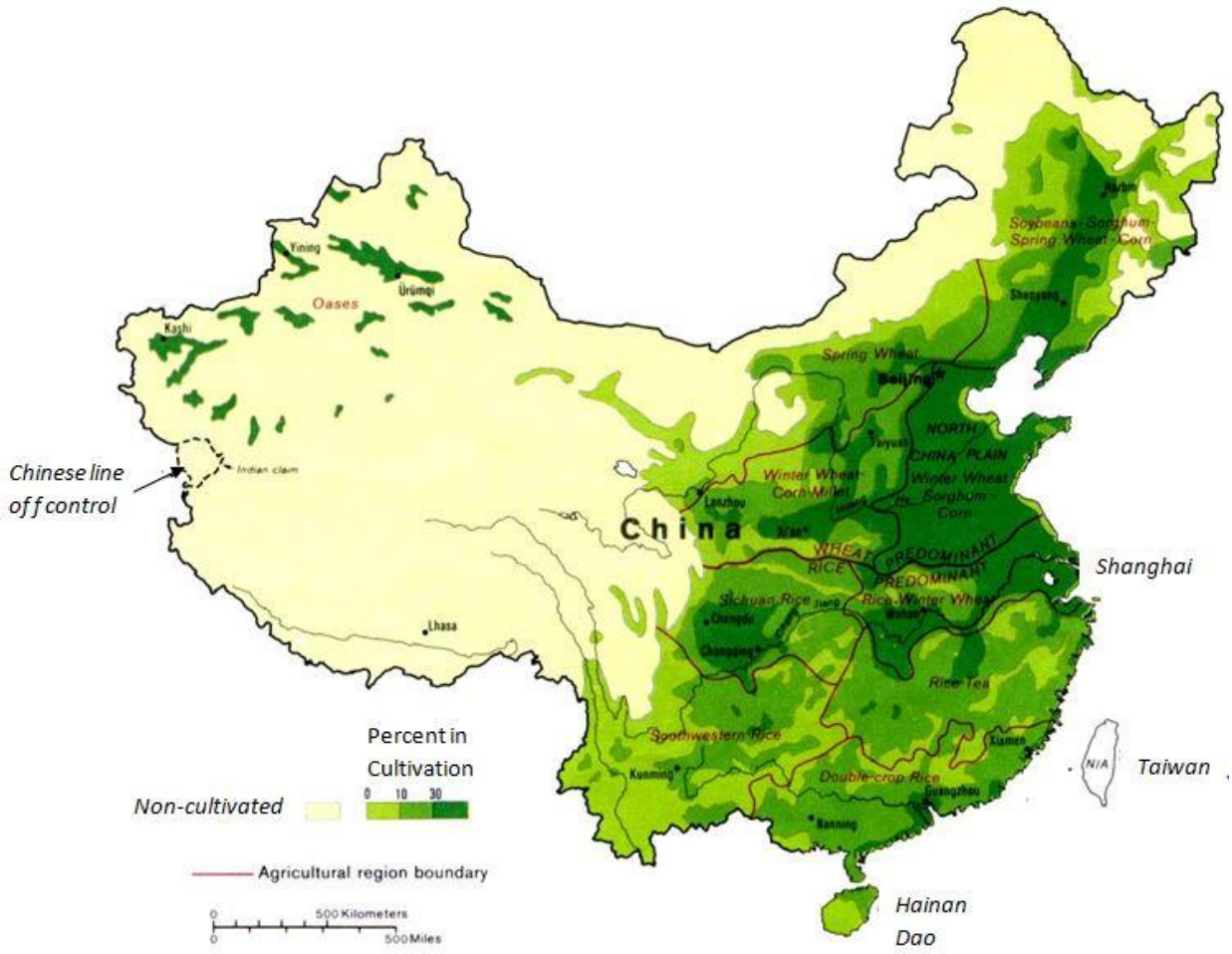
In the North and Northwest Grasslands

Pastoral farming is dominant. Sheep, goats, cattle, horses, and camels are reared. This area is too dry for arable farming since the amount of reared. This area is too dry for arable farming since the amount of rainfall is usually below 500mm. In most parts of humid China, pigs and poultry are principal animals raised.

The Western Part

Is also too dry but there is farming around the oases (Oases farming).

Map Diagram:



In general, agricultural success in China has been attributed to the following factors:-

1. **The adoption of Green Revolution** that involve the use of fertilizers, quick maturing and high yielding seeds, and advanced technology in the production process. Improved tools were use and irrigation systems were established.

2. **The role played by researches,** which were being conducted for the sake of improving seeds and promoting agricultural methods in general.

3. **Control of diseases and pests** that were attacking crops. This reduced losses that could be caused after the death of plants.

4. **High involvement of the government in the agriculture activities** was a great dynamo towards agricultural development in China.

The government contributed in organizing agricultural activities in communes, Formulating agricultural policies governing production and launching exemplary agricultural schemes like irrigation schemes as well as river control schemes.

5. **The available land was naturally fertile** hence it was easy to harness.

6. **Water availability** from the great river of Sin kiang, Yang tse kiang and Hwang Ho. This was supported by water conservation systems, which were established by the government.

7. **Conducive climate**, which allowed the growth of a variety of crops, like rice, wheat, oasis, barley, millet, vegetables, sugar cane, tea and cotton. The climate varies as one move from the north southwards. In the north there is little rainfall such that irrigation takes place. In this region rice is not grown. In the Middle Eastern part the rainfall ranges from 100mm to 2ooomm and double cropping dominates. In the south and the extreme southern part of the country the rainfall is over 2000mm and hence rice cultivation takes place three times a year. Hence with this climatic blessing China has been able to produce highly to feed the highest population in the world.

8. **Sense of cooperation and hardworking attitude** among the farmers in the communes helped much in promoting agricultural development in China.

9. **High population** that provided both labour and market stimulated agricultural development.

10. **Improvement in transport and communication** especially after the control of the great rivers was another propelling factor.

11. Another factor that stimulated agricultural development was **involvement of minimal capital in the development schemes**. The capital was low contributed much in providing labour and their ingenuity.

12. **Availability of social services** like medical treatment, educating etc had positive influence in the agricultural development in China.

13. **Environmental conservation** measures adopted by the government and communes facilitated substantial agricultural development. For example the government launched comprehensive schemes of river control, which were geared towards solving the problems of floods, among other aims. The control of floods stimulated agricultural production by reducing losses.

Limitations of Agriculture in China

1. **Floods** are still a problem especially in the Hwang Ho river valley which is called 'the Great Sorrow of China'.

2. The communes **did not allow people to own the land** hence it later led to inefficiency.

3. There is a problem of **soil erosion due to population pressure**, which led to deforestation. In solving this problem Mao encouraged the launching a forestation and re-afforestation programmes turn the Country Green' in 1956. The twelve year plan also encouraged giving education peasants on the importance of forests and woodland in preventing erosion and controlling floods.

4. **Limited arable land**, which is concentrated in the eastern side of the country in along the valets of river like Hwang Ho, Sin kiang and Yang tse Kiang.

5. **Explosive population growth,** which makes the country, keep on feeding the excessive number of people rather than investing in other economic sectors.

6. Some farmers in the **rural areas are still using poor or low technology**, which lead to poor yield.

7 .**Poor farmers face the problem of low capital** such that they fail to invest in more advanced agricultural activities.

8. **Unreliable rains** especially in neither the north nor no rains at all. In winter the area receives little snow with frequent frost and storms (blizzards).

What was the rationale behind the introduction of commune and family responsibility systems in China?

Rationale for introducing communes in 1958:

1. The communist government found that just after confiscating the land from the feudal lords or emperors the plots given to the peasants were too small to support individual farmers. Hence, after several interim experiments the government created the 'people' communes so as to form collective farms. Putting the land under the communal ownership people could use it more effectively and more productively since there could be higher control of production than the way it was before the introduction of communes.

2. To encourage cooperation among the people in mutual aid terms.

3. To make administration become easy through decentralizing the planning process and give room for great people's participation for the sake of achieving fast development.

4. To make agricultural activities in run a more organized way and more efficiently by involving the local people in their own areas so as to facilitate rural development.

5. Involving the communes could reduce the cost of production in the agricultural activities since the local people could provide labour. It was easy to mobilize labour when people were together in communes and hence assisting them was very easy.

6. The use of communes could facilitate the advancement of technology by encouraging the local people to bring in their ingenuity in order to improve some farm implements and invent new ones.

7. Communes were also geared towards promoting equality and social justice.

Family responsibility system introduced in 1979 was intended to encourage people to become more responsible by giving then (i.e individual farmers) their own land in their districts and villages.

This was to make farmers work harder than before leading to high production. As result the formed worked harder and there was an increase yield and some farmers become wealthier. Through increased production the living standards improve among the farmers. High yield also created more profit that could be used to buy better seeds and machinery to creative village industry.

What lessons has Tanzania learnt from China?

Tanzania has learnt the following from China's agricultural development.

1. **The importance of great government involvement** in the agricultural activities. The government can help in the planning, formulating policies, establishing pilot schemes and financing people's efforts.

2. **Involvement of the local people is very important** for smooth agriculture development. When the local people are involved they feel part of the development schemes and hence they work very hard. In China the government decentralized agricultural activities and established communes. The same applied in Tanzania were Ujamaa villages were established to fully involve the local people in the production process.

3. Tanzania has learnt that it is important **to develop technology through stages starting from low-level local technology to advanced technology**. This can make the local people to adopt easily the new skills and engage themselves into agricultural activities without many problems. In doing so Tanzania is trying to adopt appropriate technology, which makes use of the local skills and resources.

4. Tanzania has **learnt how man can transform inhospitable physical environment into the useful state**. In China the major problem was frequent and severe floods. But through the river control the river valleys are used for production and the supporting the largest population in the world. Irrigation schemes in the dry areas in the north have been established. The same can be done in Tanzania especially the central parts of Tanzania.

5. Tanzania has also learnt the **importance of cooperating in agricultural activities and at one time, in the villages, there established cooperative farms.**

6. **The family responsibility system**, which gave land ownership to the farmers, encouraged the production process since people began working harder. The same has to apply in Tanzania. Farmers should be given land to own so that they can feel responsible for taking care of the land and produce harder and harder.

7. Tanzania has also has leant **the necessity of controlling population** in order to avoid the problem of population pressure and get surplus production for sale instead of utilizing the whole of the production lot for feeding people. China produces highly but production loses significance because of very high population.

AGRICULTURE IN NORTH AMERICA

North America is dominated by the United States and Canada. Agriculture is one of important economic sectors in North America and is well diversified. Agriculture is highly advanced due to the use of advanced technology associated with mechanization. Factors which have led to the agricultural development in North America include availability of rich agricultural land, conducive climate whose variation has contributed to the diversification of agricultural activities, relief which has allowed good drainage and mechanization due to being either flat or undulating, the use of advanced technology which has facilitated the use of mechanized methods in the production process, market availability, power supply as well as enough capital which could easily be invested in the agricultural development.

Agricultural Regions in North America include:

In Canada the prairies and the Great Lakes – St. Laurence Lowlands that produce 90% of the Canada's agricultural output. Prairies which include Manitoba Saskatchewan and Alberta are the most important agricultural region in Canada famous for producing 95% of Canada's wheat. Other regions include Maritime Provinces (New Brunswick, Novascoti, and Prince Edward Islands), Lakes peninsula where farms are highly mechanized and electrified, Few parts of the British Columbia. The Canadian Shield area is generally unsuitable for agriculture because of its cold climate, poor soils, underdeveloped transport and communication network, and insignificant markets. Only two areas in this region have been successfully farmed namely the Cochrane Clay Belt and the Clay Belt of the Saguenay Basin where oats, barley, potatoes, vegetables, and hay are gown and dairy farming is practiced.

The average farm can be 200 hectares or ranches can be over 4,000 hectares. Most farms are on individual's basis.

In the USA there are so many agricultural regions and the average forms are about 160 hectares and most of them are highly mechanized and electrified. Fertilizers are used but very intensive farming is practiced in only a few areas, such as the North East, The pacific Lowlands and Western plateau where irrigation is carried out. As in Canada, most farms in the USA are run on individual basis.

States like Florida, California, Oklahoma, North and South Carolina etc are important agricultural areas. California is the most prosperous agricultural state where agriculture is very intensive and highly capitalized. It produces more barley, lettuce, peaches and other fruits than any other state. It's cotton yield per hectare if three times are national average. All United States lemons, figs, and most of its sugar beet are grown here.

Agricultural success in California has been due to;

1. Good and variable climate. If has a Mediterranean climate but is also attitudinally diverse allowing for the cultivation of both temperature and tropical crops.

2. Good soils, which encourage the growth of crops.

3. The state has a large supply of labour.

4. There is efficient effective and extensive transport and communication network.

5. There is ready market and a tradition of cooperative marketing, which ensures efficiency and reduces costs.

Importance of Agriculture in North America

1. It has lead to the supply of food in the country to feed the country's population.

2. It has contributed to the generation of foreign exchange as a result of exporting some crop and animal products. For example, three quarters of wheat produced in Canada is exported.

3. It has promoted the standard of living among the people in North America.

4. Agriculture has stimulated the development of industries and tourism. There are textile industries, which have developed as a result of cotton production especially in the Cotton Belt.

5. Towns have developed because of agricultural development for example Chicago and St. Louis city.

6. It has stimulated the development of transport and communication systems like railways, road and waterways.

7. North American agricultural development has become a good example to be imitated by other countries especially in the developing world like Tanzania and Kenya. This involves the necessary of using high technology in the agricultural process.

8. Agricultural development has also created employment opportunities in the country.

Limitations (setbacks or bottlenecks) of agricultural development in North America include the following:

1. Adverse climatic variations, which involve severe winter blizzards, heavy snow, droughts, hail storms, torrential rains, short growing season in some areas and tornadoes especially in the Western plains. There affect animal and crop production.

2. Pests and diseases that attack crop cause great losses. For example the attack of cotton in the old Cotton Belt by boll weevils caused a lot of damage to the plants. These led to the shifting of the cotton Belt westwards into the new Cotton Belt.

3. Severe soil erosion is another major problem especially in many parts of North America particularly in High plains where fertile topsoil has been blown away as a result of attempts to grow wheat in an area with insufficient rainfall. Another area where erosion has been extremely eroded is the 'Old South', the former center of the Cotton

Belt. Erosion in this area has resulted from mono-cultural system in which cotton has been grown continuously, without taking soil conservation measures.

In these and other areas soil conservation measures are being undertaken in the attempt to reclaim some of the lost arable land. Some of these measures include crop rotation, planting trees, construction dams, use of fertilizers and natural manure, dry farming, irrigation, terracing, contour plaguing, etc.

1. Competition from other countries like China that are also using advanced technology in agriculture.

2. Limited farms land in some places like the Canadian, Shield, which is unsuitable for agricultural activities because of poor soils. The places also experiences very cold climate, has undeveloped transport and communication system and insignificant markets.

3. Rising costs of operation like in the old cotton belt pose adverse effects on the production process.

THE COTTON BELT

Cotton is the most important cash crop grown in the Southern United States. It is largely grown in the Cotton Belt which formerly included the state of Mississippi, Alabama, North and South Carolina, Georgia, Tennessee, Arkansas and Oklahoma. The New Cotton Belt is concentrated in Texas, Oklahoma, New Mexico, Arizona and California. Cotton requires at least 200 days free from frost. It also needs a minimum of 500mm of rainfall per year. Heavy rain and swampy lands grows best on heavy soil with a high proportion of clay lime. It uses up many nutrients from the soil therefore the use of fertilizers is important.

Florida and Tennessee have large reserve of phosphates which California supplies potash.

Cotton

Fiber is used for manufacturing clothes in the textile industries. Seeds are crushed for their oil, which is used for making margarine, soap, candles, and lubricating oil.

Hulls or seed coverings are used for making animal feed, and in making paper in the paper industry. Short fibers or linters, which are attached to the seed after pinning, are used in making celluloid, photographic film and other products. Stalk can be caused for animal feed, manufacture of paper or fertilized while roots are said have medicinal value.

Ranges in the Old Cotton Belt:

There has been westward shift in cotton growing.

Instead of monoculture mixed farming and afforestation have been introduced.

More efficient methods of cotton growing have been introduced in the old cotton belt to ensure high yield.

For shifting of the cotton belt

Sons for shifting of the cotton belt are divided into problems in the cotton belt within the Eastern side and the advantages of the new belt in the Western side. These have been explained in details as lows.

Problems in the Old Cotton Belt

- Soils were severely eroded due to monoculture leading to the reduction of arable land and decline in fertility.
- The climate in the eastern part is wetter hence not suitable for cotton production.
- Pests in the eastern part like boll weevil led to mass destruction of cotton.
- The eastern part was highly populated leading to population pressure and hence land degradation.
- High costs of production in the east due to poor mechanization.

Advantages in the New Cotton Belt

1. The soils are fertile and drier than in the old belt. Cotton does not need swampy areas.
2. Flat land surface has allowed for mechanization to take place easily.
3. Absence of boll weevils due to drier conditions. Boll weevils thrive in the swampy areas.

4. Low costs of production due to the use of mechanized methods and natural fertility, which does not create the necessity for using artificial fertilizers.

5. Low population allowed for large-scale cotton cultivation to take place with mechanized methods.

Importance of Cotton to the Country

1. It has contributed to the employment creation in the country.

2. It has stimulated industrial development especially textile industries in the southern states where there is over 95% of the American textile industry located today.

3. Cotton production has stimulated the development of transport and communication systems.

4. It has earned North American an international repute.

5. There has been development of towns like Texas, Arizona and New Mexico. The living standard in these towns has been raised due to, among other things, cotton production.

6. Social services have improved such as medical services, education, etc.

7. Land is utilized effectively for the development of the country at large.

Limitations of Cotton Production in U.S.A

1. More and more farmers are concentrating on intensive farming rather than extensive farming and hence farming and hence they are producing other crops. Diversification of agriculture has been put in place so as to avoid plunging into losses, which can be caused by too much reliance on one crop, which is full of uncertainties. Most farmers believe that relying on the type of crop is tantamount to putting all eggs in one basket, which is very risky, such that once the basket drops all eggs can break.

2. There has been emergence of other of other occupations like fishing, industries etc.

3. Decline of soil fertility because of leaching and soil erosion. Cotton also uses up some nutrients in great quantities. Erosion has been a consequence of mono-cultural practice in the Cotton Belt.

4. The problem of diseases and pests like boll weevils has led to poor production.

5. Competition from synthetic fibers, which are more demanded than cotton.

6. Price fluctuation has been another limiting factor, which has discouraged the farmers.

7. There has nee strong competition from other sources of raw cotton.

8. Swampy conditions are other limiting factors especially in the eastern part of North America (in the Old Cotton Belt).

THE MAIZE BELT (THE CORN BELT)

The Corn Belt covers the states of Lowe, Illinois, Indiana, and Ohio where maize is dominant, but mixed farming is practiced in this belt. It is used for fattening beef cattle, which have been raised in the western drier parts of USA. Other adjacent states, which produce maize, are South Dakota, Minnesota and Missouri.

The limits of the maize belt are set by the climatic needs of the crop and by the extent of competition from other types of land use which may be more profitable.

In the north the summer isotherm 21^0C sets the rough boundary. In the south, the maize belt gives way to a general farming region because of unsuitable topsoil of the Ozarks and competition from tobacco and winter wheat.

Why Success in Maize Production in the Maize Belt?

1. Good climatic condition conducive for maize production. That is, temperatures are between 19^0C and 21^0C, rainfall is adequate to above 500mm and adequate growing season of 150 days free from frost.

2. Good soils rich in nutrients, moist, well drained and deep.

3. The use of advanced technology involving mechanization.

4. Proper farming methods like crop rotation, deep ploughing, and use of hybrid varieties since 1930s.

5. High disease control by the use of chemicals.

FARM ORGANIZATION

Most farms are worked on individual's basis and new employ hired labour farm size averages range from 140 hectares and above. Farming is highly mechanized and advanced methods of cultivation are used. Crop rotation is used and manure as well as artificial fertilizer is used. Crop rotation involves wheat or barley, oats, or other fodder crops like Alfa and clover. Planting is done at the end of April or early in May. By the middle of August some maize is out as fodder or it is chopped up stored as solage. The rest of the crop is harvested by autumn (September – October). Most of the farms in the Corn Belt are mixed that is they involve both crop production and rearing (husbanding) of animals. The animals kept include beef cattle, and pigs. The Corn Belt leads in keeping livestock in the USA.

Uses of Maize

Maize is used for making fodder or silage for animal food and this take about 70% of the total production of maize from the maize belt. More than 15% is used for human food or converted into alcohol, starch glucose and cooking fat. The stalks are used for papermaking etc. Less than 1% of maize from the Corn Belt is exported.

Limitations of Maize Production in the Corn Belt

1. Leaching process has led to the decline in fertility causing the loss in fertility.

2. Competition from other countries in Europe, Asian countries and Africa.

3. Diseases and pests, which attack crops.

4. Winter frost especially in the southern part where winter wheat is produced.

Importance of Maize Production

1. It has stimulated the development of industries for utilizing the maize produce and animal products. For example as a result of maize production promoting beef farming, there are meat packing centers in Chicago, Kansas city, and St. Louis.

2. Livestock farming has been promoted both beef farming and dairy farming. The maize belt is used for fattening the beef cattle raised in the western parts of the country.

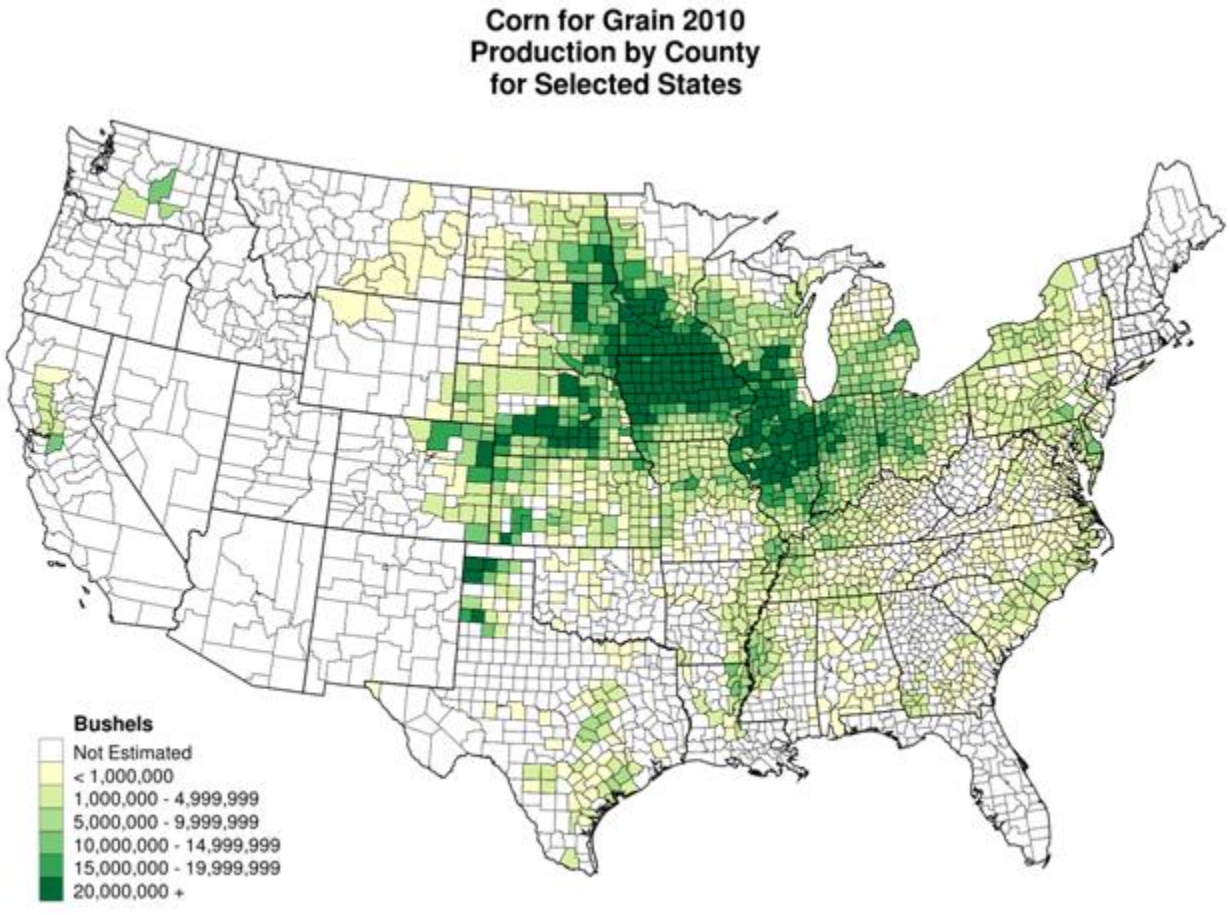
3. It has contributed to the generation of government revenue and individual income.

4. Maize has created employment opportunities since some farmers use hired labour.

5. It has stimulated the development of towns like Illinois, Chicago, St. Louis and Kansas City. There have growth fast because of the contribution made by the maize belt.

6. Maize from the maize belt has created a strong foundation of the nation's food supply and of its exported food materials.

Map Diagram



WHEAT PRODUCTION IN NORTH AMERICA

Wheat is cultivated on a large scale or extensively. Winter wheat is grown – in the south where winters are mild e.g. Texas. It is planted in autumn and ripens in summer. Winter wheat has higher yield per hectare than spring wheat. Spring wheat is the one, which is grown within 90 days. It is produced in the north such as the prairies provinces of Canada.

Varieties of Wheat Include Soft and Hard Varieties

Soft varieties are grown in the wetter areas and are used for making biscuits while hard varieties grown in the drier parts in the west with chernozem soils and are used for making bread.

Wheat Production in the Canadian Prairies

Canada is one of the leading wheat exporters and the current production is about 20million tones produced from about 10 million hectares (25 million acres) of land. Canadian prairies are the major areas in Canada where wheat is grown on a large scale. 95% of the wheat comes from the Prairie Provinces of Saskatchewan, Alberta and Manitoba.

Saskatchewan alone accounts for as much as two – thirds (2/3) of the production. High wheat production has made the Canadian Prairies to be referred to as one of the Granaries of the world.

The following factors have contributed to the rise of the Canadian prairie as one of the wheat granaries (leading wheat producers) of the world.

1. **Extensive tracts of land**. Canada has a total land area of 9,221,000 sq. km supporting estimated population of 26,104,000 people. Out of these 76% live in urban areas and less than enabled large – scale mechanized wheat cultivation to take place.

2. **Elaborate transport network**. Canada has an elaborate railway network that criss crosses the prairies. This has enhanced the region's ability to offer mass transport services of wheat to market and coastal ports for export as well as movement of labour to the production centers. Also the Great Lakes and St. Lawrence sea route offer a chief export route for Canadian wheat.

3. **Fertile soils** which are full of humus due to the fact that the carpet of prairies grass has not been disturbed for centuries due to sparse population in that area. These soils are rich in nutrients like phosphorus and potassium.

4. **The topography of the area** is characterized by flat or undulating surface. This has offered advantages like soil drainage suitable for wheat cultivation and ideal

condition for mechanization; using tractors for ploughing and sowing and the combine harvesters for harvesting the wheat crop.

5. **The climate of the Canadian wheat belt is conducive**. It lies is the temperature belt with summer temperatures of 15^0C and mean annual precipitation of about 450mm. Light rains are experienced during germination. These are ideal conditions for wheat cultivation. The Chinook wind melts the snow in spring and helps to extend the growing season.

6. **Reliable market** offered by large urban population in the country as well as external market in China, Japan, Western Europe and less developed countries.

7. **The government support** by creating agricultural policies that encourage individual farmers to undertake large – scale agriculture using mechanized methods.

Factors Limiting Wheat Production in the Canadian Prairies:-

1. **Price fluctuation** in the world market poses a great challenge to the wheat production in the praises of Canada.

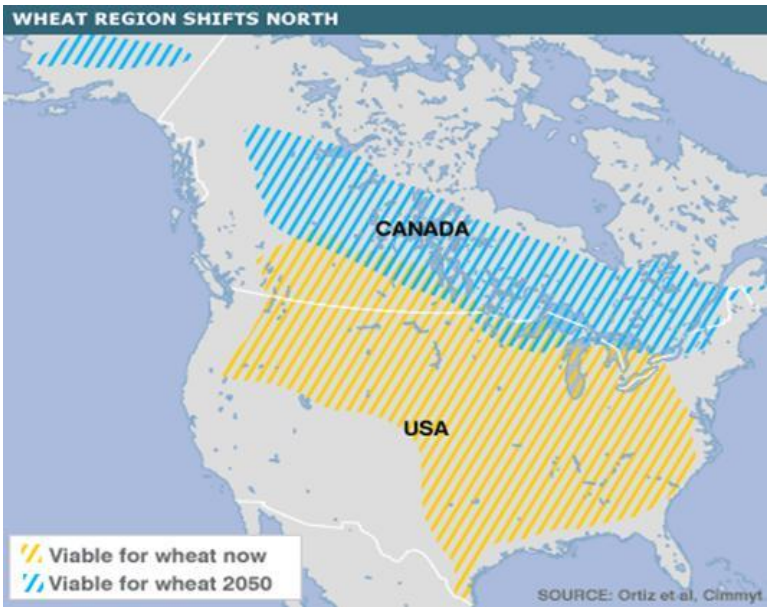
2. **Bitterly cold winters** are other limiting factors, which hinder smooth wheat production. These make the production process to be very seasonal and little work is done during the period of severe winters. During winter frosts and blizzards affect crops leading to great losses. There is a danger of hail and droughts ruining the crops. Also, tornadoes in summer cause damage to the crops.

3. **There is also a problem of soil erosion** that takes place after removal of the grass. Erosion is caused by wind and convectional rainstorms.

4. When **soil is wet** it it's very difficult for large machines to work on it. Hence, ploughing is done when the land is dry enough in April and May.

The growing season is short and hence the work of ploughing and sowing should be completed as soon as possible.

Map diagram:



MAIN TREE CROPS IN AFRICA AND OTHER COUNTRIES

Examples of main tree crops in Africa and other countries include tea in Kenya, Malawi and India; Oil palm in Nigeria; Cocoa in Ghana; Rubber in Liberia and Malaysia as well as coconuts in Tanzania.

TEA IN KENYA

Kenya is recently the largest producer of tea in Africa. Its tea ranks among the best in the world market. It is among the top six large world producers. Tea production in Kenya may overtake coffee production in the future with the expansion of tea acreage done by the government through establishing Nyayo Tea Zones.

Production areas of tea can be divided into highlands on the east and west of the rift valley.

The Western high lands include Kericho which leads in having large tea estates (plantations), Nandi, Kakamega, and Cherangani hills.

The Eastern highlands include Nyambene Hills in Nyambene, Nyeri, Muranga , and Kiambu districts.

Organization

Tea is grown on plantations but smallholder production is rapidly gaining momentum with the backing of the Government. There was developed the Kenya Tea Development Authority (KTDA) which become so instrumental in the promotion of tea among small scale farmers.

Why Success in Tea Production in Kenya?

The success in tea production in Kenya has been attributed to the following aspects.

1. Favorable geographical conditions like climate, which are warm, with high rainfall, hilly relief and good soils.

2. Labour availability from the country's high population.

3. The government support by establishing KTDA, formulating good policy agricultural development and providing financial assistance to the farmers.

4. Good marketing system organized by KTDA. Through this farmer got a good bargaining base for their crops.

5. Quality products, which attracted market both within the country and externally.

6. Capital availability, which was later, invested in the production of tea.

Contribution of tea to the development of the country:-

1. It has stimulated the development of industries especially those related to the processing of tea. The manufacturing industries are spread out in the tea growing districts of Kisi, Nandi, Kericho, Kirinyanga, Nyeri, Embu and Meru.

2. It has led to the creation of employment opportunities in the country.

3. Tea production has contributed to the generation of government revenue in the country.

4. It has stimulated external trade and international relations. Kenya's tea accounts for nearly 50% of tea export in Africa.

5. High quality tea has earned Kenya high repute.

6. The tea industry assures a farmer of income throughout the years. This because tea picking is done throughout the year

Problems Facing Tea Farmers in Kenya:

1. Diseases and pests attack crops leading to great losses. For example the black tea thrip attack the undersides of the tea leaves, red spider mites attack the upper surface of the leaf, Weevils and beetles attack tender leaves thus damaging the output from the crop since the tender leaves are the ones which are picked. Fungal diseases also attack the crop in many production areas. Hence, these need frequent use of chemicals adding to the costs of production.

2. Hailstones affect the crop by causing physical damage.

3. Price fluctuation in the world market affects the trend of tea production in the country. Sometimes the prices are low and hence discourage some farmers.

4. Kenya is facing another problem of fast population growth, which has brought about the pressure for land in some places. Population pressure inhibits the application of mechanized methods.

5. In some places there is a problem of soil erosion since the farms are in the hilly areas.

6. Labour problem as a result of people engaging into other activities whose income is more stable than tea production especially industries and trade.

7. Droughts also are another problem, which have contributed to the limitation of tea production in Kenya.

TEA IN MALAWI

Malawi began cultivating and growing tea in Africa as far back as 1878 in Blantyre. Other farms were established at Mlanje, in Chalo, the slopes of Zomba Mountain and recently in the Nkata bay area. The type of tea is Aswan from Assam, Burma and Indo- china.

Factors for Developing of Tea Production in Malawi:-

1. **Relief**; There are highlands which have encouraged the production of tea. Hilly surface has encourages drainage.

2. **Soils are good** for tea production since they are well drained and slightly acidic for tea production.

3. **Enough rains** caused by the highlands most of which are orographic in nature.

4. **Easy export** since Malawi located along the coastal strips.

5. **The government involvement** in encouraging agricultural activities in the country so as to promote the economy of the country. This has been due to the fact that Malawi's economy depends on agriculture.

6. **Labour availability** in the country has also facilitated tea production.

Advantages of Tea Production in Malawi:-

1. It has provided employment opportunities to the population in the country.

2. It has stimulated the development of some towns.

3. It has promoted income to the individuals leading to the rise in the standard of living.

4. It has stimulated industrial development in the one country by generating capital.

5. It has contributed to the generation of foreign currency in the country.

6. Tea production has acted as a dynamo to the improvement in transport and communication system as well stimulation of the energy supply in the country.

Limitations (Bottlenecks or Setbacks) of Tea Production in Malawi:-

1. There has been **massive migration** (exodus) of people from Malawi to South African mining areas especially in the rand. This has led to labour shortage in some of the farms leading to low production..

2. **Stiff competition** from other countries like Kenya, China etc.

3. **Rainfall unreliability** is another problem. Sometimes there is too much rainfall and sometimes there is drought.

4. **Snow and frost** in the highlands affects the crop.

5. **Erosion** is another problem that tends to destroy the crops in the farms on the slopes of the mountains. But the farmers have decided to use contour farming and planting vegetation on the slopes so as to conserve soil.

6. **Diseases and pests attack crops** leading to the decline in production.

7. **Price fluctuation in the world market** discourages the farmers. More often than not, prices in the world market tend to drop leading to adverse affects in the level of production.

8. **The country itself is small in size** leading to the limitation in the scale of production. Malawi is 11,484 sq. km. Its distance from North to South is 840km and width ranges from 80 – 160km.

9. **Poor transport and communication** is another hindering factor facing tea production in Malawi.

10. Concentration on tea production has decreased due to people's **involvement in the production of other crops** like tobacco, rice, cotton, groundnuts, maize, cassava, beans, millet, bananas, and engagement in fishing.

TEA IN TANZANIA

Tea is being produced in Tanzania as a beverage cash crop. The tea produced in Tanzania is of high quality and is both exported and used locally.

Organization of Farms

1. There large estates controlled by both private sector and the government. Examples of estates are like Ambangulu and Amani in Tanga. The size of the estates tends to be over 1000 hectares. Some estates are having some factors for processing tea.

2. There are also small – holder farms of 3 to 10 hectares using family labour and to low extent, hired, labour.

Factors Favoring Tea Production in Tanzania

1.**Market availability** both locally and internationally since the produced is of good quality and taste. The local market has been growing high due to strong advertisement of tea

made by the producers of tea in the country. For example there are different brands of tea products like CHAI BORA by Tanzania Tea Packers include Tanzania Tea Blenders, Green Label, Milk cafe Limited, International Food Packers Limited, Tukuyu Packing Company Limited, etc.

2. **Researches on tea production** have been taking place – leading to the increased quality of tea produced in Tanzania.

3. **Favorable climatic conditions in the highland areas.** They have enough rainfall, which is well distributed. The temperatures are relatively cool between 15^0C to 21^0C.

4 . **Capital invested** by some individuals, the government and the financial institutions. The Tanzania Investment Bank played a great role in the provision of capital for establishing ten estates in Tanzania.

5. **Labour availability** due to the high population in the country. Both skilled labour and semi – skilled labour are available for the production process in the estates.

6. **Soil quality** in the highlands has also contributed to the tea production in Tanzania. The soil in these highlands is fertile, acidic, deep, well drained, friable, aerated and volcanic in nature.

7. **Peaceful state of the country** that encourage people to effectively engage themselves in agriculture being assured with security. Tanzania unlike other countries is a haven of peace where people are living peacefully and cooperate amicably in different agricultural matters including tea production.

8. **The relief** (The presence of highlands like the Usambara Mountains and Southern Highlands that range from 1500m to 2000m above the sea level. As a result of this elevation the climate is cool and the amount of orographic precipitation is high enough to facilitate the production of tea in the country.

The Three Major Tea Growing Areas in Tanzania are:-

1. Usambara Mountains, both the south - east and north – east parts. There was established at tea research centre at Marikitanda.

2. Southern Highlands including the Iringa, Mufindi, Njombe Lupembe and Mbeya (Rungwe) areas.

3. The West Lake region also produces a small amount.

Importance of Tea Production in Tanzania

1. It contributes to the generation of the government revenue in the country and this is used for running different social and economic aspects in the country.

2. Creation of employment opportunities to the local people in the country leading to the reduction of the problem of unemployment among the Tanzanians.

3. Development of infrastructure required for the transportation of distribution of tea products in the country has been encouraged.

4. There has been stimulated of the development of industries for tea processing in the country. Some of the factories are located in the estates.

5. It has promoted the living standard of the people since it is used for drinking by the people.

Limitations or Setbacks of Tea Production in Tanzania

1. Pests and diseases affect the production of tea since this attack the crops leading to the death of plants or rusting of the leaves.

2. Low technology especially the small-holder farmers. These farmers use poor facilities in the processing of tea.

3. Poor capital availability that discourage investment level in the country.

4. Poor marketing system associated with price fluctuation in the world market. The market for the local tea is also limited as a result of the impact of the sea smuggled was impounded with some 580 tonnes of tea bearing fake labels. The confiscated tea included Tausi, Moto moto, Five Roses, Midland, Lipton, Tetley, Ketepa, Maaze, Chombe and African Tea Brand.

5. Highlands are affected by soil erosion which leads to land degradation and reduction of the arable land. But this is being solved through afforestation programmes, which have been encouraged throughout the country.

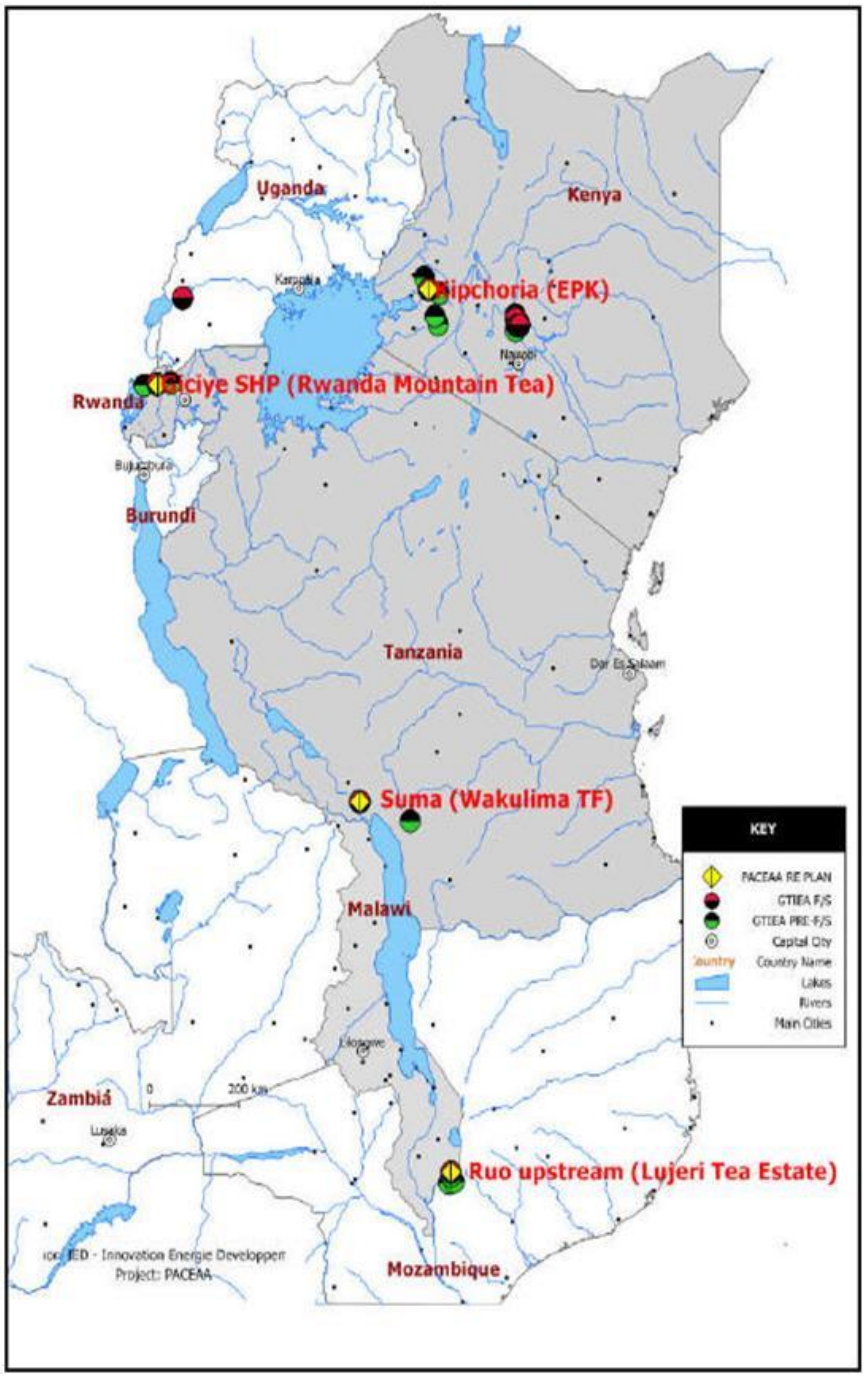
6. Some areas are affected by the decline of soil fertility due to the over use of soil nutrients by the plants.

7. There is a problem of labour supply affected by diseases, rural –urban migration and the development of other economic sectors especially tourism and mining industry.

8. Climatic vagaries characterized by droughts especially in the current time.

9. Pressure for land in the highlands which has led to the problem of land fragmentation.

10. Most farmers are poor hence they cannot afford investing in tea production.



TEA IN INDIA

Although in recent decades several African countries have become important for the production of tea, the bulk of the world's tea production still comes from Asia with India being the leading producer. Sri Lanka and China are the second and third respectively.

Conditions, which have favored tea production in India, are:-

1. Conducive climatic condition, that is, humid and warm monsoon climate with oceanic influence. Also, enough orographic rainfall, which reaches about 1500mm to 2500mm. These aspects lead to fast growth of tea and increase in the frequency of tea picking.

2. Topography is suitable for tea because of the presence of hills and highlands that offer well drained soils and conducive climate E.g. on the Southern slopes of Himalayan foothills, Assam hills and Nilgiris hills (where tea is grown mainly at heights over 1200m with rainfall from 1500mm to 2500mm per annum).

3. Soils are fertile, deep, well drained because of hilly surface and easy to cultivate. Also the soils are slightly acidic hence good for tea production.

4. Labour is available because of high population in the country, India is the second highly populated country in the world.

5. Availability of market inside and outside the country. One of the largest importers of tea from INDIA is U.K and others include Australia and West European countries.

6. Technological advancement associated with Green revolution of 1970's has contributed to the success of tea production in India. Farmers are using scientific methods in cultivation, sowing, caring, and processing tea to ensure that the products are of high quality so as to get good market.

7. Combination of small holdings and estates, (encourages by the government) as facilitated positive advancement in tea production in India. This is a good lesson to be learnt by other countries like Tanzania and Kenya where tea is also grown to some extent.

Organization

Tea is grown both on large scale (estates owned by companies) and small holdings. These two are combined to facilitate smooth running of production activities. These are many factories for processing tea and these serve both estates and small holdings and this has led to the concentration of small holders near factories. On small holdings there are now cooperative, factories serving so as to promote efficiency and effectiveness in the processing process.

Tea Growing Areas in India:-

Most of the India's tea is grown on large estates which are concentrated in three main areas:-

1. **ASSAM:** This includes Assam hills, Khasi hills at an altitude of around 1070m, in the Brahmaputra and Surma valleys. Assam produces the greatest yield due to large estates covering thousands of hectares. Each estate is a self-contained community with good factories. The factories are equipped with up to date machinery for processing and grading.

2. **DARJEELING:** Is the district on the Southern slopes of Himalayan hills. The best tea comes from this region.

3. **KERALA:** The area, which includes Nilgiris Hill (where tea is mainly grown at heights of over 1200m, receiving the rainfall ranging from 1500mm to 2500mm), the upper slopes of the Western Ghats and Cardamon hills. But production in the Nilgiris Hills of Southern India is less important but is of high quality.

Importance of Tea Growing in India

1. It is a good example for the third world countries to emulate. For example, the importance of combining both large scale and small holdings for the sake of promoting economic position of both large scale and small farmers.

2. It has helped in solving the problem of employment in the country by creating opportunities for the burgeoning (rapidly growing) population.

3. It has made India highly reputed for being the leading tea producer in the world.

4. Social services and people's living standards have been improved to a great extent.

5. It has encouraged industrial development. For example, the capital generated from tea has been re-invested in industries like textile and bicycle manufacturing industries.

6. Tea production has also stimulated the improvement and expansion of transport and communication systems.

Limitations of Tea Production in India

Notwithstanding its success, India, lake other countries tea producing countries faces some problems in tea production.

1. There is a problem of high population leading to pressure for land. The area is overpopulated with density of 223 persons per sq. km.

2. In some places farmers are still using old methods and living a traditional way of life. For example, farmers are still having small plots which are fragmented and scattered in the manner that mechanization, irrigation, drainage and pest control are difficult.

3. Rainfall is seasonal and unreliable.

4. There is a competition from other crops especially cereal crops and other crops. Most people cultivate cereal crops, rice, wheat, and millet and other cash crops like cotton and rubber.

5. Emerging of other countries as the tea as the producers pose a great challenge to India. For example many African countries like Kenya, Malawi and Tanzania producing tea. Also around India there are other countries like Indonesia, Sri Lanka and Bangladesh, which produce tea posing a stiff competition to India.

6. Tea production is costly for small and poor farmers. The people in the villages fail to afford costs since tea needs skills and high capital for buying good equipment. Machines for processing are needed such that small farmers fail to buy because they are expensive.

7. Because of the problem of malnutrition and other diseases many people are of poor health and hence they cannot engage themselves effectively in the production process.

8. Price fluctuation in the world market discourages farmers to great extent.

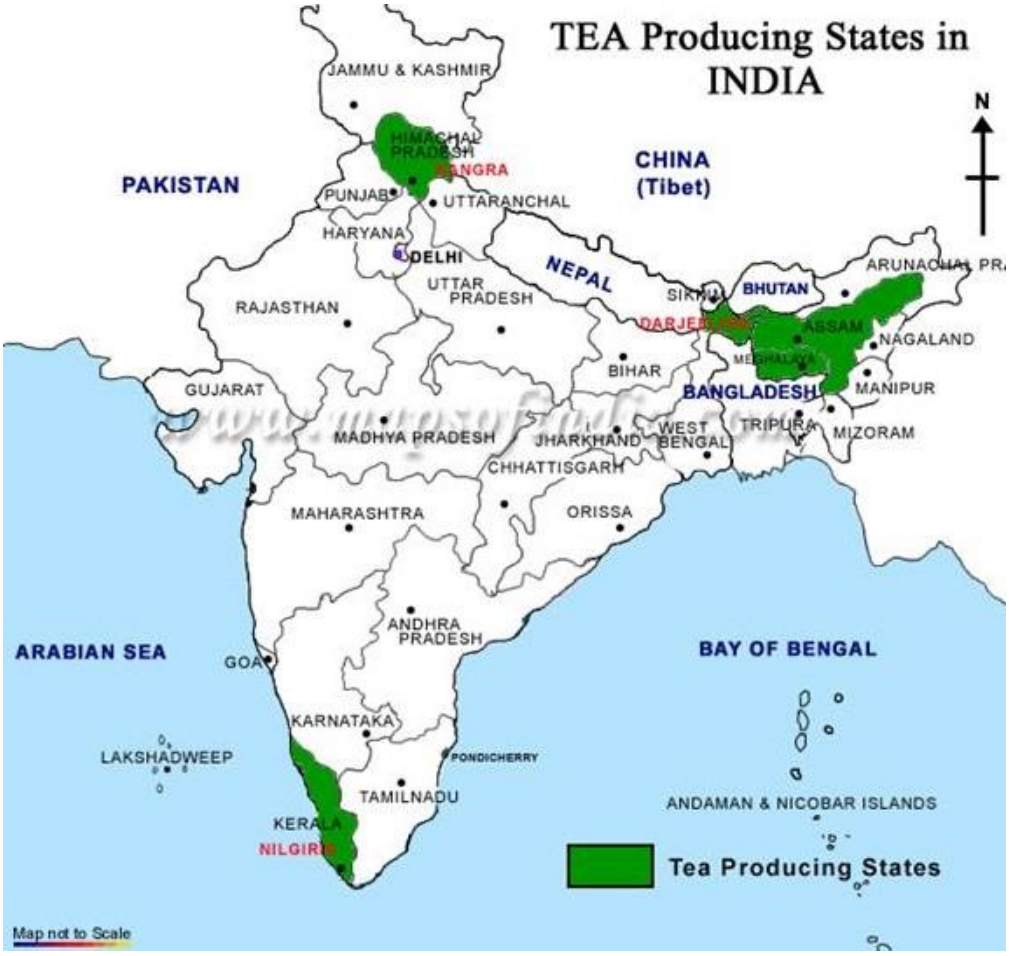
9. India is facing a great problem of earthquakes, which affect people life. People become restless and fail to concentrate in agriculture because of panic and being unsettled. Also, the earthquakes destroy infrastructure and power systems. This problem is so common in India because it is located within the converging plate tectonic boundaries, which continue colliding leading to such sporadic earthquakes.

10. Frequent conflicts that involve India lead to the problem of labour unrest and hence affect agriculture leading to dwindling crop production. For example the conflict with Pakistan over Kashmir.

11. Erosion in the country has also led to destruction of soil and declining trend in tea production. Erosion has been accelerated by excessive clearing of the land as a result of result of explosive population growth.

12. Also the soil fertility has declined due to many years of constant land use following the increase in population.

Map Diagram:



OIL PALM IN NIGERIA

Unlike cocoa and rubber (both of which originated in Tropical America) the oil palm is indigenous to West Africa and Nigeria is regarded as the original home. It is grown widely throughout the forest zone. In Nigeria it is especially grown in the South – East around Port Harcourt in the palm belt. The palm belt has ideal conditions for growing oil palm because of heavy rains of about 1500mm, enough sunshine, well – drained soil and labour availability because of high population.

Conditions Required for Oil Palm Production

1. It requires heavy, well distributed rainfall of about 1,500mm to 2030mm per annum.

2. The soil should be well drained and fertilizers should be added frequently.

3. High humidity is ideal.

4. The tree requires high temperatures of at least 21^0C and plenty of sunshine.

5. There shouldn't be strong winds and wind breakers should be set up to protect the trees from being damaged.

6. It requires plenty of cheap labour to weed the young seedlings, harvest and transport the products to the oil mills.

7. Oil mills need to be situated close to the navigable rivers and on flat land so as to facilitate road and railway construction.

8. It needs easy transport to the factory.

Farm preparation and Cultivation and Harvesting

The land is first cleared and the land is cultivated. The young palms are raised in the nurseries and are later transplanted to the field. In the farm cover crops are usually planted between trees. Much care is needed to keep the weeds from the farm. The farms must be inspected for pests and spraying is necessary. Pruning is also essential.

During the harvesting period, the fruits are harvested on a weekly basis. After harvesting the fruits should be pressed immediately last they deteriorate..

Farm Organization

There are both plantations and small holdings in Nigeria. Oil palm is largely grown in villages (smallholdings by peasants). Some peasants still use simple hand methods in the process of extraction but in plantations mechanized methods are used. Many villages have their own oil press and the oil is sold to traders who arrange for its export. The crop is helping farmers to get cash and protein. Over 90% of produce is obtained from small holder farmers while the rest comes from plantations.

Uses of Oil Palm

1. Oil palm yield two kinds of oil, that is palm oil, which is got from the fleshy pericarp, and the palm kernel oil got from the kernel. The oil is used for making cooking fat, margarine, soap, candles, and cleansing agents.

2. Waste material may be used as fuel and oil residue may be used as fertilizer or animal agents.

3. The trunks of the tree can be tapped to yield alcoholic drink known as palm wine.

4. The oil palm products can be exported to generate foreign currency.

Factors which favoured the Development of Oil Palm production in Nigeria:-

1. Warm conditions in the southern part of Nigeria, which are due to the influence of the oceanic Guinea current.

2. Most or humid condition which is influenced by the ocean and the presence of trees in the forest belt.

3. Good fertile soil has encouraged oil palm production in the country.

4. Heavy rains in the forest region, which have encourage the growth of oil palm trees.

5. The use of improved varieties, which have short trees. The new varieties have much thicker pericarp and hence yield more.

6. Large scale production on plantations and the use of mechanized methods in the production process. Estates account for 10% of the total put.

7. Transport and communication has also stimulated the development of oil palm production in Nigeria.

8. Paying of bonuses to farmers has encouraged the promotion of quality.

9. Also, researches and the use of centralized mills have contributed to the development of oil palm production.

Decline in palm Oil production

The decline in oil palm production has been due to the following reasons;

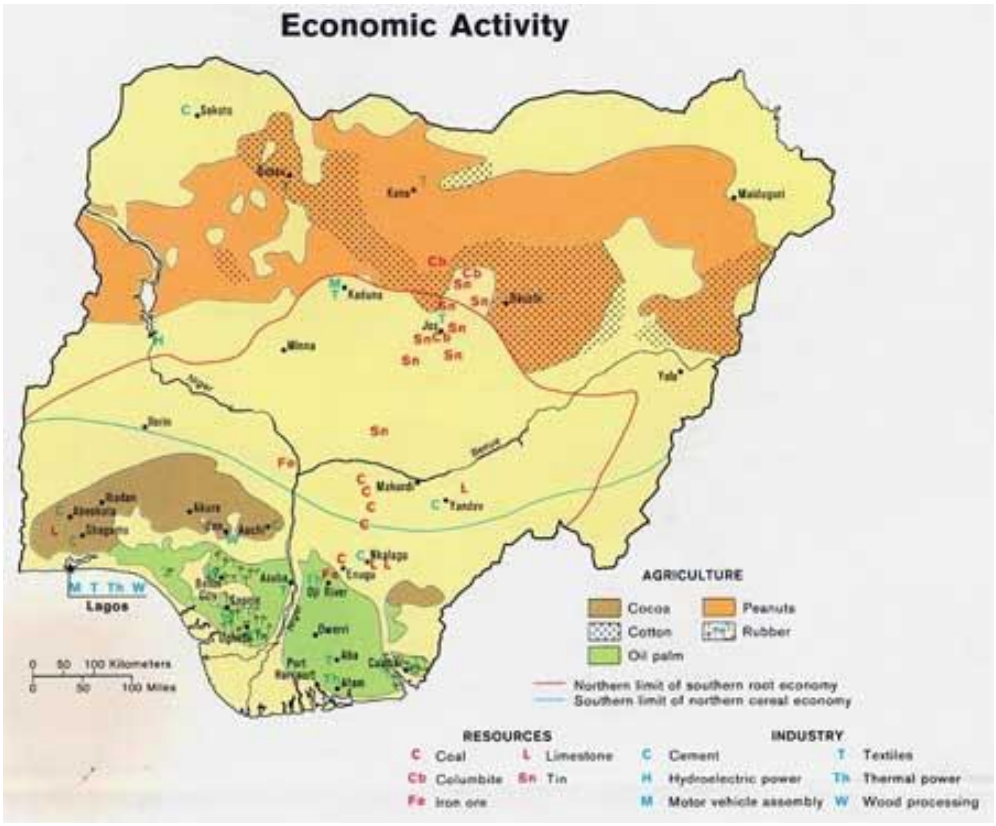
1. The government encouragement of production of basis food crops in order to minimize the importation of foods. Some farms have been left uncultivated and no oil palms

have been planted on those areas. This has contributed to the decline of the importance of oil palm products.

2. Poor methods of oil extraction due to low capital among the peasants who cannot afford investing in mechanized production.

3. Rapid population growth has led to the increased concentration on food production.

4. Attack by diseases like Anthracnose caused by fungus which turn the leavers yellow, brown, or black and can be presented by spraying; Freckle caused by fungi which also attack leaves and can prevented by spraying; Blast, a root diseases which attacks nursery beds and is usually fatal. There is no cure, but it can be prevented by careful cultivation, growing seedlings in polythene bags and watering effectively.



RUBBER

Rubber does not grow well in East Africa. In West Africa the largest rubber producers are Liberia and Nigeria, with smaller amount being produced by Cote d' Ivories and Ghana. Rubber is the native crop of Brazil, Malaysia also produces rubber.

RUBBER IN LIBERIA

Rubber growing in Liberia started as far back as 1910 when the British planted 80oha at Mt. Barcley near Monrovia, but later on had to abandon the project due to the falling world prices. Hence, in the past rubber production came from foreign – owned plantations, but today Liberian farmers account for an increasing proportion of the country's production.

The most important single producer is the American owned Firestone Company which obtained a 99 year lease in 1926 to establish rubber plantations. Since then rubber has played a vital role in the development of Liberia's economy. The company established a large plantation at Harbel near Monrovia and a smaller one near the Cavalla River. In 1980s the cavalla plantation stopped production due to the falling rubber prices in the world market.

In Liberia there are about 120,000 hectares land are devoted to rubber production, of which 60,000 hectares belong to Liberian farmers, themselves who produce approximately 20% of Liberia's total production of 80 million kgs of rubber.

Hence, it can be concluded that rubber production in Liberia is organized either in plantations per small holdings.

But small farmers do not produce much (less than 29%) due to; inefficient small farms, absentee landlords and poor standard trees.

Factors the facilitated the development of rubber production in Liberia:

1. Failure of Henry Ford's plantations at Belterra and Ford Landia in the Amazon Basin in the 1920's due to labour shortages, diseases and transport problems. This made the firestone company to obtain a 99 – year lease to establish rubber plantation in Liberia. Rubber has since then played a fundamental role in the development of Liberia's economy.

2. Rubber in Liberia was also stimulated by the effects of the Second World War, especially when Malaysia, which used to the leading producer, was overrun by Japan.

3. Conducive warm, humid climate and good well drained soils.

4. Liberia's accessibility also encouraged the production of rubber in the country.

Uses of Rubber:

1. Making of rubberized water proof materials.
2. For making rubber shoes and boots (the rubber soles).
3. Making the insulating materials for electric implements and wires.
4. Making of carpet backings.
5. Making of vehicle types and hence facilitates transport systems.

Importance of Rubber growing in Liberia

1. It has created employment. About 35% of wage earners in Liberia are employed by rubber industry.
2. It contributes to the foreign exchange earnings.
3. It has greatly assisted Liberians who grow rubber. These earn some cash after selling the products to the company. Also the company assists the small farmers by supplying seeds, giving advice etc.
4. Rubber growing has stimulated the development of other sectors like research of other crops like coffee, oil palm, rice, banana and livestock under the instrumental role of the Firestone Company.
5. Various infrastructures such as roads, health units, schools and recreational facilities have been established so as to benefit the local Liberians. The Firestone Company has established research centers on tropical diseases which affect the local workers and the rest of the people in general.

Problems Facing Rubber Growers in Liberia

1. The farmers find it difficult to invest large amount of capital since it takes a long time from planting to the period of harvesting.

2. There is a stiff competition from other countries like Ivory Coast, Malaysia, etc.

3. Small farmers are not well experienced and therefore they produce poor quality rubber.

4. There is also a strong challenge from the synthetic rubber made from other countries, which is made from oil by great industries. But natural rubber is still in a great demand.

5. Price fluctuations have been discouraging production in the country. Sometimes the prices become very low.

6. There is a problem of vagaries of weather, especially unfavorable climatic conditions like heavy rains, which interrupt tapping procedure.

7. Reliance on cheap labour supply, which is most cases, may fail to be obtained. If labour becomes very expensive it is like to affect world prices for rubber and therefore, reduction in production.

8. The other problem the sector is facing is the competition from other sectors like iron mining, which has led to a decline in rubber production since mining is more paying.

9. Labour unrest because of political problems, which are prevailing in the country. There are wars going on between the government regime and the contra-rebels. Such wars bring worries and make people keep on fleeing without concentrating on the cultivation.

The Future of Natural Rubber:-

Natural rubber has a bright future because the demand is increasing. The increase in demand is due to:-

1. Its good natural quality compared to artificial rubber which is not such much durable like natural rubber.

2. Low cost of production involved in natural rubber. Artificial rubber production is more costly. Hence, because of low cost of production even the prices of natural materials tend to be lower than those made of artificial rubber.

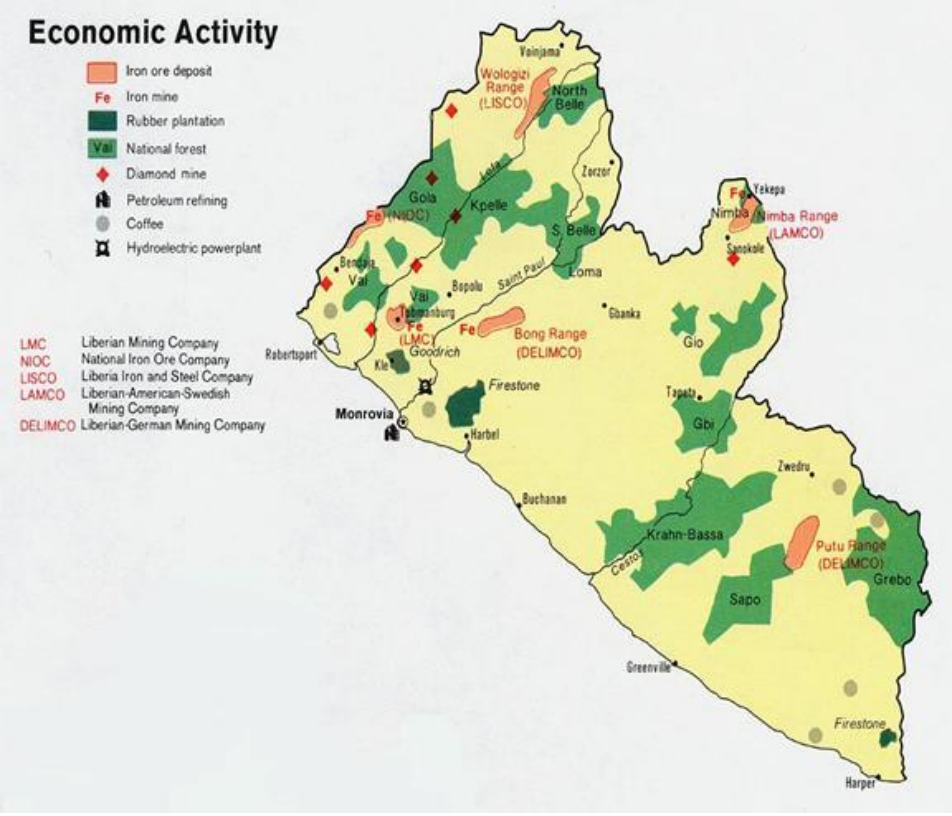
3. Natural rubber is better because is replaceable while synthetic rubber tends to use resources, which have diminishing supplies, and are non – renewable. For example, synthetic rubber uses petroleum which is non replaceable after being exhausted and it is environmentally unfriendly.

4. Family planning and AIDS control programmes, which encourage the use of condoms, will promote the market of rubber and hence lead to its increased production.

5. Greater need of expanding the transport system is another factor that will promote rubber production. As more and more cars are being made, there is a greater demand for tires and hence larger production of rubber in the world including Liberia.

Nonetheless, in Liberia, further rubber production rests on the political situation and improvement of technology among the local farmers.

Map diagram:



Economic activities in Liberia

RUBBER PLANTATION IN MALAYSIA

Rubber was introduced in Malaysia by the British in 1878. They established plantation agriculture on the western side of the Malay Peninsula.

Factors that facilitated the establishment of Rubber plantation in Malaysia

1. Already established transport systems of railway, roads, and port links.

2. Availability of large and unpopulated forest land.

3. The climate of Malaysia is conducive for rubber production since it is wet and hot. The Temperature averages are about 32^0C all the year.

4. The rainfall is high all the year round (about 2540mm). The wettest areas receive 6480mm a year.

5. Relief, The relief has allowed the establishment of transport system.

6. Cheap labour availability provided by both Malays and immigrants from India.

7. Rubber is produced both in plantations and small holdings.

Malay produces about 25% of the world's rubber production. A half (1/2) of Malaysia rubber is still on plantations which are now run by the government. The other half (1/2) is now produced by farmers in the small holdings on the eastern side of the peninsula. Small holders are given financial support by the government to protect their interests. These grow crops for home consumption as well as rubber for cash.

Production is affected by price fluctuation in the world market and stiff competition from the synthetic rubber, which reduced the demand of natural rubber. But of late 80's there has been revival in the industry due to the AIDS scare and hence the need for condoms. Malaysia claims to produce 60% of the world's condoms.

COCOA GROWING IN GHANA

Ghana is one of the leading producers of cocoa production in the world and it is second to Cote d'Ivoire in the West African region.

Organization

Cocoa growing activity in Ghana is organized entirely on small holdings. It is undertaken by small farmers (peasants) on small plots whose size range from 2 ½ to 4 hectares.

Factors which have led to the development of cocoa production in Ghana are:-

1. High temperature, which are about 27^0C.

2. Heavy rains ranging from 1250mm to 2000mm.

3. Forest trees provide the necessary shade and save as windbreakers to protect the trees and flowers from being damaged.

4. Undulating surface that has facilitated drainage and development of loamy soils, which are deep and fertile.

5. The use of cheap small holder farming. Cultivation on small holdings has led to several advantages like being cheap since family labour is used, they do not need a lot of capital hence good for poor governments, high quality of products than from the plantations, easier disease control and soil conservation, small holdings improve the life standards of the local people faster than plantations, individual's technology have improved, and can be used where there is high population.

Location of Cocoa to Ghana

The main cocoa lands are found in the south (the area extending between the towns of Koforidua and Sunyani) where rainfall is heavier and land is little higher than other areas. Ashanti is the chief cocoa producing area and Kumasi is the center of the producing area. The towns of Accra, Kumasi are the center of the producing area. The towns of Accra, Kumasi and Takoradi have formed a triangle of the area where there is the greatest concentration of cocoa production.

Importance of Cocoa to Ghana

1. Cocoa is the greatest money earner in the country accounting for 60% of exports. Cocoa is shipped to many parts of America and Europe.

2. It has promoted the income of the peasant farmers and their general living standard.

3. It has encouraged the development of towns, like Kumasi, Takoradi and Accra.

4. It has stimulated the development of transport and communication. For example the development of Takoradi as a port owed to the cocoa industry since it was aimed at easing the shipment of cocoa and other exports.

5. It has earned Ghana an international repute and improvement of social services like education, health, etc.

6. It has encouraged the development of industries and other sectors like mining. This is because the money got from cocoa sales is reinvested in such other sectors.

Trend of Cocoa production in Ghana

Cocoa production in Ghana has been experiencing a declining trend due to the following limiting factors.

1. There has been predominance of old trees in the farms, which have not been replaced, hence they don't give enough yield.

2. Lack of disease and pests control because of low concentration on cocoa production and the use of poor farming methods. There are fungal diseases like black pod, swollen root, manilla and witchesbroom and pests like capsid which have led to great problems in the trend of production. The only way of dealing with swollen root problem has been to cut down the infected trees and burn them. The government has sponsored the cutting out scheme and millions of infected trees have been destroyed. The problems of capsid are being solved by spraying with an insecticide.

3. Poor farm management by the local farmers because of lack of proper managerial techniques.

4. Low government incentives to improve production. But nowadays there is more emphasis than in the past to encourage local farmers to embark on improved methods like spraying so as to increase yield by protecting the plats.

5. Climatic problems for example rainfall in the north is insufficient for cocoa production and in the southwest the rainfall is too heavy (above 1800mm. Optimum conditions for cocoa lie between 1300mm and 1500mm with a dry spell, so too much moisture has encouraged fungal diseases like swollen root and black pod.

6. Another problem is the predominance of low quality variety in the farms, which give low yield per hectare.

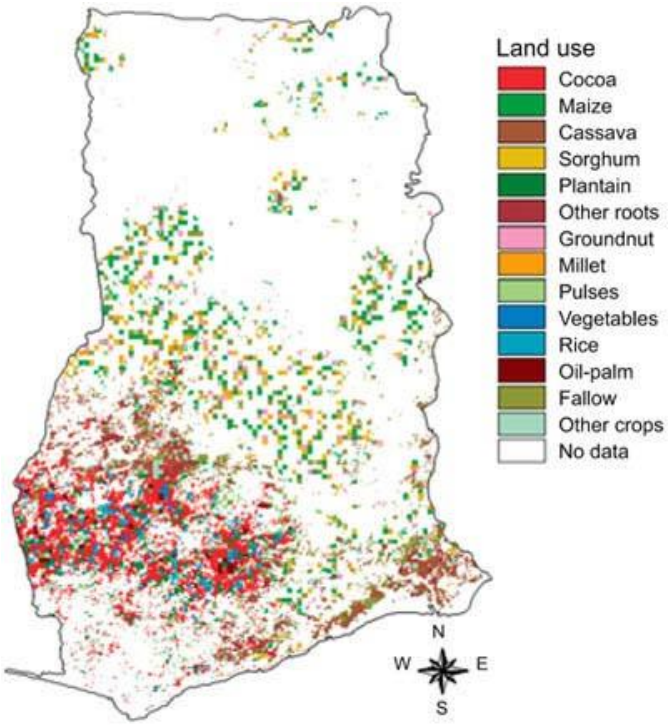
7. Price fluctuations in the world market have been discouraging farmers from increasing the production of cocoa. In 1970's a lot of cocoa was thrown in the ocean because of lacking market such that farmers were highly discouraged. To address this problem, today the government is trying to diversify her crop production and emphasizing

industrial development, although cocoa growers are still reluctant to accept these new innovations.

8. There is limited mechanization because of predominance of traditional methods.

9. Frequent fires also cause great devastation of cross in the farm leading to low yield.

Map diagram:



COCONUT PRODUCTION IN TANZANIA

Coconuts are typical of coastal plain in the tropical areas where conditions are favorable such as:-

1. High temperatures of about 300C.

2. Heavy rainfall above 1500mm per annum.

3. Well – drained sandy soils. It also tolerates salty soils.

Coconuts are both cash crop and food crop and roughly the growers consume half of coconuts.

Uses

Coconut coir can be used for making ropes and carpets. Other uses invoice making oil from copra. Copra residues can be fed to the poultry, making wine, the leaves and trunks provide materials for ma's shelter, hard shells can be made into utensils and lastly it can be used to manufacture margarine and soap.

Trees are grown in small fields as well as plantations. The government in Tanzania established the coconut schemes in Tanga, Mtimbwani, Mkwaya and Kerge Ujamaa village. In Zanzibar coconuts are grown throughout the Island especially in Chwaka, Uroa, Paje, Mangapwani and Makunduchi. The production in Zanzibar has been encouraged by the presence of the factories like:-

1. The coir factory at Mtoni that makes carpets, ropes and baskets.

2. The copra factory also located at Mtoni that dries the copra and then heats and presses it to extract oil for cooking, making margarine or for export. Poorer quality oils are sent to the soap factory in Kwahani and the reside is used for cattle food.

In Pemba coconuts are extensively grown but are fewer than in Zanzibar. There are also some industries for coconut oil extraction.

Problems of Coconut Cultivation in Tanzania:-

Coconut production in Tanzania has been facing the following problems:-

1. Low production due to the predominance of small farmers (peasants) who use poor methods.

2. The varieties of coconuts are tall hence harvesting becomes a big problem since people have to climb the trees.

3. Most people do not give first priority to coconuts as the commercial crop and focus on other crops, which tend to grow fast.

4. Low government support on growing coconuts. Zanzibar is more advantaged because of the processing factories.

5. The trees especially in mainland Tanzania are very old, but there are some new short varieties, which are now being introduced.

6. Other countries like South – East Asia (Philippines, Malaysia, Sumatra, and other countries like Sri – Lanka, India etc), pose stiff competition in the world market.

7. There is labour shortage in the coconut farms since most of people especially the young ones have migrated to towns for other activities like petty trade.

Suggestive Conclusion

There is a strong need for the government to pay more attention to the production of this crop. The crop has some advantages that include:

1. It requires little investment so not very high capital is needed unlike other crops. Even small farmers can afford the production of coconuts.

2. It doesn't require very advanced specialized knowledge production.

3. It can propagate itself.

4. It has many uses and almost every part of coconut palm is used. Advanced factories should be established and good (short) varieties should be introduced. Marketing system has to be coordinated properly. Transport and communication system should be improved so as to facilitate exploitation. Some new areas like Rufiji Basin should be opened up for larger plantations.

5.2 LIVESTOCK (PASTORAL) HUSBANDRY

1. Livestock or pastoral (husbandry) farming is the rearing of animals and birds (goats, cattle, sheep and poultry (birds).

2. It can be distinguished into traditional (subsistence) livestock farming and modern (commercial) livestock farming.

TRADITIONAL (SUBSISTENCE) LIVESTOCK FARMING SYSTEMS:-

A. Nomadic Pastoralism

- This is also called as nomadic herding.

- It is livestock farming in which pastoralist constantly move from place to place in search of pasture and water. A person who moves from place to place in search of pasture and water if called a nomad.
- The system is extensive and subsistence in nature as the farmer keeps animals for food and not for sale.
- Examples of places where nomadic pastoralism takes place are West Africa by the Fulani tribe who move from Lake Chad down to the Jos plateau in Northern Nigeria. In East Africa by the Maasai who move between Tanzania and Kenya. In Ethiopia by the Nubia, in south Africa by the Hottentots and in the Sahara by the Tuareg.

Characteristics of Nomadic Pastoralism

1. The cattle are kept for prestige, paying bride price and not for sale.
2. The breeding process is uncontrolled.
3. The herds of animals are large in size.
4. The land is commonly owned. This causes overgrazing and serious soil degradation.
5. Diseases common because of poor care given to the animals. For example farmers do not vaccinate their animals.
6. Low technology is involved.
7. The animals are of poor quality (poor health) and of low value.
8. The system takes places where there is sparse population.
9. It is not expensive.
10. There is no permanent settlement as farmers move constantly with their animals.
11. There is no crop cultivation and hence the animals are the sole base or support of the family life.
12. Many animals are grazed on the same field.

Advantages of Nomadic Pastoralism

1. The system is cheap (not costly). It does not need advanced technology or sophisticated tools.

2. It assures the family the availability of food especially when the animals are so many.

3. The traditional varieties of animals are resistant to diseases and other environmental hardships.

Disadvantages of Nomadic Pastoralism

1. Animals give poor production and are of low value.

2. Many animals die due to lack of disease and pests control, which attack the animals.

3. A farmer wastes a lot of time moving from place to place. He /she cannot settle and engage into other into other activities like crop production, etc.

4. Movement from place to place and overgrazing lead to the large scale destruction of vegetation. This in turn causes Desertification and soil erosion.

5. It cannot take place where there is high population since the number of animals tends to be large and hence large open area is needed.

6. There are poor storage facilities hence the farmer suffers a great loss.

7. During the movement the pastoralists come into conflict with the wildlife conservation sector and agricultural cultivators and this can head to death.

What should be done?

1. The farmers should be given proper education that can enable them to get new and advanced technology.

2. The number of animals should be reduced (destocking) so that they can be managed well.

3. Farmers should be encouraged to keep the animals good quality varieties like hybrid or improved breeds. These give good yield compared to the traditional varieties.

4. The government should help the pastoralist to improve the faming system.

5. The farmers should stop moving from place to place. They should settle in one place in order to be able to engage themselves in crop production and other activities.

6. There should be disease control by dipping the animals in chemical solution and vaccination.

7. The marketing system, transport and communication services should be improved so as to encourage the farmers to embark on the advanced livestock farming methods.

8. Farmers should also grow grass through irrigation so as to ensure reliable supply of pasture.

B. Semi – nomadic (Semi – Sedentary) Pastoralism

1. Semi – nomadic or semi – sedentary pastoralism is a system in which a farmer has started setting and begun growing crops like maize, millet and sorghum apart from keeping animals.

2. A farmer can also use some cattle dung as manure to encourage plant growth. Examples include the Sukuma of Tanzania and the Karamajong of northern Uganda.

Nomadism is increasingly decreasing due to:

1. Improvement techniques such that pastoralists can improve production without shifting.

2. The governments are encouraging the people to settle down and stop moving since it is wastage of time and energy as well as a danger to the environment.

3. Rapid increase in population has forced people to engage into intensive livestock farming systems rather than extensive system.

C. Sedentary Livestock Farming

It is the system in which a farmer keeps animals while settled permanently in one place. He does not move from place to place.

There are several factors that have led to the change from nomadic pastoralism to sedentary pastoralism. These include:

1. The advancement of technology and the increase in the level of education, which have made farmers, find setting more economical than moving from place to place.

2. The increase in the size of population has led to the decrease in the size of pastureland. Hence, nomadism cannot take place where the population is high.

3. The governments have been insisting on the farmers to settle instead of moving so that they can be assisted easily. The farmers have been advised to reduce the number of animals and keep good varieties of animals.

4. The reaction by the environmentalists. These have been encouraging farmers to settle so as to conserve the environment.

5. Also, pastoralists themselves have begun to engage into other different activities like fishing, lumbering, and crop production. These have force them to settle.

Characteristics of Sedentary Livestock Farming

1. The method uses more advanced technology than in nomadic technology.

2. The number of animals is not so high.

3. The animals are kept in sheds. Some can be fed using fodder as zero grazing. Zero grazing is when the animals are given feeds where they are in the shed, without making them go into the field so as to obtain pasture.

4. There is disease control.

5. The system can take place where there is high population like in town and villages. E.g. on the slopes of Kilimanjaro among the Chagga.

Advantages of Sedentary Livestock Farming

1. The animals are healthy and hence the yield is high. Settling on one area the risk of becoming sick is reduced both in animals and farmers.

2. Since a limited number of animals is kept there is better care of animals in terms of diseases control and food supply than in **nomadism**.

3. A pastoralist does not waste a lot of time moving from place to place.

4. It is easy for the pastoralists to get assistance in terms of education, dipping the animals and loans.

5. The population of animals in the country can be assessed easily when people are settled. That is it can be easy to country the animals in the country.

6. It encourages the improvement of the environment and its resources (Environmental conservation).

7. It enables a farmer to engage himself in other activities like crop cultivation, fishing and trade. It contributes to the rise of the life standard of people.

8. Manure can be used in the gardens and other crop farms.

9. A farmer gets balanced diet since there is availability of both proteins and carbohydrates.

Transhumance

Transhumance is the farming system, which involves seasonal movement of people with their animals. It differs from nomadism because of being characterized by permanent.Shifting the Fulani in West Africa practice this system. The move from Lake Chad to Jos plateau in the Northern Nigeria and extend to southern Niger along the River Niger.

During the rainy season (May – October) they migrate northwards and graze the cattle up to December. When it is dry season they move to the south in search of green pasture and water. They graze in the south up to April when the rains begin. However, some Fulani today are involved in commercial livestock rearing. Tsetse fly infestation is the major problem that is encountered during this movement.

Identify the factors determining sedentary livestock agriculture in Africa:

1. **Climate**: Where the rainfall supports pasture growth sedentary agriculture takes place easily unlike where there is severe drought.

2. **Soil**: Where the soil is poor pasture also is poor hence sedentary livestock farming cannot take place. But where the soil is good and can support pasture growth the system can develop easily.

3. **Nature of pasture**: If the pasture available is palatable sedentary agriculture can develop easily unlike where the pasture is of poor quality and inadequate.

4. **Political stability can encourage or discourage**: For example where there are political conflicts people are not settled or feel insecure, hence they cannot develop sedentary livestock farming. But where people live in peace they feel confident to develop sedentary livestock farming.

5. **Government policy on agriculture**. Some governments in some countries like Kenya are encouraging the development of sedentary livestock farming such that ranches have been launched. Likewise in Tanzania there are cattle ranches, which have been started like Kongwa, Mkata in Morogoro and Kagera ranch in Kagera region.

6. **Technology** also influences sedentary livestock farming in Africa: Where technology is low farmers do not settle and they don't produce highly compared to the areas where people have high technology and are settled.

7. **Transport system**. Where the transport is well developed the farmers establish sedentary livestock farming but where transport is poor sedentary livestock is also poorly developed.

8. **Market availability** can encourage sedentary livestock if it is good but where the marketing systems are poor sedentary farming also tends to be poor.

9. **Capital availability**. If the capital is available then sedentary farming tends to be more advanced due to the investment in technology while where the capital is poor the system tends to be poor also.

Mention the problems caused by sedentary livestock farming

1. It causes land degradation due to overgrazing and clearing of the vegetation.

2. It leads to environmental pollution. For example the decomposition of dung leads to the emission of methane gas, which pollutes the air, and the use of chemicals pollutes the soil.

3. It can lead to the decline of other sectors since a lot of capital can be directed to animal farming.

4. Sedentary farming brings problems of conflicts especially when the animals stray in the crop farms.

5. Some diseases affecting the animals like East coast fever, cancer and Foot and Mouth Disease can affect the people also it no keen care has been taken.

Outline the problems facing subsistence live stock farming in East Africa:

1. Low capital to be invested in the animal keeping. E.g. buying of chemicals and good varieties of animals.
2. There is high disease incidence affecting the health of animals and the farms.
3. High rate of population growth, which force the farmers to produce for food only rather than for sale.
4. Poor storage and processing facilities.
5. Poor transport and communication.
6. There is poor yield because of animal varieties.
7. Low level of technology among the farmers.
8. Religious beliefs such that some people like Moslems cannot keep animals like pigs.
9. Attitude of pastoralists who believe that keeping of many animals is the sign of prestige.
10. Poor climatic condition like inadequate rainfall, which can lead to shortage of pasture etc.
11. Poor quality of pasture. The grass in coarse (rough, not tender) and unpalatable.
12. Rural – urban migration has led to the problems of labor supply.
13. Rustling (cattle stealing) discouraged the pastoralists.
14. Land conflicts between the cultivators and the pastoralists because of struggle for land. This problem has been accelerating by the lack of land tenure system due to poor agricultural policies.

II. COMMERCIAL (MODERN) LIVESTOCK FARMING:

This is a system of keeping the animals and birds for sale. It can be intensive or extensive.

Examples of commercial livestock farming are beef farming on ranches, dairy farming etc.

(a) Extensive Commercial Livestock – Farming

This is the system that takes place on a large scale. It involves keeping a large number of animals on a large stretch of land called ranch. The animals kept in ranches involve:

1. Cattle for beef (Beef farming) cattle for milk (Dairy farming).
2. Sheep for wool and mutton.
3. Goats for mohair and milk production.
4. Pigs for pork.

Example of Ranches;

1. Beef farming in the Pampas of Argentina, Kongwa in Dodoma (Tanzania), USA, and Kenya etc.

2. Sheep ranching in Australia and South Africa. Ranches occupy very large areas about thousands of hectares. They are more developed in the temperature grasslands like the prairies of Canada, Pampas of Argentina and the downs of Australia.

The temperate regions are better due to:-

1. The cool healthy climate.
2. Palatable grass which is not coarse compared to the tropical grass.
3. High fertility that encourages prosperous growth of pasture.
4. Better supply of water due to a fairly distributed rainfall and absence of extreme evaporation.
5. Lower disease incidence.
6. Higher market availability.

Characteristics of Ranches

1. It takes place on a large area.

2. They are scientifically managed due to use of high technology.

3. There is little or no migration. This is due to permanent and reliable food supply supplemented by fodder.

4. Improved breeds or hybrids are used. These give high yield.

5. The animals are kept in a large number.

6. The production is for sale.

7. There is continuous cover of green pasture because of the use of irrigation system. The farmers tend to grow well – selected pasture like Alfa, Lucern and cloves.

8. It involves high capital investment in relation to labor required. Capital is needed for fencing and buying farm machinery.

9. Usually one type of animals is kept aimed at one type of production. This is for controlling the quality of products.

Advantages (Merits) of Ranching

1. There is high production and the products are of high quality because of the use of high science and technology.

2. It stimulates the development of transport and communication systems.

3. It encourages the development of towns.

4. It creates employment for managers and other people who provide labor.

5. It assures a constant supply of meat and milk to the consumers.

6. They contribute to the generation of the government revenue.

Disadvantages (Demerits or Weakness)

1. The ranches are costly since they need high capital to establish and maintain.

2. The system needs of a large area with sparse population. It can't take place where there is high population.

3. The system can lead to pollution of the environment because of the use of chemicals and the decomposition of the organic matter. When the animal dung decomposes methane gas also pollutes the air, water and the soil.

4. Ranches can also accelerate deforestation because large areas are cleared for establishing the pastureland. Deforestation can lead to desertification and soil erosion.

CASE STUDIES

BEEF FARMING IN THE USA

The USA is the greatest beef producer in the world but because of large local demand of beef it has little surplus for export. Most of the beef is bought locally. Today there are over 100 million cattle in the USA most of which are reared for beef. There are large ranches for beef farming which have been established in the western part of the country especially the Great Plains, prairies and semi areas of California. Also, there are so many beef cattle, which are bred and fattened entirely in the Corn Belt leading to the emergence of mixed farming in the zone.

Factors which have led to the successful beef farming in USA are:-

1. The use of advanced technology involving the machinery in the production Alfa Alfa.

2. Reliable supply of water especially from the rivers and dams, which have been established in the California region.

3. Reliable availability pasture some of which is being growing under the irrigation schemes. The pasture produced under irrigation schemes includes alfa alfa or fodder as well as maize from the Corn Belt.

4. Reliable transport and communication network like railway line; which is used for ferrying animals animal products.

5. Good soils, which have encouraged the growth of pasture.

6. Enough local market following high demand for beef by the local people in the country. The local demand in USA is such high that little beef is exported to other countries.

7. Availability of enough land especially in the western part of the country (California, the Great Plains etc) due to sparse population. Also, most of the land has an undulating surface. Because of this it has been very easy for the individuals to establish large – scale mechanized beef farming (ranching).

8. Climate characterized by slight rainfall that encourages the growth of grass and conducive temperature has stimulated the successful development of beef farming in those regions.

9. The use of irrigation schemes to ensure consult supply of pasture has been another stimulating factor.

10. The area has few diseases and also there is high disease control leading to the reduction of deaths of animals.

11. Availability of capital to be invested in beef farming has stimulated the successful development of beef cattle industry.

12. The presence of good animal varieties like Aberdeen Angus, Red Angus, Polled Hereford, Polled Shorthorn and the cross breed of Zebu.. Most of the breeds in the USA are European except the cross breeds with Zebu.

Fattening of Cattle

1. Fattening is done either traditionally in the Corn Belt whereby the cattle are reared in the Western grassland areas for two years and then sent to the Corn Belt for fattening before being sold or slaughtered.

2. Nowadays it is done locally in the feed yards such that many western cattle are no longer sent to the east in the Corn Belt. It has been possible because of developing of irrigation scheme where crops like sorghum and grass like alfa alfa are grown. Many fattening concerns are still based in the Mid-west.

Hence, it can be summarized that fattening process has been shifting westward from the traditional Corn Belt because of availability of large amount of pasture due to irrigation and fertilization of soil of large dry areas in the west and the shift of the slaughter houses and meat packing factories to the west. Processing of animal products is done in towns like St. Louis, Omaha and Kansas City.

BEEF FARMING IN ARGENTINA

In Argentina beef farming is in the Pampas (The temperature grassland). It lies between the subtropical latitudes 30^0S and 40^0S. The ranches in Argentina are called estancias and can be up to 200mk^2 in area.

Conditions favoring beef production in the pampas of Argentina

Physical Conditions

1. Presence of the extensive low rising flat land which allows for large scale mechanized livestock farming to take place.

2. Reliable supply of pasture which is good in quality.

3. Fertile soils have given rise to good pasture.

4. Well – distributed rainfall throughout the year with annual total of about 1000mm encourages good grown growth of pasture and regular supply of pasture. This rainfall if reliable because of the oceanic influence.

5. The temperatures are not very low (10^0C to 24^0C) and hence encourage the growth of pasture.

Human Factors

1. Introduction of good quality cattle from Europe like the short horn and Herefords.

2. Application of advanced technology like the use of refrigeration facilities etc.

3. Availability of ready market in the European countries.

4. Farmers plant grass like Alfalfa, which has lead to the increased supply of pasture and hence high production of beef.

5. There is good organization in the ranches and they are mechanized. Farmers use machines in the production process.

6. A good railway network, which help in transporting cattle to the factories and markets areas.

7. The government policy encourages the development of animal husbandry to take place at a large scale.

Advantages of Beef Farming in Argentina

1. It has encouraged the development of towns and ports like Buenos Aires, La Planta and Bahia Blanca.

2. It has facilitated the development of transport and communication system.

3. The ranches provide employment to people. For example in the estancias (or ranches) the employed cowboys called Gauchos drive horses around the farms to look after the cattle.

4. Argentina has provided a god example to other countries especially the developing countries like Tanzania, to copy and improve the livestock farming in the country.

Other products apart from beef are hides, fat, bone meat for fertilizer and glue made from horns and hoofs. The major limitations that are facing Argentina involve political chaos caused by the economic slump. There has been economic crisis leading to the devaluation of the local currency. This is going to bring problems in terms of investment and hence the beef farming section is also going to be affected.

SHEEP FARMING IN AUSTRALIA

Sheep are kept for wool or for meat. The sheep kept for wool require dry and cool conditions. The sheep kept for meat need wet conditions, which encourage a great supply of pasture. Sheep also provide the products like skin and milk.

Australia has a sheep population of over 135 million. Sheep farms are very large. A single farm can be having up to 50,000 sheep. Australia is the world's leading wool producer and more than 90% of her production is exported. The areas where sheep farming takes place are in the rolling downs on the western side of the Great Divide Range.

Factors that Led to the Development of Sheep Farming in Australia

1. The use of advanced technology like the use of refrigerators. Skilled labor is highly used in the production process.

2. Availability of pasture which can support large scale sheep farming.

3. Good climate healthy to animals and which provides rainfall leading to regular water supply.

4. Good soil that supports the growth of grass.

5. Reliable water availability due to the precipitation especially in the south – eastern part.

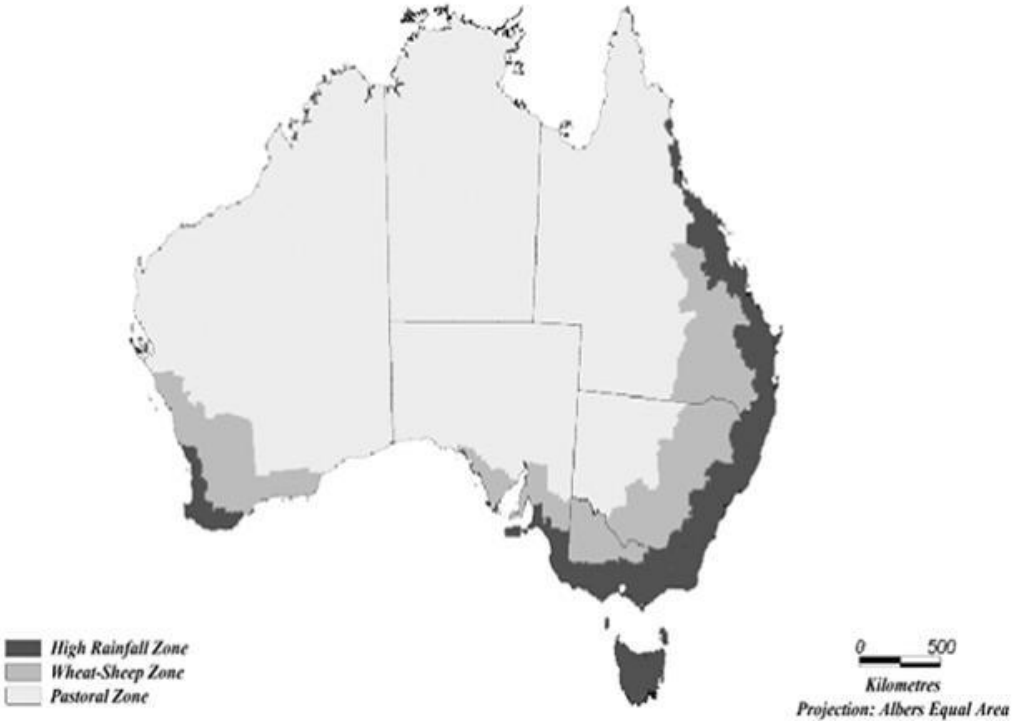
6. Ready market.

7. Good quality products because of the use of good animal varieties like Merino.

8. Good transport and communication.

In Africa sheep farming takes place at a large scale in South Africa. Tanzania also has sheep farming taking place especially in Iringa.

Map Diagram:-



DAIRY FARMING IN NETHERLANDS

Dairy farming is the keeping of animals for milk production. It is an intensive activity and the farmers are producing for sale. Apart from Netherlands dairy farming also takes place in Denmark and Kenya. But it is more developed in European countries than Tropical African countries due to the extremely high temperatures, poor technology, and poor quality of animals

and animal products, poor market, prevalence of disease and poor capital. In the Netherlands dairy farming is most intensive north of Amsterdam.

Factors that have led to the development of dairy farming in Netherlands

1. Plentiful availability of capital that is invested in mechanized methods.

2. The government policy favoring scientific .and commercial agricultural farming.

3. Good climate associated with mild winters. The climate is moderated by the warm ocean current and the wind that blow from the North Sea.

4. The land is flat allowing for easy mechanization to take place; especially cultivating the land for growing pasture.

5.Good soil that was reclaimed from the sea encouraged the growth of pasture leading to the reliable supply of food.

6. Reliable water supply by the rainfall, from the North Sea and the Lake Yssel. The rain fall is adequate and evenly distributed supporting Lush for pasture.

7. Large nearby urban markets.

8. Good animal breeds like Friesians, which dominate the dairy Farming in the Netherlands.

Chief Dairy Cattle Products

Milk, butter, cheese

DAIRY FARMING IN DENMARK

Unlike other European countries, Denmark is not endowed with basic raw Material for the development of heavy industries like iron and steel, or oil. Also, the country has been facing a great challenge from North America, which supplies the grains more cheaply than what are being produced in the country. Hence, it has emphasized on dairy farming which has become the main agricultural activity in the country. The Country is the one of exporters of butter.

Organization

The farms have long been organized into cooperative and are very small in size usually less than 20 hectares. The cooperatives are responsible for buying and selling .The cooperative

system is very effective in quality control, advertising and marketing. There are cooperative creameries, which collect milk from the farms in order to produce and market butter, cream and cheese. Cooperatives also provide farmers with processing facilities, credits, research service and advice. They also buy for them some machinery and farm input like fertilizer. Every dairy farmer is a registered to a member of a diary cooperative. Types of animals kept include Danish red (the traditional cow of Denmark),

Friesian that accounts for 75% of the dairy cattle in the country, Channel Island cows like Jersey (small), Guernsey and Alderney.

Factors for the successful Development of Dairy Farming in Denmark;

1. The use of mechanized methods due to the advanced technology. This is not the case in East Africa. Denmark is highly mechanized compared to East Africa countries. There are good facilities for processing and preserving the dairy products in all the cooperative farms.

2. Assured supply of pasture and the farmers grow fodder. They depend on fodder due to its high nutritional value and the nature of climate. The climate is too cold in most part of the year and hence discourages the growth of grass. From November to March the animals are fed in doors with fodder since it is very cold.

3. There are both local and external markets readily available for Denmark. This is due to the fact that the dairy products from Denmark area of high quality because of the use of advanced technology and nutritious food, that is fodder.

4. Good breeds like Friesian are widely kept (75% of all types of cattle) and these give high yield to the country.

5. There are good transport and communication systems, which facilitate the distribution and exportation of the dairy products. The use of internet service has facilitated advertising the sector in the other countries.

6. Good marketing system organized by the cooperatives encourages the farmers to keep on carrying out dairy farming activity.

7. High capital investment in dairy farming and growing of pasture especially fodder has encouraged the successful development of dairy farming in Denmark.

8. High yield throughout the year has been achieved by keeping of Animals indoors during severe cold condition where they are being Fed with fodder.

9. Availability of cheap food stuffs from other countries like North America, which provides cereals for feeding the animals.

Importance of Dairy Farming in Denmark;

1. It provides nutritious food that is milk.

2. People get income because of dairy farming leading to the rise in the living standards.

3. It has stimulated the development and expansion of the transport and communication systems and industries.

4. It is a foreign currency earner .E.g. Denmark is the fifth leading exporter of cheese and the sixth leading world's producer.

5. It has earned Denmark an international repute and has given a good lesson to other countries, which are undertaking dairy farming.

6. It has attracted tourist who come to study dairy farming from the other countries whose economies are based on agriculture.

MIXED FARMING

The system of keeping animals and growing of crops in the same farm Unit; USA in the Corn Belt (Maize Belt) is the best example of the Placer where mixed farming because of the factors like plentiful rain that Support plant growth, Fertile soils, the use of advanced technology, high capital available and conducive temperatures to $20^{o}C$. The maize produced in the Corn Belt is fed to the animals it is Used as the fattening area for beef cattle and pigs. Dairying in the Corn Belt takes place eastwards near the towns.

Problems facing live stock Farming in East Africa;

1. Lacks of capital for investing in the livestock farming since most of the farmers are poor.

2. Poor technology as a result of predominance of traditional methods. Livestock in many areas is not mechanized.

3. Disease and pests, which attack both animals and farmers, bring adverse effect to the livestock farming. In central parts of Tanzania like Tabora are infested with tsetse flies leading to the Decline in livestock farming in those areas .There are other disease like Foot and Mouth disease , Rinder pest, Nagana and anthrax that affect animals.

4. Transport and communication are still poor. Hence, distributions of Animal products become very difficult. Some of the roads are impassable during the rainy season.

5. Climate vagaries, which involve the occurrence of prolonged Droughts, lead to the problems of water and pasture supply. In some Areas there are problems of frequent floods like in Kilosa. This discourage livestock husbandry. Also, sometimes the temperature area very high the condition which is not ideal for exotic breeds.

6. Cattle rusting are another problem .This involves raiding of cattle and sometimes killing of people .This also discourages livestock farming.

7. The marketing system in East Africa unlike in Denmark and Netherlands is very poor due to poor condition. Also the local market is poor because of low purchasing among the poor people in the rural areas.

8. The breeds are of poor quality and improved breeds are very few and the local farmers are reluctant to keep them since they are used to traditional breeds, which are cheap to keep because of being more resistant to disease.

9. Little government concern is another hindering factor in the development of livestock husbandry in East Africa.

10. There is poor coordination in many places such that the livestock farming is not well organized.

11. The pasture in East Africa is poor and unpalatable to animals. The grass in this region is very coarse or rough hence not preferred by animals.

12. Poor education among the farmers make farmer adamant to accept some new changes in the livestock farming activity.

13. Socio cultural factors: In some societies people keep so many animals for prestige. Religious background tends to restrict keeping of some animals. For example, among Muslims it is prohibited to eat pigs since they are regarded as unclean.

14. Expensive medical services are another problem. The farmers are poor and hence they cannot afford the services.

What should be done?

1. There should be introduction of new breeds, which are of high Yield and quality

2. Farmers should be given comprehensive education so that they can accept good changes in the methods of keeping animals.

3. The government should be highly involved in livestock farming. I should be so instrumental in the formulation of good and practicable policies focusing on the promotion of livestock husbandry. It should finance some farmers and bringing to halt the problem of rustling.

4. There is a great need for the farmers to organize themselves and settle rather than keep on shifting from place to place and waste time.

5. The marketing system should be improved by setting good prices for the products.

6. Destocking should also be encouraged so that the number of animals can correspond to the carrying capacity of the land and its pasture.

7. The transport and communication system should be improved to facilitate the distribution of animals and animal products to the market areas.

8. Irrigation system should be developed to ensure constant supply of Good pasture, which is tender and palatable. Nutritious grass should be planted so as to promote production.

9. There should be high disease control like combating the spread of Nagana, which is caused by tsetse flies. This can be done through Large-scale fumigation of the pastureland with chemicals. Also Animals should be dipped and inoculated frequently.

10. Water supply can be improved through the construction of boreholes and water reservoirs. Rivers should be dammed to impound large amount of water.

In point form, enumerate the factors that limit the development of ranches in East Africa.

1. Water storage due to frequent drought that hit the region

2. Remoteness of some place due to poor transport and Communication system.

3. Pests and disease, which attack both animals and people, discourage this activity.

4. There is a great problem of lack of capital among small farmers.

5. Climate vagaries leading to seasonality in the supply of pasture.

6. People's ignorance and lack of attention to livestock lead to poor development in livestock farming.

7.Ranches are expensive to run since they need big initial capital and the local peasants can't afford.

8. Poor marketing system is another hindering factor.

9.The processing and preservation systems are also poor hence they discourage the livestock farming.

10. Social-cultural factors.

Problems Caused by agriculture

1. Deforestation that lead to desertification because of cutting trees a result of poor methods of cultivation and livestock farming.

2. Soil or land degradation as a result of the exposure of land after Cutting trees by farmers.

3. Environmental, pollution like air pollution by methane gas from the farms, carbon dioxide and carbon monoxide due to the burning of the bushes and grass. Also it has led to the pollution of soil and water because of the use of chemicals.

4. Depletion of soil fertility as a result of monoculture activities especially where there are plantation crops grown.

5. Agriculture has also caused conflicts between pastoralists like the Kilosa case in 1999/2000 in Morogoro.

6. The decline in agricultural, production because of problems like drought, disease and decline in fertility can cause food shortage .This is due to the fact that agriculture tends to be susceptible to these problems when there is no high care.

7. Agricultural success in certain place can attract high population leading to pressure for land.

8. Large scale agriculture leads to the decline of other economic sectors because of involving a lot of capital.

5.11 SOIL DEGRADATION AND CONSERVATION

Soil Degradation

Soil degradation is the deterioration (destruction) of the quality of the soil through the loss of fertile, pollution, and erosion and mass wasting.

Degradation renders soil useless for human development activities and unfit for the life of the biota.

Loss of soil fertility

This refers to the decline in the soil ability to support plant growth through the failure to provide necessary nutrient for plant growth.

Loss of fertility can be caused by:

1. Leaching process, this washes down the necessary nutrient in solution from the top soil. It makes soil become more acidic and hence toxic. It is common in areas, which are humid, and experience heavy rains.

2. Over cultivation in certain area as a result of the rapid population growth. The crops grown on the same piece of land for a long time leads to the depletion of soil nutrients.

3. Monoculture that involves the cultivation of crops without crop rotation or inter cropping .The nutrient are used up without replacement and the soil structure can be destroyed (soil becomes unstable).

4. Soil pollution due to the excessive use of chemical like pesticides and artificial fertilizers, dumping of harmful wastes in the soil and acid rain which make the soil toxic, structure less and hence unproductive.

5. Soil erosion accelerated by poor land management like deforestation, flat cultivation on the slope etc.

6. Mass wasting that leads to the loss of upper layer of the soil and its Nutrients.

7. Severe loss of soil water due to excessive vapor transpiration especially in the arid and semi arid areas.

Soil Erosion

Soil erosion is the wearing away, detachment and removal of soil material from one place to another place through the agents like water, wind and ice .Two types of erosion are often distinguished as:

Normal Geological Erosion

It's the widespread type of erosion that occurs wherever there is a natural flow of energy and matter on the earth's surface without man's influence .It is fortunately very slow and so not normally injurious to the soil cover of the world.

More often than not, its rate is either slower or equal to the soil formation hence its effect are rarely noticeable. Erosion under this category is easy to control.

Accelerated Soil Erosion

Is the type of erosion associated with man's activities (man induced). It is spectacular in nature (very destructive), therefore it has attracted man's attention .Its side effect include physical loss of soil nutrients, leading to severe economic loss arising from the reduced crop yield or total crop failure, and/or wasted effort and money spent on unsuccessful soil-conservation projects.

Factors that affecting (Controlling) Accelerated Soil Erosion

There are factors which can accelerate or decelerate the rate of soil erosion.

They include:

1. Physical Factors;

- **Climate:** Where there is heavy rainfall erosion tends to be severe while where there is low rainfall erosion is also low.
- **Topography:** On steep slope soil erosion can be high while on the gentle slopes the rate of erosion tends to be low.

- **Nature of soil**: This depends on its characteristic features like texture, structure, permeability etc. Unstable soils with coarse Texture are prone to severe erosion compared to the fine textured stable soils.

- **Vegetation cover**: Where there is dense vegetation soil erosion is checked. But where is scanty or no vegetation soil erosion take place easily.

2. Human Factors;

1. Good management of the soil which involves the way human being uses the soil wisely and skillfully and undertaking conservation measure to reduce or mitigate erosion through afforestation, terracing, strip cropping, crop rotation, contour ploughing, inter cropping and restocking.

2. Poor management that involve injudicious (unwise use of the soil through over cultivation, mono-cropping flat cultivation over-grazing and deforestation).

3. The increase in population leads to over exploitation of resources especially minerals, forest and over cultivation.

Agents of Soil Erosion

Water is the most important agent of soil erosion. The erosion by water Involves:

- **Splash erosion:** caused by rain drops.

- **Sheet erosion:** which involves the removal of the uniform cover of the soil, by surface run-off on gentle slopes.

- **Rills erosion:** that leads to the formation of same channels called rills on the surface.

- **Gully erosion:** that leads to the formation of deep troughs called gullies due to severe undercutting.

- **River erosion:** take place in the specific channels called river valleys.

Wind is another agent of soil erosion. It takes place in arid and semi-arid or where the soil is loose Gravity leads to the gradual movement of weathered material down the slope without involving transport agent. The spontaneous Material movement causes soil erosion. It is influenced by the nature of slope.

Human Activities which can Cause Soil Erosion

1. Poor cultivation methods like mono cropping (monoculture) flat Cultivation splash and burn in shifting cultivation.

2. Mining which leads to the creation of pit, deforestation etc.

3. Construction activities like building houses, establishing roads, etc. excessive cutting trees for lumbering and source of fuel. This causes the loss of vegetation species (deforestation).

4. Overgrazing which leads to the destruction of grass, leaving the land bare and hence exposed to erosional agents.

5. Casual Burning of vegetation to encourage fresh grass, which can Be good for pasture. This is common in the tropical areas.

Effects of soil Erosion

Soil erosion leads to the following effects;

1. Pollution of water bodies due to the introduction of material eroded from the surrounding areas. Some of the materials are toxic in nature.

2. Loss of fertility which in turn causes the reduction in yields or total crop failure. This can then lead to the occurrence of famine and death of people.

3. Migration of people from areas, which have been affected to the areas, which have not been affected by erosion.

4. Over flooding of the rivers as a result of the creation of the small channels leading to the river systems.

5. Deforestation as a result of the death of plants due to the loss of soil.

6. Reduction in the size of the arable land. This leads to poor crop production since people concentrate on a smaller land that is not sufficient.

7. Loss of the habitat as a result of deforestation caused by the loss of soil.

8. Soil erosion can accelerate rock weathering by exposing the underlying rock to the weathering agents like temperature etc.

9. It leads to the costs incurred in during the process of conserving the soil, which has been eroded.

10. Soil erosion can destroy transport and communication systems like roads, railway line and telephone posts.

11. It can lead to the destruction of houses rendering people homeless. Important economic schemes can be destroyed such as tourist resorts when the hotels collapse and decline of the irrigation schemes. This can contribute to the escalation of poverty.

Soil pollution

Soil pollution refers to the introduction or presence of any substance in the soil which adversely affect the soil quality. The substance which pollutes the soil is called a pollutant.

Sources of Soil pollution

Pollution can be from the atmosphere, industries, home stead and agriculture areas.

1. **From the atmosphere:** The pollutants are introduced through the acid rain. These make the soil become acidic and hence destroy the soil structure and killing the plant. Acidic rain is predominant in the industrialized areas like Germany.

2. **From the industries**: Some chemicals, radioactive material can be introduced into the soil and render the soil unfit for agriculture. Some of the chemicals are poisonous therefore they kill plants after getting into the soil.

3. **From the homesteads:** Some wastes like metal materials, bottles, plastic bags, cans etc lead to the pollution of the soil.

4. **From the Farms**: Chemicals like pesticides e.g. DDT, crop remains, fertilizers can be produced and get into the soil under the influence of rainfall.

5. **Irrigation:** agriculture encourages the accumulation of salt (Stalinization) in the upper soil layer .Also agricultural activities can cause negative pollution of soil through the depletion of vegetation.

Effect of Soil Pollution

1. Decline in fertility because of addition leading to the decline in crop production.

2. Destruction of soil structure and texture.

3. Death of soil biota (organisms), which are very important in the decomposition of organic matter.

4. It can lead to water logging or flooding due to poor drainage. It interferes with aeration making the soil unproductive.

5. It makes man incur a lot of costs when trying to fight against the problem of soil pollution. For example liming for reducing acidity in the soil and flushing so as to reduce soil salinity.

6. Soil pollution can also lead to people's migration to the areas, which are not affected by pollution.

7. Crop failure yields caused by pollution leads to the occurrence of famine, which in turn causes poor health, and death of people.

Soil Management and Conservation

Soil management: refers to the skillful or wise use and control of the quality of the soil (land) resource.

Soil conservation: refers to the process of preserving the soil for proper and sustainable use.

Why Undertake Soil Conservation?

1. To maintain the quality of the land preventing it to get exhausted and become totally unproductive.

2. To improve or restore the quality of the land where there has been exhaustion as to promote production.

3. To get more land and produce more products for satisfying the burgeoning population in the countries.

4. To ensure that the coming generation can benefit from the same land used today.

Conservation methods include the following:

1. **Educating people** so as to promote the land management ideas among the people. This should be undertaken by the government and some committed individuals.

2. **Training and encouraging the farmers to use proper farming methods** like crop rotation, inter cropping, use for organic manure, Strip cropping, Contour ploughing and deep ploughing.

3. **Planting of cover crops, afforestation and reforestation** in order to check soil erosion by reducing the speed of water on the surface.

4. **Reducing and stopping the use of pesticides** like dieldrin, DDT, and artificial fertilizers, which tend to destroy the soil.

5. **Recycling of wastes** rather than dumping them into the soil.

6. **Restocking** in order to avoid overgrazing that leads to the destruction of grass.

7. **Encouraging dry farming** that involves mulching in order to reduce Loss of water through excessive evaporation especially in the dry areas.

8. **Land filling** with brushwood should be used where the soil has been severely eroded production gullies.

9. **The population should be controlled** so as to discourage the excessive exploitation of resources, which leads to land degradation.

10. **Alternative sources of energy** should be explored and used to avoid the excessive use of forest materials and oil, which cause hazard to the environment.

11. **Radioactive materials** should be dumped very deep in the soil to prevent the upper soil layer from being highly affected.

12. **Terracing, construction of stone lines** (in Burkina Faso) and **check dams** (in China) so as to control the movement of water and force to get into the ground rather than flowing like the surface run-off.

13. **Developing other economic activities rather than depending on agriculture** only especially in the developing countries.

14. **The government should formulate good policies** which advocate community participation, land tenure and encourage the proper use of the land. Where possible people should be given financial support so as to invest in scientific agricultural techniques (which are not precarious to the soil.)

CASE STUDIES

SOIL CONSERVATION IN THE USA

Soil erosion has been a major problem in the USA and the TENNESSEE Valley is a renowned area in the world where severe problem of erosion has been successfully controlled. The River Tennessee is a tributary of River Ohio, which in turn is a tributary of the Mississippi. The river drains through many states in USA.

Soil Erosion which used to be a Menace in the Areas was caused by:

1. Deforestation as the land was cleared for cultivation. Clearing of the forest propelled by the growth of population in the area.

2. Periodic flooding during the rainy season resulting from the surface run-offs from the Application Mountains.

3. Poor farming methods like monoculture where were practiced in the area especially growing of corn and cotton.

4. Steep slope of the Appalachians accelerated erosion. These entire plus the problems of silting and disease like malaria led to the decrease in agricultural production.

To control soil erosion along the Tennessee Valley the US

Government established the development Authority called the Tennessee Valley Authority (TVA) in 1933. The TVA covered the states, which are drained by the river namely West Virginia, North Carolina, South Carolina, Georgia, Kentucky, Tennessee, Alabama and the TVA also covered the Tennessee's major tributary, Cumberland.

Steps Taken by TVA to Control Erosion;

1. Constructions of 32 dams were constructed across the main rivers and its principal tributary.

2. Reforestation was done especially on the steep slope of Appalachian Mountain slope.

3. The gullies were filled with brushwood to prep the eroded soil Particles especially silt.

4. Encouraging farmers to use modern and sound agricultural methods Like contour ploughing, terracing, strip-farming, crop rotation and fertilizers and insecticides.

5. Planting of grass or cover crop on the steep slopes so as to combat the Impact of the surface run-off.

Apart from soil conservation and flood control TVA had long term plans of improving the living standards of the people, improving navigation, developing HEP generation Centers and improving the land use along the river basin.

Success of TVA

Remarkable results of TVA include the following:

1. Reliable water availability from the reservoirs for irrigation in the events of droughts, domestic use and industrial development.

2. Improved navigation along the Tennessee Rivers so that it could be used throughout the year.

3. Availability of HEP to many people.

4. Industrial development was encouraged especially as a result of HEP supply.

5. There was creation of many tourist attraction including national parks.

6. Improvement in the fishing industry leading to the increased supply of proteins.

7. It added to another source of income in the country especially foreign currency earnings due to tourism etc.

8. Heavy industries were established like machinery and aluminum melting at Birmingham in Alabama and Atlanta in Georgia. Atomic power station and aluminum smelting at Alcoa.

Conclusion

TVA project in the USA is an outstanding example of how planned programs can be made to work successfully. With sound planning, careful resource management and human cooperation, men can overcome the `most hostile environment or rehabilitate a devastated region. If this kind of project could be done in the underdeveloped countries of the world many of the poor could be better-fed and hipper human beings.

The positive results in soil conservation were due to:

1. Financial position of the country hence it could be easily to invest in the conservation programs.
2. Good and advanced technology used in the conservation process.
3. People's readiness to accept some advice and changes.
4. Strong cooperation among the people.
5. Close government involvement.

SOIL CONSERVATION IN TANZANIA

Tanzania has also been experiencing the problem of soil erosion in many parts .This has been affecting agriculture in a negative way through the loss of fertility and the reduction in the size of arable land. **Poor cultivation methods on the slopes**, **overgrazing in some places**, **deforestation because of cutting trees and over cultivation are some of the causes** which have been responsible in the occurrence of soil erosion in different parts of Tanzania. The problem of population pressure in some places has been so instrumental in the facilitating deforestation and land fragmentation.

Soil Erosion and Conservation in Kondoa (Tanzania)

Kondoa is the one of the areas, which has been affected by severe soil erosion. It was caused by:

1. Unstable soil due to semi aridity.
2. Sporadic heavy rains that tend to wash away the loose of soil materials.

3. High population in the area led to the destruction of vegetation.

4. Hilly landscape on which water runs fast.

5. High animal population that led to overgrazing.

There are different strategies, which have been used in Tanzania so as to Curb this problem both at an individual level, village level, regional level and National level. Some of the strategies are:

1. Contour ridging on the slopes of the highland and hills. This is practiced widely in Rukwa , Tabora , some parts in Mbeya (Mbozi and Rungwe) and Iringa.

2. Using farm yard manure to restore fertility. The use of farm yard manure is common among the Sukuma, Ukara-Ukerewe and Sumbawanga Where people collect cow dung from the grazing areas or cattle sheds.

3. Fallowing is also practiced whereby people leave the land uncultivated for sometime especially after exhaustion so as to regain its fertility.

4. Resettlement scheme or villagization programs were introduced with the aim of improving the land use and stop shifting cultivation, which is a poor method and detrimental to the environment.

5. Encouraging crop rotation so as to stabilize the soil.

6. Planting drought resistant crops in the widely cleared dry lands.

7. The use of leguminous plants like sun hemp (marine) and cultivation of groundnuts as well as beans so as to maintain fertility. sun hemps are used in Ruvuma (in Namanjule villages), Dodoma ,Mbulu ,Tanga ,Rukwa ,Iringa , Songea, Mbeya Especially in Mbozi and Kigoma sun hemp is used as a weed killer ,insecticide and fertilizer and was brought by the Tanzania government from Indian in 1942,sun hemps are highly recommended as a cheap and easy technique of maintaining fertility.

8. The use of Ngoro farming system in Umatengo (Mbinga) District in the southern part of Tanzania. In this system the crop are planted on the ridges and all the waste matter is thrown into the pit so as to get rotten future use as manure.

9. Inter cropping in which perennial crops are combine with food crops. The perennial crops add up fertility through shedding the leaves. Inter cropping help in stabilizing the soil hence

checking soil erosion .For example in Moshi people are inter cropping beans or maize with coffee and bananas.

10.Restocking has been encouraged coupled with the introduction of Modern and proved breeds. In many areas many farmers are practicing Mixed farming at a small scale and zero grazing (indoor rearing). This Reduced pressure on land has given room for the improvement of soil quality. E.g. Mixed farming is now being practiced in Mbeya, Moshi and few areas in Iringa and Sumbawanga. Commercial ranching has been established for proper management of both animals and pastureland. Rotational grazing in paddocks is being practiced so as to avoid causing land degradation.

11.Afforestation programs like HADO 'Hifadhi Ardhi Dodoma" were Introduced in which the trees were planted to prevent soil erosion and combat the drought conditions.

In 1967/1968 financial years the government instituted village afforestation programmers as a means of alleviating both fuel, wood scarcity and reserving soil degradation problem. Mbeya also responded to the programs and began planting trees. In 1980 the institute of Adult Education in conjunction with the Ministry of Natural Resources and Tourism and the Ministry of Education and Culture instituted intensive educational campaign on village afforestration and reforestation. Also books titled "MISITU NI MALI" (Forest are Wealth) were published and set posters on the theme of deforestation and desertification have been produced. Likewise the government has declared other areas as forest reserves e.g. in Mbeya the forest reserves cover about 422,000 hectares (about 75% of the total areas of the region).

12. Mulching is also used to prevent erosion and excessive evaporation when the grass decays it adds to the soil fertility.

13. Terracing is also used in some areas associated with planting of grass, which provides a uniform cover, and reduces the speed of the running water down the slope.

14. There are some programs for educating people both in schools and in adult classes such programs are also disseminated on the radio, through newspaper, printing on the vests and matchboxes which carry information that encourage environmental conservation.

15. Introduction of irrigation schemes in some places like in Usangu, Dodoma, Kilombero and Nyumba ya Mungu etc.

Drawbacks Hindering Soil Conservation in Tanzania

1. Financial problems due to poverty among the farmers they therefore can't invest in the modern programs of oil conservation.

2. Low commitment among the members of the local government and individuals reforestation programs. The National tree planting Campaign that was stated in 1999 has not yet realized good progress so far.

   The problem associated with the tree planting campaign is that the trees, which were planted, were not carried for they were forgotten and literally abandoned to die; thereby sabotaging the conservation campaign. Also there was no specific organ given the task of supervising the planting and caring processes. Nonetheless, the government leaders are still stressing on the necessity of planting more and more trees so as to conserve our environment. Those who have planted should take care of them so that those which have been planted can grow and survive into full maturity.

3. Lack of effective and efficient coordination of the soil conservation activities both at a local level and at a national level.

4. Rapid population increase creating pressure on the land and its resources the land is cheap resource; any need for excessive population (like food) is met by exploiting land resources especially through agricultural activities.

5. Most of necessary information is confined in urban areas and people in rural areas are not yet reached due to transport problems.

6. Political problems siphon a lot of money in the process of solving them. So most money is directed to these problems rather than solving environmental problems, which use extravagant amount of money that could helping soil conservation.

7. There low international support.

Problems of Agriculture in Tanzania:

1. **Soil erosion:** This destroys the land in many parts of Tanzania especially increase like Usambara, pare and Kondoa–Iringa areas.

2. **Unreliable and poorly distributed rainfall:** sometimes there long droughts leading to crop failure while at times it is too much leading to flood is unevenly distributed due to relief, wind and the over head sun.

3. **Temperature, diseases and pests**: The tropical climate encourages the trivial of diseases and pests, which harm people, crops and animals in the farms. For example fungal diseases,

bacterial diseases and malaria are a rampant problem in Tanzania. Pests include army worms, quell, locusts, and grasshoppers and stalk borers. Animals like monkeys and pigs attack crops in the farms.

4. **Too seasonal rivers:** There is a big problem with rivers such that sometimes they go dry leading to problems of water availability in the irrigation schemes. Dams are not constructed due to the lack of capital.

5. **Land shortage:** In some places due to overpopulation like in the Chagga land and Umatengo etc, some people are landless. In those areas land is highly fragmented and hence mechanization is difficult. Apart from overpopulation other areas are swampy mountainous have mining pits, etc leading to problems in cultivation.

6. **Poor knowledge and low technology:** Most of the farmers use poor farming methods due to poor knowledge and low technology. In some places the farmers are illiterate and hence they cannot learn new methods of farming easily since they are still conservation and adamant to accept new and positive changes.

7. **Poor marketing system:** The internal market is poor due to low purchasing power among them is bought on credit without being paid early. The international market is also poor due to price fluctuation. Sometimes the prices are very low discouraging the farmers to a great extent.

8. **Gender discrimination and inequality:** Women are the ones who are involved more in agricultural products and land. They are not involved in the decision making process, they are not well trained and do not own land because of poor cultural traditions. This contributes to the decline of agricultural production in Tanzania.

9. **Poor transport and communication:** Some areas are like Rukwa, which is one of the granaries of Tanzania, experience great problems of transport and communication. Hence, ferrying of agricultural products, disseminating information on new agricultural techniques and distributing important services that support agriculture become difficult. The villages in these areas are badly hit by this problem. For example in 1980's a lot of crops got rotten in Rukwa due to poor transport at the same time some people in Shinyanga were starving because of shortage of food supply.

10. **Poor storage facilities:** Most of the farmers in rural areas do not have good storage facilities such that they cannot store properly their produce. Most of the agricultural products go bad leading to great losses.

11 **Too much selectivity:** Some communities are used to certain type of food crop and are not ready to switch to another type of crop. Such that once that crop fails they get problems of hunger while they could as well grow another crop that could serve the same purpose. For example some people in Rukwa are used to maize and hence they find it difficult to grow cassava during the drought period. Hence they end up getting problems of food supply.

12 **Agricultural policies:** They have not been so emphatic on agriculture due to the diversification of priorities. Unlike in the USA and China, the policies have been so soft such that agricultural development has been dwindling time from time in the rural areas. This has led to food shortage such that Tanzania has been importing some food from outside despite having great potentials for producing adequate amount of food.

13. **Rural- urban migration:** People especially the young ones, are so mobile moving from rural to urban areas Rural–urban migration has negatively affected agriculture in Tanzania. Many young people are living in the village and flood the towns leaving the rural areas with young children and the old people who cannot effectively and efficiently engage themselves into agriculture.

What should be done?

1.There should be comprehensive schemes for undertaking soil conservation by the methods like crop rotation ,controlled grazing, contour, farming, dry farming (mulching), terracing and strip cropping as well as facilitating the processes of restocking ,afforestation and reforestation.

2. Educating people both in the school system and out of school (formal and non –formal education) on how to apply sustainable method of cultivating.

3. There should be high disease and pests control by cleaning the thickets, draining water, from the ponds and marchers, spraying the crops with chemicals, improving health care centers and developing researches on different disease etc.

4. Introduction of irrigation schemes. Hence reservoirs or dams should be constructed to ensure constant supply of water in the farms, such attempts have been made in Tanzania like the Nyumba ya Mungu dam, Mtera dam, Mindu dam in Morogoro etc.

5. Construction of better roads, good storage facilities etc. International linkages should be improved so as to facilitate the diffusion of new technology to our country.

6. Land reallocation and resettlement schemes should be reviewed, for example during vulgarization there were problems of sending some people to which were not fertile. Hence, before establishing a settlement anywhere, there should be profound preliminary surveys so as to assess land suitability for settlement.

7. Rural-Urban migration should be reversed. This can easily be done through investing in the rural areas. Great economic projects should be launched in the villages so as to promote the living standard of the people in rural areas and make people stay instead of moving to towns. Once rural areas are more developed some urban dwellers can be attracted to rural areas.

8.There should be improvement in the marketing system. Internal market can be improved through the development of cooperative boards the way it was with NMC, establishing local industries that are agricultural oriented like textile industries and food processing industries. Good price should be set and the payments should be done immediately. External market can be improved by trading with other countries with high quality crop products, uniting to promote bargaining power in the world market, diversification in the world market etc.

9. Another measure of improving agriculture is by empowering women so that they can also have more rights and greater room for participating in giving their own views on the way of improving agriculture .Women should also be given land to own in order that they can take of it and hence produce effectively. Men also should be actively involved in the agricultural activities so that the great burden or work low that women are having can be reduced.

10.Maintaining peace in the country so that people can settle and concentrate on production rather than keep on the fleeing as, refugees to other countries. Peace can make people engage effectively in agriculture since they will be feeling secure but when there are conflicts a lot of time and resources are wasted in wars and famine becomes a common factor dominating the country's course of life.

11.Comprehensive guidance and counseling programs should be launched in order to educate, especially the young people on the dangers of the killer disease HIV/AIDS which is claiming the lives of a large number of young and energetic producers. These programs should be organized by both government and non-governmental institutions as well–willing individuals so as to effectively make concerted efforts in combating this disease. In many parts of the country HIV/ AIDS has led to the problem labor shortage as a result of the death of the young people.

GUIDING QUESTIONS

1. **Write short notes on** the following terms.

a) Ranch.

b) Ranching.

c) Beef farming.

d) Dairy farming.

e) Restocking.

2. What are the factors hindering the development of ranches in Tanzania?

3. Identify the advantage and disadvantage of ranching in Argentina and USA.

4. Outline the factors that have lead to the development of beef farming In Argentina.

5. Show the role of sheep farming to the economy of South Africa

(Show its advantage).

6. Why is beef farming more developed in the temperate areas than in Tropical area?

7. Identify the measures that can be used in combating the problems facing large scale farming in East Africa.

8. How does the rapid population growth affect livestock farming in Africa?

9. Show the effects of livestock farming on the environment.

10. Why mixed farming is more developed in the USA Corn Belt than In Tanzania?

11. Mention the tribes involved in the following agricultural systems.

a) Shifting Cultivation in West Africa..

b) Nomadism in East Africa.

c) Semi-nomadism in Tanzania and Uganda.

12. Mention the examples of the countries where the following

Agricultural systems take place.

a)Mixed farming.

b)Dairy farming.

c)Beef farming.

d)Sheep ranching.

13. Mention the factors that influence agricultural development in any country.

14. How is nomadic pastoralist carried on and organized?

Support a wide range of light and heavy industries around changing (Chunking) and Chengdu (Chengtu). Lesser deposits occur in the province of Yunnan, Guizhou(Kweishow), Jiangxi (Kiangsi) and human- serving local demand only.

Factors, Which Have Facilitated the Use of Coal as a Source of Energy in China

1. The presence of large deposition of coal almost in all provinces.

2. The presence of heavy industries, which need great amount of power to run effectively. These industries have provided market for coal.

3. The use of mechanized methods in the extraction methods due to the advanced level of technology in China.

4. The presence of well-developed transport system especially the railway system has facilitated the distribution of coal.

5. Easy accessibility of some place like Manchuria has also facilitated the extraction of coal deposits and hence high use of coal in china.

6. Depth of coal deposits has been another factor. In some places like Fusion and fixing cheap open-cast methods are used in the extraction of coal. since the deposits lie the surface.

7. Labor availability due to high population in china .Labor has not been a big problem in the mining of the coal.

Importance of Coal Mining in China

1.It has stimulated the development of industries in the countries in the Heilungkiang province. Heilungkiang heavy industries make steel, machinery ,cars, tractors, etc, This has been possible since Manchurian Coal seams are thick, easily accessible and are having some high- grade coking coal.

2. It has provided employment to many people in the country reducing the problem of unemployment in such most population country in the world.

3. It has contributed to the generation of the government revenue and creation of capital to be invested for further economic development in the country.

4. Coal mining has stimulated the development of transport and communication systems like railway lines, roads etc. There are car industries, shipbuilding industries and other transport- oriented industries, which have developed as a result of the impact of coal mining.

5. It enhanced the development of mechanized agriculture through the promotion of heavy industries .Heavy industries have been produced some farm machinery like tractors and combine harvesters. This has enabled China to feed its high population.

6. It has also contributed to the improvement of the living standard among the people. This has been a result of the improvement in the supply of social service like education, medical treatment, power etc.

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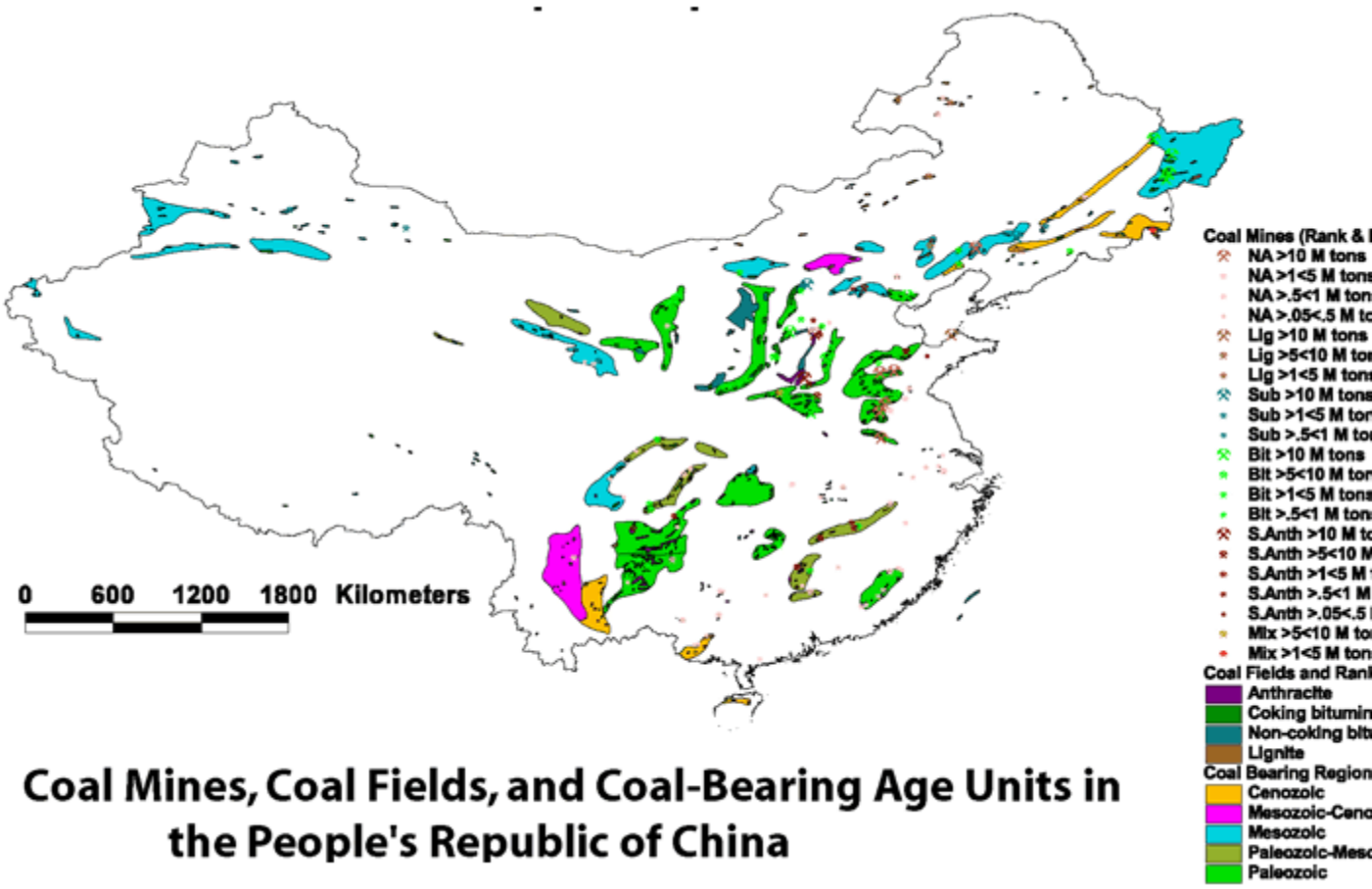


Coal Mines, Coal Fields, and Coal-Bearing Age Units in the People's Republic of China

Problems Encountered in the Extraction of Coal in China

1. In some places the deposits are becoming deeper and deeper leading to the rising of a expenses of coal extraction.

2. Some coals seams in some places like Mongolia are folded or faulted creating problems in the extraction.

3. Some deposits are so scattered like in the Sichuan coal fields.

4. Coal is an unclear source of energy that creates some health problems when extracting.

5. There is a stiff challenges posed by other countries like the USA and Russia, which also procure coal.

6. Opposition from the environmentalists who are discouraging the use of coal as source of energy and like salary energy, wind power etc.

7. Exhaustion of coal deposits in some places contributes to the decline in total production of coal in the country.

EXTRACTION OF COAL IN THE USA

The USA is the world's leading producer of coal and her major coalfields include the following:

1. **The Eastern region** (**Appalachian fields**) which is the most productive region .The area produces about 70%of all USA coal . The coalfields include Pennsylvania field producing anthracite and coking West Virginia coalfield, which produces steam, coal and household, coal and Alabama coal fields which are minor deposit.

2.**Interior region** (central coal fields) is the second major producer of coal in the USA producing mainly bituminous coal. It extends from Lake Huron, Indiana, Illinois, low, Missouri Kansa, Oklahoma and Arkansas. Coal produced in this region serves large market in the Great lakes shore lands, Middle West and other industrial district in the region. This region contains USA major conurbation of Pittsburg.

3.**Gulf region** which include the states of Texas, Alabama, and Arkansas. Hence lignite coal is found in scattered deposits.

4.**The rocky mountain region**. This has the greatest American coal reserve but has not been exploited much because of its inaccessibility and distance from the markets. Coal produced in this region is mainly of lignite and low- grade bituminous types.

5.**The pacific region** has small coal deposits that are of limited local importance .The fields are Oregon, California and Alaska as a reserve for future supply.

The methods used in the extraction of coal in USA include simple stripping (open cast) method like in the western interior where the seams are horizontal and near the surface ,shaft method in some parts of Appalachian field where the seams are deep situated and audit (Hill slope boring) method where the seams are exposed on the valley side

Factors that have facilitated Coal in the USA

1. Availability of coal deposits, some of which are very large, of high quality and easy to work.

2. The use of mechanized methods in the extraction of coal from the ground.

3. The presence of large iron deposits required for metallurgical industries demanded great amount of power, which was then to be obtained from coal.

4. Well –advanced transport system, which made accessibility easy, and transportation of coal effectively done.

5. Strong support by the government, which was eager to enhance the supply of power so as to hasten the pace of industrial development in the country.

6. Availability of both capital land labor made the coal mining process develop at a high speed.

Importance of Coal in the USA

1. It has stimulated the development of iron and steel industry in Birmingham and Pittsburg district(the iron and steel capital of the world), pharmaceutical industries and the making of locomotives.

2. It has led to the creation of employment opportunities for many people of USA.

3.Transport and communication systems have developed fast in the country due to the supply of power. There has been development of locomotives, which play a great role in the transportation system.

4. It has led to the creation of capital that has been invested in other sectors like agriculture, tourism.

Limitations of Coal Mining in the USA:-

1. Problems in mining where there are faulted and contorted seams especially in the North, Eastern Appalachian coal fields despite having an excellent anthracite coal.

2. Some deposits are small, scattered containing low-grade coal like the Pacific region.

3. Inaccessibility of some places like the Rocky mountain coalfield due to the difficult terrain, and distance from the market. The Rocky mountain region has the greatest reserve but the coal is of low grade.

4. Other sources of energy like Nuclear power, Solar power, Wind energy, HEP are posing a stiff challenge or competition to coal. For example the presence of oilfields in the interior provinces has negatively affected coal production.

5. Coal is a non – renewable resource hence it has been getting exhausted due to exploitation.

COAL EXTRACTION IN SOUTH AFRICA

South Africa has coal deposits and is the foremost coal producer in Africa. First coal was mined at Molteno in the Cape Province (1864). In 1879 the revenging was discovered.

Main Producing Areas

1. **Transvaal:** Is the largest producing approximately 62%. Transvaal Wit bank collieries are the heaviest producers and coal is good (system coal) but rather unsuitable for cooking. Its rapid exploitation is due to its closeness to the rand and ease to extraction. The seams average 60 ft thick and lie close to the surface. Mining is safe due to stable seams with little gas. These factors and low labor costs make the coal mining the cheapest in the world. Other major mining centers in the Transvaal include Verceening, Ermelo, Belfast and Boksburg.

2. **The Orange Free State:** Coal mining in this region is confined the northern fringe centered around Vierfontein, with small mining zone south – east of Vereeniging where low quality coal goes to the power station near Klersdorp on the veal and the Saxonburg plant for extracting oil from coal.

3. **Natal Coalfield:** The chief mining centers are Vryheid, Utrecht, Dundee and New Castle. The seams in Natal are thinner and more countries faulted but there is much high-grade cooking and steam coal.

Factors which have Led to the Development of coal mining in South Africa:-

1. The technological advancement that facilitated the exploitation and the mining process. Extensive exploration was done unlike other countries like Tanzania.

2. Low cost labor was readily available especially from the neighboring countries like Mozambique and Malawi who went there as migrant laborers.

3. Ease of mining because of the deposits lying close to the surface.

4. Good transport and Communication system in the mining areas has facilitated the development of coal mining in South Africa.

5. Closeness of the coal deposits to the industries areas stimulated the development of coal mining since no much costs were involved in the transportation coal.

6. The strong need for oil fuel has made South Africa produce a lot of coal for the sake of extracting oil. It does not have oil deposits therefore it extracts oil from coal at Sasolburg; Sasolburg uses 60% of coal for producing oil.

7. Large seams of coal in South Africa give confidence of the continued coal mining in the country. This aspect has encouraged the investment in the coal mining.

8. The government of South Africa has been putting much emphasis on mining and hence a lot of great investments were made on mining and hence a lot of great investments were made on mining and these covered coal mining.

9. Large external demand from Europe and elsewhere also stimulated the Development of coal mining in South Africa.

Importance of coal mining in South Africa

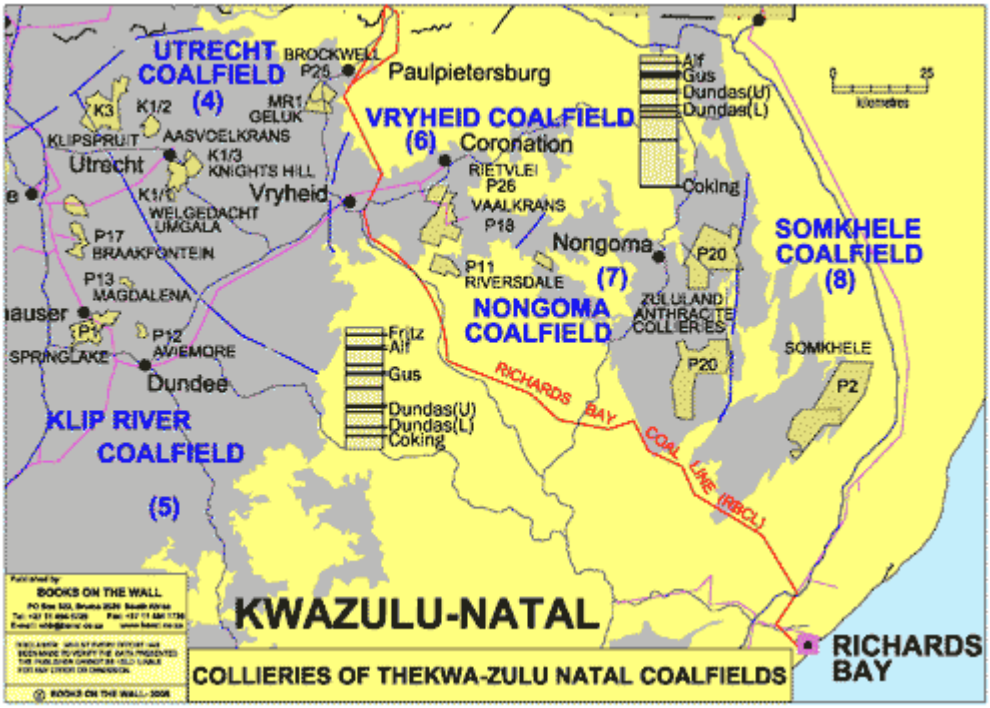
1. It has highly stimulated the development of transport systems in the country ranging from roads, railway lines etc.

2. There has been fast development of different types of industries in the country because of providing power. For example cooking coal has stimulated the development of iron and steel industries in Vereeniging, Durban, new Castle, Pretoria and Johannesburg. These are locomotive industries which have developed because of the influence of coal production.

3. Coal mining has also contributed to air pollution by introducing green house gases like carbon dioxide and carbon monoxide as well as water pollution.

4. Health deterioration among the workers since coal is a dirty energy resource.

5. It has also contributed to the labor shortage in Malawi and Mozambique because of labor migrants from these countries to the coal mining areas in South Africa.



Limitations facing coal Mining in South Africa.

1. Rising coasts of mining due to the aging of machines and deepening of mines.

2. The problem of coal exhaustion as a result of over dependence on coal as the source of energy. For example coal is used for fuel oil extraction. This has encouraged an over exploitation of coal in South Africa.

3. There are stiff challenges posed from other environmentally friendly and sustainable resources like solar energy, water, wind, power, as well as the upcoming challenge from the increased use of nuclear energy, which is more economical and clean compared to coal Nuclear energy is produced from Uranium in South Africa.

4. Despite the abolition of the apartheid system, there some occasional conflicts, which occur between Africans and the bores creating, labor unrest.

5. Water problem is another hindrance. This is because of the fact that large part of South Africa does not get heavy rains and the rivers are short running away from the interior part of the country to the oceans. Hence, water shortage is experienced and that which is available is under high competition from mining section, agriculture and manufacturing industry.

6. Labor competition with other mining sectors as well as industries. Other mining sectors like gold mining, diamond mining, etc are regarded as more precious and hence more paying than coal. Therefore, more people go to those mining areas leaving the coal-mining sector suffering from labor drain.

7. Another limitation factor is food shortage since the arable land is small and many people are concentrating on the mining activity and manufacturing industries.

8. Staunch opposition from the environmentalists, who are diligently advocating for the use of environmentally friendly energy sources rather than coal, which is harmful to the environment.

COAL IN TANZANIA

Tanzania has large reserves in the South West of the country in the Ruaha basin, the Katewaka – Mchuchuma area and Songwe – Kiwira area.There is active mining taking place in Songwe – Kiwira to supply coal to the cement industry in Songwe. The reserves at the Ruhuhu basin and the Katewaka – Mchuchuma areas are estimated at over 500 million tons of recoverable high quality coal. According to a specialist on ecological engineering at the University of Dar es Salaam, Dr. Mkilaha, researches show to those found in South Africa and Australia. (Business Times 22/2/2002, page 3). Dr. Kilaha said Tanzanian coal is suitable for domestic use, manufacturing industries, and power generation.

Mchuchuma – Katewaka is the leading coalfield in Tanzania. It is has the coal that coal generate about 400MW using Circulating Fluidized Bed Combustion (CFB) technology that has been proposed to take off. Experiments are being conducted to determine if Tanzanian coal can be mixed with biomass to produce less pollutant substances. This will involve mixing the coal with biomass in boilers so as to reduce such pollutants like Nitrogen Oxides, which are culprits for the acidic rain to be over 20 million tons. In this zone lies the future potential for development of heavy industry in East Africa.

The National Development Corporation (NDC) has established the project proposal for establishing the thermal plant 287 kilometres from Makambako town envisaged to consume about 1.38 million tons of coal annually (Business Times 22/2/2002, page 3). It is estimated to cost US$ 660 million and generate 400 Megawatts from burned coal. The heat energy would then be converted into electric energy. NDC experts that the first unit of the plant will be accomplished in 2004, to implement the project the NDC plants to involve the private sector. In the plan, it is proposed to create a private power subsidiary owned by NDC. This subsidiary will then select an Independent Power Producer of international reputation and experience to be a partner in a joint venture company. Meanwhile the Environmental Impact Assessment done by

experts sponsored by the government and the World Bank revealed that the envisaged project for utilization of coal deposits at Mchuchuma Katewaka is viable. The consortium of investors in the Mchuchuma coal project includes Siemens, Grinaker – LTA, Cinergy Global Energy Corporation and the National Development Corporation of Tanzania (NDC).

Importance of Coal in Tanzania

1. It will stimulate the development of iron and steel industry in Liganga where there are iron ore deposits. This will lay a strong base for a large – scale industrialization.

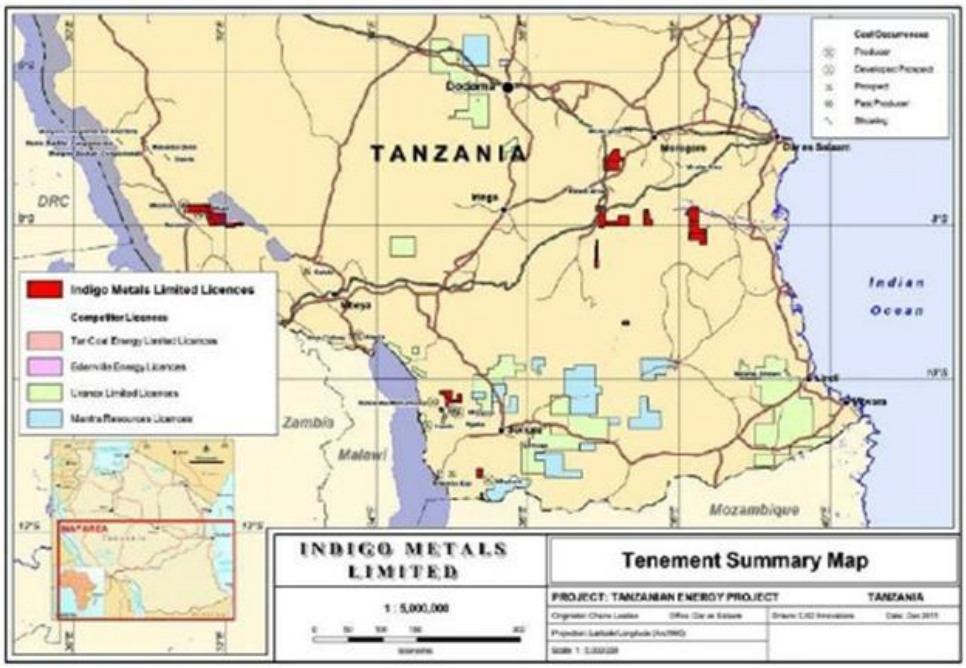
2. It will lead to the creation of employment opportunities and hence solve the problem of unemployment. There are some people who are already employed at Songwe – Kiwira coal mining area.

3. It will further stimulate the development and expansion of the transport systems like roads and the railway lines.

4. Promotion of the supply of energy for home use and local iron smelting industries like SIDO and other industries like Mbeya Cement Industry in Songwe, etc.

5. Some of coal is exported to other countries like Zambia and Congo leading to the earning of foreign currency.

6. It will also contributed to the generation of electric power and reduce the over increasing power demand in the country and outside especially in the neighboring countries like Uganda, DRC, Zambia, Rwanda and Kenya.



The Drawbacks Facing Coal Mining in Tanzania

1. There is inadequate capital to the invested in the coal – mining sector since Tanzania is economically poor.

2. There is low industrial base hence the market for coal is also very low. This discourages heavy investment in this sector.

3. There is poor transport network in the country and the mining sectors are not well served with roads or railways. The present roads and railway lines are not serving to the maximum.

4. Exhaustion and deepening of mines make the work complex and costly hence leading to low coal production.

5. Problem of labour mobility whereby people move from coal producing areas to other economic sectors, which are more paying. Also, labor availability is hit by the problem of diseases like malaria, HIV/AIDS and killings that take place associated with skinning of people so as to get money. Killing and skinning of people has become a big problem of grave concern in Mbeya and the government and its people have to wage concerted efforts so as to stamp out this great problem.

6. Delays by TANESCO in signing the Power purchase Agreement (PPA) with the identified consortium of investors are another hindrance in exploiting coal deposits. The sources said that the delay was due to the uncertainty arising out of management changes in the Company. The contract between the government and the South African firm (Net Group Solutions) held up the start of the project, which was scheduled to start in December 2001 (According to Business Times Friday, May 10-16, 2002).

OIL

It is also a non – renewable resource and was formed underground from decaying animal and plants.

Main producers include Middle East, USA, Russia, Mexico, China, UK, Norway, Canada, Venezuela, Nigeria, Angola, Algeria and Libra.

Origin of Oil (Petroleum)

Petroleum which is in its natural state is called crude oil. It is a compound of hydrogen and carbon. It is thought to have been formed from the decomposition of marine organisms (plants and animals) which collected in the sediments on the floor of some seas. The decomposition was done by anaerobic bacteria. Some scientists believe that the compaction of the deposits lead to the creation of high heat and pressure that transformed the decaying organic matter into oil droplets.

Uses of Petroleum

Petroleum (oil) has a wide range of uses in industries, commercial centers, agriculture, etc.

It is used as follows:

1. It is used as fuel to provide power in the machines in the industries or car engines.

2. It is used as lubricant to reduce friction in the cars, bicycles etc.

3. For heating, cooking and lighting.

4. For manufacturing petrochemicals for making synthetic textile, dye stuffs, fertilizers, insecticides, resins, adhesives, detergents, plastic materials, medicine, etc.

5. Other uses include making of tar for roofing and road construction, candles, Vaseline.

6. It is used for generating electricity, producing petroleum gas.

Methods of Extraction

Oil is extracted through drilling and there are two ways of drilling. These include percussion or cable- tool method and the rotary drilling method. The percussion method was used by earlier drillers like Edwin Drake in drilling shallow wells of not more than 610 meters. It is cheap but slow and inefficient.

The Rotary drilling method is the modern method used by companies and is more efficient. When the oil – bearing rocks have been located, a hole is drilled from the surface to the rock containing oil. This is done by means of a large metal structure called Derrick. From the derrick a steel pipe (shaft), which is fitted with a drill head called bit is forced slowly into the surface rocks. When the oil deposits are reached the oil gushes out under natural pressure or pumped out. Then it is transported to the required places by pipelines or tankers.

Manufacturing involves three basic operations:

1. Fractional distillation. Breakdown of hydrocarbon mixture into different parts. Then the crude oil is vaporized and allowed to condense in a distillation column. This leads to the production of liquid fractions as follows;

    (a) Natural gas, Petroleum gases and gasoline (gasoline is used for internal engine combustion).

    (b) Kerosene (Mainly used as fuel for jet aircraft).

    (c) Gas oil (Is made into diesel for powering and locomotives).

    (d) Residue of heavy oils, which when distilled in vacuum produces lubricating oils, wax and bitumen, Bitumen is used for making roads and roofing.

2. Conversion of hydrocarbons from one fraction in a vacuum. The fractions are heated under high pressure to get lighter factions which are of high demand.

3. Purification of the fractions to remove various impurities especially sulphur compounds.

Disadvantages

1. Low receives, which tend to inadequate energy supply exhaust of oil deposits.

2. It leads to air pollution, which is turn causes harmful effects to man and other organisms. For example the burning of fuel oil leads to the emission of green house gases like carbon dioxide and carbon dioxide and carbon monoxide that contribute to the occurrence of the global warming phenomenon.

3. The oil spills are dangerous to the ecosystems. When oil forms the uniform cover on the surface of water, it prevents the diffusion of exigent leading to the death of living organisms like fish, valuable plants, etc.

4. It leads to accidents due to fire outbreak and exploitations.

5. It needs high capital in establishing. Hence, poor countries like Tanzania cannot be able to easily establish the oil mining industry because of low or lack of capital.

OIL MINING IN AFRICA

Introductions

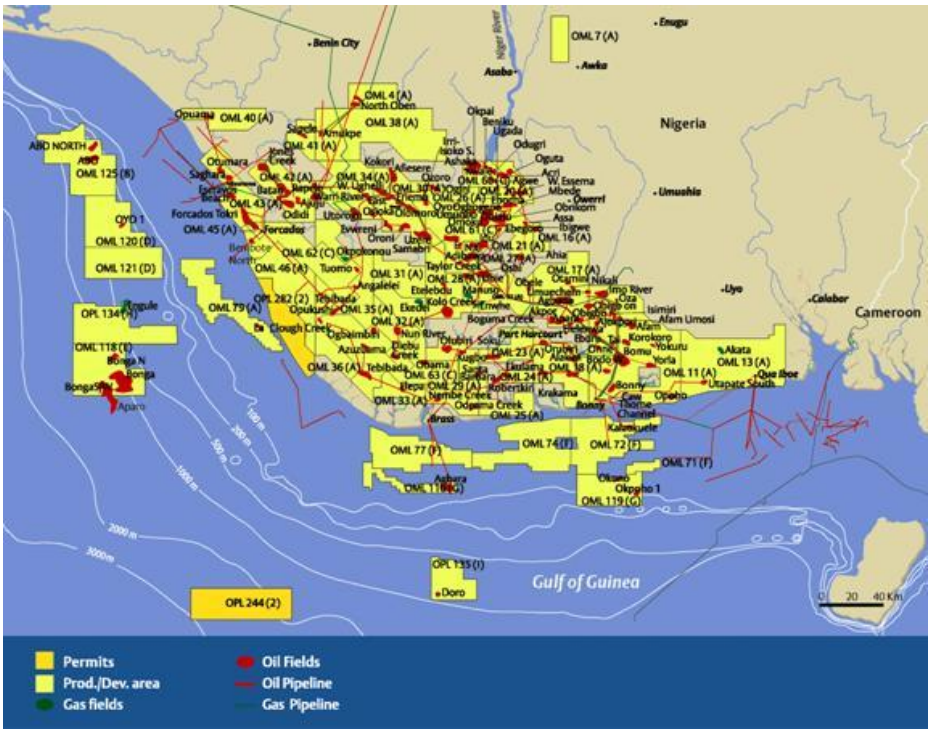
Today's Africa's major oil producers include Nigeria, Libya and Algeria which range among the top fourteen producers in the world. These three countries together with Gabon are the members of O.P.E.C. Other producers of oil in Africa include Egypt, Angola, Tunisia, Congo and the Democratic Republic of Congo.

Oil Extraction in Nigeria

Nigeria is the tropical Africa's largest producer and exporter of Petroleum (oil). Oil mining in Nigeria began in 1937 but it was not until 1956 that commercial deposits were discovered and production began in 1958 at the Otoibire Field. The companies that stated oil mining in Nigeria includes Shelf B.P (British Petroleum), Gulf, Mobil, Texaco, and Safrap. In 1971, the Nigeria National oil Corporation was established.

Oil Producing Areas in Nigeria

Major oil fields are found in the Niger delta area (along the coast) and in the offshore zone. There are also good prospects of locating other oil fields within Nigeria. It is believed that there are many potential deposits along the coast especially the continental shelf off Nigeria's coastline. There are large refineries at Port Harcourt and Warri near the oil fields. The other refinery at Kaduna is linked by pipeline from Warri. At Afam there is a large gas – field.



Factors for Oil Mining Development in Nigeria

1. **Presence of deposits** which are large and cheap to operate.

2. **Labor availability** since Nigeria has the largest population in Africa.

3. **The government support** on the development of oil mining industry.

4. **The role of the foreign companies**, which had enough capital to start mining.

5. **Easy transport** since the deposits is located along the coast where exportation has become very easy.

6. **Development of transport and communication system** stimulated the industry. There are roads and railway lines as well as pipelines for transporting crude i.e the net work of pipelines linking the oilfields and the oil terminals at Warri and Bonny was another for export.

7. **Strong need to diversify the economy of Nigeria** was another factor, rather than depending on agricultural products especially palm oil production.

Importance of Oil in Nigeria

1. It has created a large number **of employment opportunities** for the population, which is the largest in Africa.

2. It has led to the **development of thermal production centers**.

3. There have been **earnings of foreign exchange**. Oil sector today accounts for most of the country's foreign exchange. Oil contributes more than 90% in the foreign exchange.

4. It has **stimulated the development of transport and communication**.

5. **The oil industry has reduced a lot the importation of oil**, although the country still has this problem because of exporting too much of what is produces.

6. **It was earned Nigeria world** repute as one of the major oil producing countries in the world.

7. It has encouraged **the development of other sectors** like social services supply, development of industries.

8. It has led to the **development of towns and ports**.

9. It contributes about **41% of the national income**.

10. It has **reduced over-dependency** of loans and grants from outside.

11. It has made Nigeria invest in the **development of science and technology** so as to cope with the current rhythm of life system in the world.

Problems of Oil Mining in Nigeria

1. It faces a big problem of labor unrest due to civil wars, which are still taking place.

2. Deep mining has become expensive since it needs sophisticated machines.

3. Oil mining has contributed to water pollution.

4. Extraction tends to be difficult where the hard rock cover the oil bearing layers.

5. Development of new oil well cause land degradation especially along the continental shelf.

6. It is threatened by exhaustion due to intensive extraction of oil.

7. The companies prospecting oil are foreign owned by Japan, Italy, USA, Britain, and Germany. Only few are owned by Nigeria.

8. Shortage of capital to explore more deposits.

9. Price fluctuation in the world. It can be fall or rise and the market is under high competition.

PETROLEUM IN TANZANIA

The economy of Tanzania is much more heavily dependent on petroleum than any other source of energy. Tanzania imports petroleum from other countries. Hence, importation affects the economy of the country because of fluctuation in supply, demand and prices. To facilitate the supply and distribution of oil in Tanzania there are zonal depots constructed to supply petroleum products. Mbeya for example receives oil from Mikumi depot, which also supplies Iringa, Ruvuma and Rukwa. The government has also allowed the private companies like OIL COM, GAPCO, PB, TOTAL, ENGEN, ORYX and KOBIL to supply oil to the people in the country so as to facilitate the distribution of energy in the country. These in an oil refining plant TIPER situated in Dar es Salaam. But overhauling of the refinery and aging of the machinery has been leading to the decline in capacity. TIPER refinery plant has been producing 62% of the equipments of Tanzania for refined petroleum products. Remaining 38% of the country's requirements are imported.

Export of Petroleum

Tanzania exports limited quantities of refined oil to neighboring countries like Rwanda, Burundi, Zambia, and Democratic Republic of Congo (Republique Democratic De Congo).

Importance of Oil in Tanzania

1. Provision of employment opportunities at TIPER and the companies like GAPCO, OIL COM, and ENGIN, etc.

2. It contributes to the generation of the government revenue that control the prices of oil.

3. It has encouraged the development of industries in the country.

4. It has greatly stimulated the development of the transport and communication systems in the country.

5. Other sectors like tourism and trade have expanded to a greater extent as a result of the use of oil as a source of energy especially in the transport and communication network.

6. Improvement in the living standard of the people due to the increased supply of energy in the homesteads.

Problems Associated with Petroleum in Tanzania

1.The data on energy flow and use in Tanzania is not adequately available since some companies are reluctant to release data and keep it as business secret.

2.Soaring prices on the importation of both crude and refined oil. This has made Tanzania to be strict on the nature of use of oil especially in the government sector. To solve this problem there have been several explorations conducted by the government to see whether there can be deposits within the country so that production can start taking place within the country. Some tests conducted in 1979 confirmed of the possibilities of petroleum presence at Songosongo associated with natural gas.

3.Transport problems like poor roads leading to delays and accidents on the way as well as high transport charges lead to the problem of oil supply.

4.Other problems like leaking of oil containers and oil pipes, fire out break lead to the problems of oil availability in the country.

5. Due to aging of the refinery plant at TIPER the refining has declined from 810,000 tons and probably to below 750,000 or below 680,000 tonnes per annum.

6. Civil wars in the neighboring countries like Burundi and Rwanda have been deterring exportation of oil to those countries.

7. Low level of technology that has led to poor exploitation of oil deposits in Tanzania.

8. Lack of capital to be invested in the exploitation activities and establishment of oil plants.

Prospects of Oil Extraction in Tanzania

It is expected that once full exploitation going on at Songo songo gas deposits. There is a possibility of getting oil since the researches show that there are all signs of oil deposits associated with natural gas at Songo songo. More exploitation is going on in the Rufiji Basin with the aim of discovering both natural gas and oil. The prospects are so far 'good.

OIL EXTRACTION IN THE MIDDLE EAST

Middle East produces about 35% (over 1/3) of the world's annual production of petroleum and most of this comes from the area around and beneath the Persian Gulf. The three leading producers of the Middle East Iran (31%), Saudi Arabia (28%), Kuwait (18%) followed by Iraq (10%). Proven reserves in the region amount to more than ½ of the world are total.

About 1/3 of the Middle East Oil production is refined in the Middle East at centers like Abadan and Kirkuk. The rest is exported in the crude form mainly to the Western Europe, Japan and Canada. Regarding the world production Middle East is by the largest followed by North America (25%), the former USSR (15%), Africa (10%) and the rest (7%).

At the beginning most of the Middle Eastern countries experienced the problems of technological backwardness, small population and lack of capital. Hence, the international companies have largely been responsible for exploiting these oil reserves. Almost all the oil from the Middle East countries is exported. The major pipelines run from the inland fields on the Persian Gulf to the Mediterranean Coast.

Impact of Oil in Middle East;

1. It has encouraged the development of industries in the countries.

2. Oil has led to the rise in per capital income among the individuals.

3. Has led to the rise in the amount of export e.g. Kuwait 100%, Saudi Arabia 99%, Iran 85%, and Iraq 90%.

4. The revenue from oil production has enabled Middle East to develop their cities with great economic and social status.The health services and education improved tremendously.

5. Various Sheikhs and rulers were able to build luxurious palaces and ultra – modern apartments.

6. It has become possible for the countries to invest overseas leading to the addition of another source of wealth to the Middle East States.

Limiting Factors

Oil production in the Middle East is often subject to disruptions. Conflicts between the Arabs and Israelis, the undefined nature of many of the desert boundaries, and the conflict between rival sheikhdom or rival governments, as in the case of Iraq – Iran war of the 1980's, then the Gulf War of 1991 and war against Terrorism waged by Americans (from 2001) make oil industry in the Middle East countries insecure.

NATURAL GAS

It is a non-renewable resource. It is formed underground from decaying animal/plant materials. The main producers are USA, Canada, Russia, Mexico, Venezuela, Algeria and China. Tanzania has discovered the natural gas deposits at Songosongo in Kilwa. It is used for cooking, heating and production of electricity.

Advantages of Natural Gas

1. It is an efficient source of energy.

2. It is clean – least polluting of the fossil fuels.

3. It is easy to transport.

Disadvantages

1. It explodes easy leading to destruction and death.

2. It causes some air pollution.

3. It is exhaustible (non renewable source of energy). Oil, coal and natural gas are referred to as thermal (fossil) energy sources.

GAS PRODUCTION AT SONGOSONGO TANZANIA

In Tanzania Natural gas deposits have been discovered at Songosongo (Kilwa – Lindi region) about 200 km south of Dar es Salaam. Songosongo deposits are capable of providing about 8% of the world production of commercial gas when full production starts. Its life span is natural gas at Songosongo was discovered in 1974 by the Tanzania. Petroleum Development Corporation (TPDC). Two wells were sunk in the area and showed proven reserve of natural gas of about 2.8 billion cubic meters. Subsequent tests conducted in 1979 confirmed the possibilities of an oil accumulation together with gas. The project is started to cost about 320 million US dollars and will generate 112 MW of electricity. The AES Corporation based in Airling ton, Virginia in the USA, is currently the major investor in the project and has a US$ 50million equity investment in the joint venture. The other shareholders in the project Son Gas Limited – are CDC Financial Services, the Tanzania Development Finance Company (TDFL), Tanzania Electric Supply Company (TANESCO) and Tanzania Petroleum Development Corporation (TPDC). The project produces gases that will, among other uses, be used generate electricity at the Ubungo power plant.

The project involved the development of one trillion cubic feet of natural gas reserves at Songosongo Island on the snore south of Dar es Salaam and gas gathering and processing systems at Songosongo. A 25 km land pipeline to Dar es Salaam, also was constructed. The gas is transported to the Ubungo thermal power plant, which was formerly being operated on expensive imported fuel. The turbines had to be converted to go – firing.

The Completion of the Songosongo Gas Project

It was scheduled that the completion of the projection should be by October 2003 but some analysts say that the prevailing situation of slowness and costs delayed the completion as scheduled and this added to costs.

But full exploitation could not taken place quickly because of the following factors:

1.There is low technology among the Tanzanians that can be used in exploiting natural gas at Songosongo Island along the coast of the Indian Ocean. Hence, there is too much dependence on the foreign experts than the local experts.

2.Several ministerial changes in the government and the long disputes involving TANESCO and IPTL also contribute to the hitches (delays) in the project.

3.Low capital to be invested in establishing some plants since Tanzania is one of the poor countries. The project needs high capital for establishing the plant and both sub-marine and land pipelines. These make the project become costly leading to delays.

4. Poor transport infrastructure also compilable the full exploitation of natural gas at Songosongo.

5.The use of other available sources of energy like HEP and forest has delayed full extraction natural gas since some of them are cheaper than gas. It is said that the natural gas might be more expensive than the imported fuel due to the high cost of the project.

Advantages of Extraction of Gas from Songosongo

1. It will lead to the reduction of over dependence on gas from outside.

2. It will stimulate the development of some iron and steel industries by using the available iron deposits in Tanzania as well as scrape iron materials. This will be because of the energy that will be produced from gas resources extracted from Songosongo.

3. It will contribute to the promotion of environmental conservation since natural gas is clean and environmentally – friendly.

4. It will lead to the creation of employment opportunities in the country so as to solve the problem of unemployment.

5. The standard of living among the people will rise due to the provision of efficient energy source.

6. It can stimulate exploitation of other resources like petroleum, which is expected to be present at Songosongo.

7. It will lead to the increased generation of electricity.

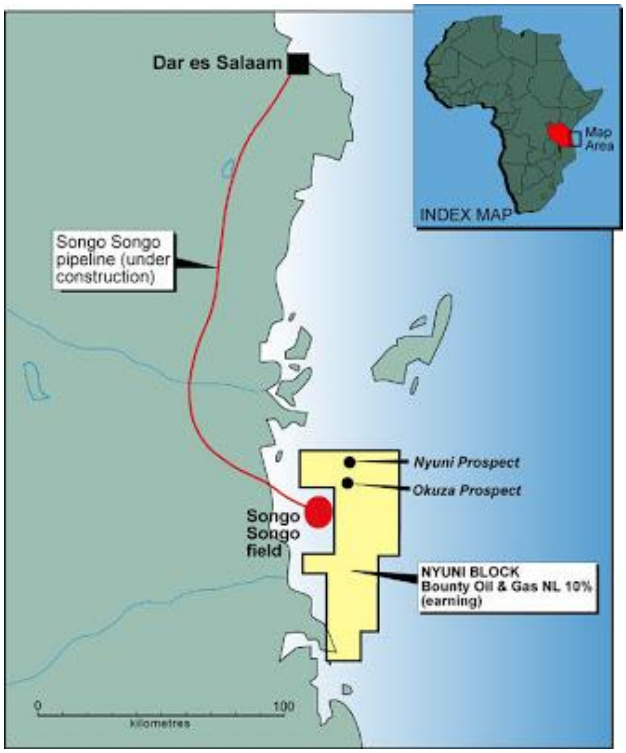
8. Exploitation of natural gas at Songosongo might stimulate the extraction of petroleum that has been tested to be present, associated with the natural gas. Exploration is continuing in the Rufiji basin and the prospects of finding more gas and oil are described as "Good and promising."

Problems that will be caused by the Project

1. It will lead to the eviction of the people in areas where the land pipeline will pass from Songosongo to Dar es Salaam.

2. If importation of fuel from outside will be reduced then people are likely to incur a lot costs in energy supply. This might happen in case the use of the energy source from Son Gas Project will be associated with high costs. The costs are likely to be high due to the high cost of the project. The discovery of Songosongo gas was initially expected to bail out local industries high price of imported fuel and petrochemicals. However, considering the high cost of the project, the gas is estimated to be sold at such a high price that local industries will find imported fuel a cheaper alternative. (Business Times, 22 – 28, Feb 2002, page 2)

Map diagram:



Exploration History

Source: Tanzania Petroleum Development Corporation **Date:** 1 January 2000 Tanzania has been intermittently explored over the last 40 years. Most of the multinational petroleum companies were represented, in the area; at one time or another. Significant gas discoveries were made at Songo Songo and Mnazi Bay. Between 1954- 1997, 25 new field wildcats (NFW) and eight delineation wells (at Songo Songo) were drilled. Of the 25 exploratory wells, 23 were drilled in the coastal basins and two in interior rift Rukwa Basin. Table 1 illustrates drilling activity by year completion and shows the location of all exploratory well and most boreholes. The cumulative seismic coverage is approximately 52,000km; 28,000 km offshore and 24,000 km on shore, including the interior rift basins.

Phase 1: 1952 – 1964

BP and Shell were awarded concessions along the coast including the islands. Extensive geological work was conducted including the drilling of more than 100 stratigraphic shallow boreholes, gravity, aeromagnetic, and reflection and refraction seismic surveys. A thick sedimentary section was identified and four wildcats were drilled, one each on Zanzibar, Pemba, and Mafia Island and another onshore in the Mandawa Salt Basin. Although the wells did not encounter significant hydrocarbon shows, they confirmed the presence of reservoir and source rocks in the stratigraphic column.

Phase 11: 1969 – 1979

The State Company, Tanzania Petroleum Development Corporation (TPDC) was established and the first Production Sharing Agreement (PSA) was signed with AGIP on former BP/Shell concessions. During this period large regional, on and offshore, seismic surveys were conducted. AGIP, joined by Amoco in 1973, drilled three onshore and two offshore wells, including the significant gas discovery at Songosongo in 1974.

Phase 111: 1980 – 1991:
Adoption of the Petroleum (Exploration and Production) Act of 1980 and high oil prices encouraged increased activity. Most of the drilling in Tanzania occurred in this period, including the delineation of the Songosongo Gas Field and the gas discovery at Mnazi Bay, (1982) by AGIP. TPDC participated in Songosongo development drilling, two wildcats at Kimbiji and several seismic programs. Increased interest in the interior rifts, partially as a result of Project PROBE, resulted in Amoco drilling two wells in the Rukwa Rift basin. Shell drilled Dira-l, in the Mafia Channel in 1991 and relinquished the license in the same year.

Phase IV 1992 – 1999:

At the start of this there were no active concessions and little activity except for various studies, and a dedicated effort by the authorities to achieve fiscal and technical agreements for the development of the Songo Songo gas field. TPDC, Tanesco and Canadian Companies Ocean and Trans – Canada pipelines, are actively working on the Songo songo gas field development, transmission and utilization. Beginning in 1995 a number of international companies acquired exploration licenses in the coastal basins. Tanganyika oil Company in 1996/97 drilled two wells in the Mandawa Basin. Exploration agreements have been signed with Antrim and Canopy both of Calgary, Alberta, Canada, Gulf western Mining of Cyprus, Ndovu Resources of Australia and others are under negotiation, Agreements develop the Mnazi Bay gas discovery and to build a power generation plant are being negotiated.

Database

The petroleum exploration database in Tanzania consists of numerous geological and geochemical studies, geological and drilling records from more than 100 boreholes and 33 deep wells and many thousands of kilometres of gravity, airborne magnetometer, and seismic surveys.

A summary of each well, a full list of electric logs, mud logs, geological and engineering reports, and composite logs are available for inspection at TPDC's Exploration Office in Dar es Salaam. Several technical reports have been prepared from these data and provide an assessment of the hydrocarbon potential of Tanzania. Data packages for each of the exploration areas are also available for purchase.

Geology and surface Information

The country was initially mapped by the Tanganyika Geological survey now based in Dodoma, and maps are available at a scale of 1: 5000 Only twenty – five wildcat exploration wells and eight development wells have been drilled in Tanzania, over a sedimentary areas, more than 700 km long and 400 km wide, A number of these wells, both early and more recent, were located on the basis of poor quality or inadequate seismic control and in retrospect, were invalid structural tests. Other wells were drilled on the less prospective basin margins.

Magnetic and Gravity Surveys

There is excellent coverage of aeromagnetic data over Tanzania onshore and offshore the data include magnetic surveys of 1977 by aero survey for AGIP and 1976 surveys are in the form of maps and are part of the data packages. The coverage of gravity data is patchy consisting mainly of regional surveys; the best coverage is in the coastal areas over the Mandawa and Ruvuma basin, the larger offshore islands and in the Rukwa Rift Basin. In the Ruvu, selous and Rufiji areas the gravity coverage is limited mainly along the recently acquired seismic lines.

Seismic surveys

A total of over 24,000 km of onshore seismic data and 28,000 km of offshore seismic data have been recorded n Tanzania, Details of all seismic surveys with a listen of acquisition and processing parameters and a shot point map at a scale of 1:500,000 are provided in the technical reports. Most of these data can be obtained in the form of paper prints and films. A certain amount of digital data is also available. Hydrocarbon Occurrences. **Source:** Tanzania petroleum Development Corporation Date: 1 January 2000.

Oil

The known oil seeps of Tanzania are located at Tunduma on the west coast of Pemba Island, Wingayongo and at Msimbazi near Mnazi Bay and in the Interior Rift Basins. The Pemba Island

seep indicates a marine source, which has been correlated with Campania – Maastrichtian shale's. However, the typing of the seep does not correlate with oil shown from the nearby Pemba-5 well. It appears that two separate sources are involved. The wingayongo oil seep at the northern flank of the Rufiji Trough shows unusual biomarker characteristics, which have been interpreted to be derived from a source rock deposited in a restricted carbonate lacustrine environment. The Makarawe shale (Bajocian) is a possible source of this seep.

Wells

East Lika – 1 Oil stains and cut fluorescence in Middle and Lower Jurassic, Kimbiji East – 1 Good gas show in Eocene and paleocene Kimbiji Main – 1 Poor gas show, Kisangire – 1 Middele Jurassic bitumen stain kiwangwa Trace oil show, high mud, gas, Lukuliro 1 Gas shown in Lower Jurassic Mafia – 1 Oil and gas shown in Lower Tertiary, Makarawe – 1 Trace oil, high mud gas in Middle Jurassic, Mandawa – 7 free oil in Nondwa Shale and Mbuo claystone Mbuo – 1 Oil fluorescence, Mita Gamma – 1 Oil stain, streaming fluorescence, Mnazi Bay – 1 Gas Discovery in Miocene/Oligocene sands, oil shows in Upper cretaceous/Upper Tertiary, Pemba – 5 Minor oil and gas shows in Eocene/Oligocene, Ras Machuisi -1 Mud gas at base of Tertiary, Songo Songo-1 Gas Discovery well in Lower Cretaceous Songo Songo -2 to 9 Development wells in lower cretaceous, Tan Can-1 Minor gas in Paleocene, Zanzibar-1 Minor gas in Eocene limestone.

Boreholes

Lindi – 1 Minor oil show and gas kick, Mtwara – 1 Bitumen staining and gas in Miocene sandstone, Pindiro-1 Wet gas in Lower Jurassic, wingayongo-1 Bitumen staining.

Surface Occurrences

Msimbazi seepage I bituminous and, wingayongo olive oil, Pemba Island Oil seep, Lake Tanganyika sub lacustrine flow of asphalt, Seeps at Msimbazi near the Mnazi Bay gas discovery indicate two families o oil; one is interpreted to be generated from a carbonate source rock deposited in a strongly reducing environment; the other contains significant terrestrial organic matter and biomarkers of Late cretaceous or younger age. A number of oil seeps and slicks have been reported from the interior Rift Basins. Oil seeps were reported from Lake Tanganyika as early, as 1896 and in more recent times, project PROBE found an oil film on the lake. Oil shown have been reported from the Pemba – 5 Mandawa Mafia – 1 Mita Gana -1 well. Cut fluorescence and staining from seven other wells and three boreholes have been observed. Songo Songo wells yielded small amounts of oil, which are low in sulphur with 33^{o} – 47^{o} API.

Gas

Commercial gas discoveries have been made at Songo Songo and Mnazi Bay, while gas shown have been encountered in several wells and boreholes, gas seeps have been reported from several locatives in coastal and inland basins.

Songo Songo Gas Field

The field is located on and offshore songo songo Island (figure 7) about 15 km from the mainland and 200 km south of Dar es Salaam. The discovery well, Songo Songo was drilled in 1974 by AGIP. Songo songo is a large N-S trending structure containing one to two TCF of gas reserves. The gas is contained in Lower cretaceous inner shelf sand reservoirs with porosities averaging greater than 20% and net porous intervals up to 155 m thick. The structure was uplifted during the Early cretaceous and the reservoir modified by the mid cretaceous regional unconformity. The trap consists of two faulted highs separated by a saddle. A series of N-S and NW-SE trending faults steps down to the east. This faulting regional eastward tilting and rapid tertiary sedimentation created more growth faults which mostly sole out in the sealing shale's of the upper cretaceous Ruaruke formation. The lower cretaceous reservoirs are not affected by this later episode of faulting continued activity along these faults not affected by this later episode of faulting. Continued activity along these faults resulted in the development of broad, low relief anticlines. The gas appears to have been sourced from post mature organic material of Jurassic or Early Cretaceous age. The associated liquids are probably sourced from mature organic matters of early cretaceous and middle cretaceous age and seem to have migrated from a nearby basin.

Mnazi Bay Gas Discovery

AGIP drilled the discovery well, Mnazi Bay-1 in 1982. The well encountered commercial quantities of gas in two Oligocene sands within the Mnazi Bay Clay Formation. These sands have porosities of 15 to 25% and permeability's up to 560 md. Drill stem tests produced flows of 3.5 × 105 m3/day (12.5 MMCF/d). Based on one well and seismic coverage, the reserves at Mnazi Bay are estimated to be in the 1 TCF range. The gas is considered thermogenic but no source identification has been made.

Source Rock Characteristics

Oil prone source rocks have been identified in the Lower to Middle Jurassic Pindiro or Nondwa carbonate/evaporates, as shown in the Mandawa-7 Mbuo-1 and Mita-Gamma-1 wells. They contain a rich mixture of Type 1 and III kerosene with TOCs greater than 9% (Figure 8) The permo – Triassic and possibly even some early Jurassic sediments are dominated by Type III kerosene, although rocks with TOC of 7% and a Hill of 386 mg HC/g TOC occur in the lukuledi-1 well in the Ruvuma Basin. The section above the Middle Jurassic is typically, dominated by Type III kerosene and is essentially gas prone. The upper Cretaceous in Kimbiji East – 1 contains TOCs up to 12% cretaceous and Tertiary source potential has also been speculated, Eocene lignite's and organic rich shales are present in wells around the Songo Songo Gas Field. Occurrences of oil in a Songo Songo well and in the Pemba – 5 well have been described in the preceding section on Hydrocarbon Occurrences.

Basin studies chemical analysis and burial history and maturation modeling indicate that extensive hydrocarbon generating kitchens are likely to occur within the basins. Hydrocarbons generated in the Karoo basins may have accumulated in reservoirs of the same age, or migrated into Lower Cretaceous sands. The regional upper cretaceous shale's of the Ruaruke hydrocarbons generated in the lower cretaceous shale's in the distal (offshore) areas could be expected to migrate laterally and up dip into the younger cretaceous and Tertiary sequences. The interior Basins contain lacustrine Karoo sediments (4 to 5% TOG) with 30% Type 1 and II kerosene. The tertiary lake Bed Formation contains up to 4.9% TOG, consisting of Type I and II kerosene. All the required elements for successful petroleum systems have been observed in Tanzania. These are manifested in two commercial gas discoveries, at Songo Songo and mnazi Bay, numerous oil and gas shows, e.g. Pemba, Makarawe, Songo Songo, and oil seeps at Mnazi Bay, Wingayongo and Pemba Island. The basins of Tanzania have good potential for both oil and gas production. The interior Rift Basins also have elements necessary for an effective petroleum system.

Basin overview

The overall regional geological framework of Tanzania was discussed on page 14. The following section is an introduction to the descriptions of the individual basins of eastern Tanzania. Each basin description contains information about exploration, geology, and hydro-carbon occurrence.

SELOUS BASIN

Source: Tanzania Petroleum Development Corporation DATE: 1/1/2000.

Area: 50,000 km^2

Database: one well; 4700 kmof seismic; aeromagnetic; land sat.

Tectonic framework: permo-triassic ne trending rift containing up to 10 km of sediments; failed in early Jurassic.

Structural style: large basement highs; growth structure anticlines; tilted fault blocks; horst blocks.

stratigraphy: permian-triassic (karoo) clastics, deposited in fluvial, lacustrine, deltaic to possibly marine environment.

Drilling results: liwale-1 (shell 1985), d&a at 1762 m; tested a highly faulted and cemented continental Clastic Triassic section on the eastern flank of the basin.

Potential: large untested structures, thick sedimentary section, good source rock potential.

DISCUSSION

The basin covers about 50,000 Km^2, is sparsely populated, and includes the open savannah of the selous game reserve. The basin fill consists of over 10 km of karoo and post- karoo fluvial-continental, lacustrine and possibly, some marine sediments. It is virtually unexplored, with only one shallow well, liwale-1, drilled by shell in 1985 after acquiring about 4700 km of seismic in 1982 – 83. The well was abandoned in Late Triassic sediments at 1762 m. The selous Basin is a failed rift, which was active during Permian Triassic extensional rifting and filled with synrift sediments. Seismic data indicates several basements horst features with faulted rollover anticline structures and down faulted blocks against basement. Landsat and aeromagnetic data provide an excellent outline of the basin and agree with the seismically interpreted basement configuration.

Early Permian sediments have been postulated in the selous Basin from seismic and outcrop data and are believed to be several thousand materials thick in the half grabens developed during the first major rifting episode, Outcrops of Karoo sediments occur in the southern part of the basin and along the Rufiji River valley to the north. The sediments in the south consist of fluvial and swamp deposits containing coal seams of industrial value of in the north the deposits are lacustrine – deltaic with reported evidence of brief marine incursions. Analogy is made to good source rocks documented in similar rift environments of the same age in Africa. E.g. Middle sakamena Formation at the Permo - Triassic boundary in the Morondava Basin of Madagascar and maji ya chumvi formation or ‘fish bed’ at the same stratigraphic level in southeast Kenya. Lacustrine source rocks are also common. Source rocks in the selous Basin include Lower and Upper Permian shales with TIOG values of 2.2 to 9%

Analogy is made to good source rocks documented in similar rift environments of the same age in Africa e.g. Middle sakamena Formation at the Permo-Triassic boundary in the Morondava Basin of Madagascar, and Maji ya Chumvi Formation or Fish Beds at the same stratigraphic level in southeast Kenya. Lacustrine source rocks are also common. Source rocks in the zealous Basin include Lower and upper Permian shales with TOG values in the 1 to 6% range and Rho values of 0.6to 2/3 Triassic black clay stones in the liable well recorded by shell to have TIOG values of 2.2 to 9% Potential reservoirs in the basin include Karoo clastics with porosities ranging from 10 to 15% and permeability's ranging from 0.4 to 1700 md (average 62 md) improved porosity and permeability development is expected in the middle of the basin where sediments will be better sorted and contain a higher amount of coarse grain classic material. The hydrocarbon plays in the Selous Basin are expected to be mostly intra-karoo, containing the essential elements of reservoir source and seal associations. Trapping would involve fault related, basement blocks, roll over's along major faults and drapes over basement highs The structural style of the basin: This seismic profile on the eastern side of the basin illustrates an undrilled growth structure north and east of the liwala – well shoes total depth of 1762 m equates to about one second two way seismic time.

Source: Tanzania Petroleum Development Corporation Date 1 January 2000

Area: 16,000km

Database: One exploratory well 2600 km of seismic gravity aeromagnetic.

Tectonic Framework; Late Jurassic east west subsidence imprinted on the northeast extension o the failed Permian – Triassic serous Basin the Rufiji Trough extends eastward to the Rufiji River Delta.

Stratigraphic

- Upper cretaceous Black, deep water shale's deltaic/turbidity sands.
- Lower cretaceous Deltaic, fluvial sands.
- Middle Jurassic Marine shale's, thick carbonates, up to 800 m
- Lower Jurassic Black carbonaceous muds

5. Permian Triassic Fluvial continental sands.

Drilling Results: Lukuliro – 1 (shell 1985) DM at 2367 m gas shows reported in the lower Jurassic.

Potential; Large truncated, Permian to Jurassic, fault blocks overlain by cretaceous sands; Mid Jurassic carbonate platform build up and reefs.

DISCUSSION

The Rufiji Trough is a major east west trending basin separating Masasi Basement Spur in the south from the Dar es Salaam platform to the north. The northern flank of the Trough merges with the Dar es Salaam platform approximately 40 km north of the Rufiji River Delta. It stretches from the basement in the west to the Rufiji River Delta. The one exploratory well, Lukuliro encountered 800 m of middle Jurassic platform carbonates gas shows were encountered into lower Jurassic.

Through is a composite basin, comprising part of the failed rift system in the west and Jurassic Rift Basin in the east (the Rufiji embayment) the major structural trends are inherited from these two elements. The major structural trends are inherited from these two elements. The NNE element associated with permo – Triassic continental rifting the E-W elements parallel to the regional lineaments which were initiated or reactivated into the early Jurassic. The resultant structures are inters basined thank horst and tilled fault blocks. It is also postulated that the Rufiji Trough is a restricted basin similar to the Mandawa salt Basin although little evidence of mobile salt can be shown due to paucity of dat. Salt springs and salt water wells at Kipatimu indicate presence of salt in the sub surface.

Despite the presence of the songo songo gas field just of share to the east at the area a significant oil seep at wingayongo on the northern flank of the Trough and hydrocarbon impregnation in the Middle Jurassic limestone at Kipatimu on the southern flank, the Rufiji Trough is the least explored of the Tanzanian coastal basins. No well has been drilled in the Rufiji Delta area. There is fairly good regional seismic coverage around the Lukuliro location but virtually none in the delta area. Gravity control is available along the coastal and Rufiji River Delta areas Potentially rich; Mostly Jurassic source rocks have remained not the oil window for a long time and still remain there. An oil seep at wingayongo indicated that this Trough has oil potential Play types include: Triassic fault blocks and rollover anticlines carbonate platform reef and limestone: Triassic fault blocks ad rollover anticlines carbonate platform reef and limestone listric fault rollover structures in the Rufiji River Delta areas.

The carbonate bank section encountered in the Lukuliro I well was also penetrated in the Kisangire I well to the north of the Trough. There is also undrilled seismic anomaly at the carbonate bank level. One of several features in the area Featured with seismic line showing

tilted blocks beneath the Middle Jurassic unconformity, reminiscent of the present North as prospective lower Jurassic and Triassic sections.

MANDAWA BASIN

Source: Tanzania petroleum Development Corporation Date January 2000

Area: 15,000km

Data base

Five wells: 3700 km of seismic gravity aeromagnetic maps and tapes.

Tectonic Framework: An early Triassic to Early logistic rift basin containing lower Jurassic evaporates salt tectonics active during the passive margin phase (cretaceous to Tertiary)

Structural style: Tilted fault blocks in the pre – mid Jurassic salt cored anticlines trending NNW.

Stratigraphic: Oligocene/Miocene – Deltaic sands, Eocene carbonate platform Palaeogene classics and reefal limestone's lower cretaceous.

Sands and silts, minor limestone's, mid upper Jurassic classics carbonates during salt tectonics, Triassic/Jurassic marine fluvial sands shales and evaporates (oil prone).

Drilling Results: Mandawa – 7 (BP/Shell 1959)) D&A 4065 oil shows, kizimbani (AGIP 1979) D&A at 2697 m Mbuo – 1 1996) suspended TD at 3313 m oil shows, Mita Gama 1 (Dublin INT. 1996) suspended TD at 2390m oil shows East lika -1 (Dublin int. 1997) D & at 2002 m.

Potential: Tilted fault blocks pre middle Jurassic sub crop and stratigraphic plays cretaceous structural and stratigraphic plays associated with salt structures roll over's on the down side of tertiary growth faults.

DISCUSSION

The Mandawa Basin lies along the south-east coast, south of the Rufiji Trough and north of the Rufiji Trough and north of the Ruvuma Saddle. It is unique in being the only drilled salt basin in East Africa. This basin contains a thick Jurassic section containing excellent oil prove square rocks. Three wells drilled salt related features. Two later wells drilled in 1996 and 1997

penetrated thick Jurassic sequences with fluorescence shows and a considerable thickness of reservoir quality sandstones and limestone's. The late Triassic – Early Jurassic age of evaporates indicates that rifting into the eastern side of the Masasi spur was younger than the same phase in the serous Basin to the west. Before the Middle Jurassic marine incursion this area was already an evaporate basin. Subsequently, the salt formed ridges and became the core of several anticlines treading NNW in response to the Mid Jurassic Mid cretaceous N-S right lateral wrenching that affected the region during the rift of Madagascar along the Davie Fracture Zone.

Lower Jurassic sediments are the dominant salt basin fill, which was then overstepped by the post rift Middle and upper Jurassic passive margin development and the accumulation of a predominantly classic delta wedge continued thought the cretaceous and Tertiary thickening from west to east. There was little deposition in the salt basin after the early cretaceous. The lower Jurassic Nondwa evaporates and Mbuo shale's are the most promising proven source rocks in Tanzania maturity modeling indicates a large early Jurassic kitchen area with oil generation from the Early Jurassic to the Middle cretaceous. In Mandawa – 7 a section of over 1000 m of Mbuo Formation includes abundant black shale's with average TOC values of 4.7% Kerogen type is appropriate for oil and gas, consisting of a 22m section of Mihambia Formation with a TOC of almost 4%. These measurements increase the prospectively of the post salt plays which still remain untested. Petroleum generation could also have occurred outside the Mandawa Basin to the east in what is now the coastal offshore basin where potentially rich rift sediments could have generated hydrocarbons porous intervals encountered in the wells include the salt sandstone or Early Jurassic age and as interbreeds within organically rich shale's (Mbuo – 1) in addition the salt capping limestone of Mid Jurassic age with other shale encased porous sand bed of Jurassic age (Kizimbani (1) provide significant encouragement of the hydrocarbon potential of this basin.

INTERIOR RIFT BASINS

Source: Tanzania Petroleum Development Corporation Date January 2000

Area 36,000

Date Base: Two wells 6000 km of seismic gravity, aeromagnetic maps and tapes.

Tectonic Framework: Early limited rifting in permo-carboniferous and lower cretaceous, with significant extension tectonics since early Miocene.

Structural style: Eastward thickening half grabbers with major boundary faults.

Stratigraphy: Miocene quaternary continental locustae silly sandstone moods cretaceous continental redbuds carboniferous karoo titbits and coals,

Drilling Results

1. Galole – (Amoco 1987) D&A at 1524 m
2. Ivuna -1 (Amoco 1987 D & A at 2316m

Potential: Tilted fault blocks horst graven structures drape features stratigraphic traps

DISCUSSION

The East Africa Rift System is represented in Tanzania by lake Tanganyika, Lake Rukwa, Lake nyasa and the Ruhuhu Basins. The prospective sectioning the lake area lies mostly beneath the water in depths o up to 15000 m . Only two wells have tested the interior basins Amoco and partners drilled the wells into the Rukwa Basin and the penetrated thick section of Tertiary to Triassic sediments, oil and gas seeps have been reported in and around the lakes, Rift valley exploration has yield significant discoveries in many parts of the world and by analogy the east African interior Rift basins also merit further investigation.

Basin evolution many have started in the permo – carboniferous with karoo deposition accentuated by rifting into the lower cretaceous and followed by intense extension tectonic activity since the early Miocene. The basin fill is a thick continental lacustrine sequence of Neocene to quaternary age, overlying an equally thick sequence of Permian and Mesozoic continental deposits. In profile these rift basins are half with the sedimentary section thickening towards the major bounding fault. Early geological studies into the late 1940 an 1950 focused on the coal potential in the Rukwa area. Woods Hole Oceanographic institute carried out the first geographic survey team on Central lake Rukwa (1973) and by a Chinese team, as part of their study of the petroleum geology of Tanzania (1977).

Between 1981 and 1986 about 2000 km of seismic data was acquired by Duke university project PROBE program for a consortium of oil companies, Petro – Canada conducted a gravity survey for TPDC in the Rukwa Basin (1983) followed by another gravity survey by nor consult (1985) in the Lake Nyasa Ruhuhu Basins. Amoco with partners Pectin and Fina were granted the first exploration license into the basin in 1985 and carried out geological field work, gravity survey and acquired about 4000 km of seismic dat. This group drilled in 1987 two exploration wells in the region both galula and vicuna I were dry holes.

Reservoir potential in these basins is known only from outcrops and the two Amoco wells. However, evidence from analogous rift valley sedimentation illustrates potential for classic reservoirs in the karoo (over 12% porosity and up to 1320 md permeability's average 143 Red sandstones (13 – 25%) porosity range) and the lake bed formation (17% porosity and 25% porosity range) and the lake Bed Formation (17% porosity and 25 md permeability). The best quality oil source rock is in the lacustrine karoo sediments (4 to 5% TOC) overlying the coal beds, with 30% type I and II kerogen. The next best oil prone source rocks is in the Tertiary lake Bed formation in the Rukwa Basin, This formation contains up to 4.9% TOC consisting of Type I and II kerogen. Rukwa rift Basin maturation models indicate the top o the oil ozone between 2000 and 2500 m Similar results have been reported from Lake Tanganyika where a potential kitchen area forms a strip about 25 km wide and 130 km long in the central Bain of the lake.

RUVU BASIN

Source: Tanzania Petroleum Development Corporation Date 1 January

Area: 15,000km

Data base: three wells 28000 km of seismic gravity aeromagnetic

Teklanika framework: Narrow Permo Triassic remnant o selous failed n\rift extension with superimposed tertiary sag basin

Structural style: early title fault blocks wit early cretaceous truncation down to the basin tertian faulting

Stratigraphy: Eocene shale's sands and limestone's upper cret/pal turgidities lower/mid crept near shore shelf sands permo -Triassic continental fluvial clastics

Drilling Results

1. Ras Machuisi – 1 (AGIP 1974) D&A at 3370 m Eocene gas show shallow offshore well.

2. Makarawe -1 (IEDC 1984) D&A at 3821m Jurassic gas show.

3. Kiwanawa -1 (kifpec 1986) D&A at 3514m gas show.

Potential: Large tilted permo – Triassic fault block; other faulted anticlines in Lake Mesozoic rocks; rollovers into Tertiary growth faults.

DISCUSSION

The basin covers the onshore region from the western Dar es Salaam platform to the Kenya border. The serous/Ruvu permo-Triassic failed rift narrows down to 20-30 km and occupies almost entirely the onshore portion of this area. There is no cretaceous platform equivalent to that of the Dar es Salaam platform. The Ruvu Basin evolved into thermo Triassic/early Jurassic and is the north-easterly extension of the serous Basin failed rift. The Tanga Fault marks the western limit of the basin. To southeast, the basins bound by the Kisangire and Pugu highs of the Dare s salaam platform. The eastern limit of the Ruvu Basin coincides with the present day coastline .with the present day coastline. The cross section illustrates the positions of the Ruvu Basin in the west and the down to the basin tertiary faulting into the Zanzibar channel.

The sedimentary fill consists of Permo – Triassic to Neogene sediments. There wells have been drilled in this basin Makarawe in the north Kiwangwa in the south and Ras machuisi just offshore in the central area. All three wells encountered gas shows at various starts graphic levels. Geochemical data indicate that the area has potential for soil generation. An oil prone source rocks (TOG up to 4%) was encountered in the Bajocian shales in Makarawe. The potential reservoir targets are permo- Triassic to lower Jurassic fluvio – continental classics , middle Jurassic carbonates apptian/albian sandstones (equivalent to the songo songo reservoir section) and limestone's, and upper cretaceous sandstones. Structural style of the Ruvu Basin, indicating down to the basin faulting the folding in cretaceous and older sediments. The kiwangwa 1 well, on the western side of the profile was drilled to a total depth of 3514 m encountering mostly shales with zones of interbeded sandstones towards the bottom of the well. A minor gas show (CI-C4) was encountered near the top of the lower Jurassic (blue seismic marker).

RUVUMA BASIN

Source: Tanzania Petroleum Development corporation Date 1 January 2000.

Area: 16,000 km

Database: Two wells 1800 km of seismic gravity and aeromagnetic maps and tapes.

Tectonic framework: A late Triassic to early Jurassic rift basin which was succeeded by passive margin sedimentation from the middle Jurassic to tertiary

Structural style: Rift phase normal faults passive phase district down to basin tertiary faults along the coast

Stratigraphy: Oligocene lowstand mostly deltaic classic (Ruvuma delta) Eocene regressive sands, local limestone Palaeogene clays minor sits and sods, upper crept passive margin arils and shale's lower crept regressive sands with minor conglomerates and salts,

Upper Jurassic – Shallow marine shelf sands, lower Jurassic continental to restricted marine sediments permo Triassic sandstones

Drilling results Mnazi Bay -1 (AGIP, 1982) gas discovery in Oligocene deltaic sands

Lukuledi-1 (Texaco 1990) D & A at 1941m.

Potential: Cretaceous and Tertiary low stand plays on and offshore, stratigraphic traps below cretaceous canyon cuts large roll over structures on the down side of Tertiary growth faults Jurassic reservoirs in rift grabbers and carbonate bank edges

Discussion

The Ruvuma Basin is situated in the south-eastern coastal zone of Tanzania adjacent to the Mozambique border, The Tanzania parties between the Ruvuma River and Ruvuma saddle, and is bounded on the west by the Maasai Basement spur and on the east by the shelf break, It is about 16,000 km2 in area, including the narrow 10 – 15km wide shelf offshore. BP commenced early exploration followed by AGIP drilling the Mnazi Bay discovery in 1982. Texaco drilled the second well lukuledi – 1 in 1990

There are two district structural styles displayed in the Ruvuma Basin. During the rift phase, a NNE SSW trending horst and graven structural style developed in the pre – upper Jurassic section. This section dips regionally eastward due to subsequent passive margin loading. The passive margin section is unstructured except for the Tertiary epicentre at Mnazi Bay where district faulting has developed a large gas bearing structure. The section thickens eastward and southward to the Ruvuma River (the postulated site of a transform fault zone.) Another transform fault zone to the north could have resulted in the up thrown Ruvuma saddle, which separates this basin front eh Mandawa salt Basin to the north.

The basin fill includes pre – Jurassic sediments with minor marls and early Jurassic restricted marine deposits flanked by continental sediments of the basin margins. The middle Jurassic to Neocene section is a thick transgressive and regressive sequence. Depth to basement is estimated to be 7 km at the coast deepening seaward. In the onshore, basement, block faulted province, mainly continental to marginal marine send, dominated sections have gas source potential an

some possibility for oil generation (locustae, type kerogen) porosity 22% and permeability's of several decries) This well also confirmed the presence of middle upper Jurassic reservoir quality marine shoreline sandstones of the mtumbei Formation with porosities exceeding 20% and good permeability's.

In the coastal to offshore province, gas prone source rocks are present, as shown by the Mnazi Bay discovery, where gas has migrated from deeper levels along listric faults. This well encountered oligo-Miocene sands stone with porosities of 16 to 24% and excellent permeability. The bitumen seeps occur nearby point to oil prone source rocks in the area. One of these sources is interpreted to be in a carbonate section deposited in a strongly reducing environment (lower to Mid Jurassic carbonate and shale sequence) and the other sources interpreted to contain a significant terrestrial component of late cretaceous or younger age.

The msimbati oil seep, south of Mnazi By and minor shows in wells and boreholes indicate potential for oil source rocks at depth. The lukuledi well penetrated a permo Triassic section which had TIOC values of up to 7.5% and an above average hydrogen index of 38 mg HC/g TIOC it is possible that the companion age black shale's identified in the kimbiji area to the north were also deposited in the coastal and shelf area of the Ruvuma Basin. This shale's contain TIOC values of up to 12% are oil prone and will be mature where buried under the tertiary Ruvuma delta.

NUCLEAR ENERGY

The nuclear energy sources no renewable. Nuclear energy is produced as result of the reaction of the nuclei of radioactive metals like uranium. This leads to the alteration of the atomic structure and during this action much energy is generated in the form of heat, which can be used for generating electric power.Alteration of the atomic structure involves either of these processes.

1. Nuclear fission in which the nucleus of a heavy element like uranium splits into smaller particles releasing energy.

2. Nuclear fusion in which the separate light atoms like those of hydrogen are fused to form a new composite nucleus at meanwhile releasing emery. Fusionism commonly used in p repairing the hydrogen.

3. There are about 20 countries that have nuclear power plants, the example of the countries that have developed nuclear power station are Britain (with about 35 power stations) USA with about 80 plants frame with about 36 plants the former USSR with about 43 plants, Japan

with about 28 plant others are Germany, Canada, Sweden, Belgium, Spain, Switzerland, India, Pakistan, Namibia Niger south Africa.

1. 4. It is used in producing heat and generating electricity.

2. 5. It is also used in making nuclear weapons like bombs.

3. 6.The current trend is that nuclear energy is expected to play a major role in the future. This is because of the following reasons.

4. 7. Increasing coasts of fossil fuels. The prices of that fuci are soaring high to a great extent.

5. 8.The fossil fuel resources are diminishing because of excessive exploitation.

Advantages of Nuclear Energy

1. -It is clean and produces fewer green house gases. Hence, it is less pollutant if well handled.

2. -It is efficient in terms of use. It can be used to produce higher amount of electric power than any other form of energy.

3. -It is more economical since it used very small amount of raw materials. Therefore, it is less bulky compared to coal and hence transportation is not a big problem.

4. -It is produces little amount of waste.

5. -The possession of nuclear energy enhanced the generation of electricity. Moses of the developing countries now are opting for nuclear power as an electricity such countries are like Egypt and India.

6. -Minerals used as raw materials are mined in areas where people end to benefit in terms of employment, infrastructure, income generation etc.

7. -The power produced can be exported and hence bring the foreign currency to be country.

Disadvantages

1. -It contributes to environmental problems like water pollution, air pollution leading to different effects not the organisms radiation produced is dangerous like the Chernobyl l leakage in Russia which led to different problems like cancer leukemia deaths of people animals and plants. The explosion took place in 1986. The solution was that we, Canada and the European community began negotiation with Ukraine and Russia to close down all remaining Chernobyl type rectors.

The case of Hiroshima and Nagasaki led to the death of about 80,000 people and mammy other got disabilities hitherto.

2. -Building the nuclear plant is very costly therefore it demands high capital.

3. -There are proems of disposal for wastes since the waster are radioactive.

4. -It disturbs the security o the countries in the world. For example it has accelerated the rate of terrorism in the world, which involve bombing of important places like the American embassies in Kenya and Tanzania. Also it has led to the escalation of conflicts between India and Pakistan where tug of war involves the use of nuclear bombs.

5. -Disposal of radioactive wastes is very difficult and costly.

6. -There is also a problem of choosing the sites for locating the nuclear reactors since it need a place which is very far from the settlement areas so as to avoid the accidents like what happened in Ukraine in 1986.

Hence when the nuclear energy us handled properly or used appropriately it can bring great benefits in terms of development but it mishandled or misuses in can head to horrendously hazardous effects to the whole global community at large.

The future of the Nuclear energy:

-It is tempting to argue that as nuclear power stations become more economical and supplies of conventional fuel energy sources became more difficult to obtain, nuclear power will overtake other forms of sources of electricity.

-It is fair to say that nuclear power will play a much more prominent role in the future power supplies but it will never entirely replace conventional fuels due to the following limiting factors.

1. -People oppose the use of this energy as it generates some wastes which are difficult to manage, and which have some negative impacts on the environment. Wasters also can lead to problems of health like causing leukemia and cancer amount the people.

2. -Nuclear power cannot generate at or near full capacity hence it is necessary to have other sources to support it. It is estimated that nuclear power can never supply more than about 60% of the total electricity requirement because it needs close attention. Too great amount can become difficult to manage.

-Locating nuclear power stations is a problem. While thermal power can be located anywhere, nuclear energy needs the area or site which is very far front he population centers. It is therefore a big problem in the crowded areas like European countries and Japan where the land is small.

4. -The existing plants or power stations are obsolete and will continue being used for a long time hence power will increase very slowly. This is due to the fact that buying new machines and establishing new plants is very expensive.

5. -Competition from other sustainable or environmentally friendly sources of energy like solar energy source, biogas, wind energy tidal energy etc. Nowadays there are countries which using solar energy to generate photo voltaic electricity, in which silica cells are used to catch sunlight and store energy in batteries. Therefore, there will be limitations in the extent of the nuclear energy use in the world.

NUCLEAR ENERGY IN JAPAN

Japan is referred to as the nuclear nation because of having many nuclear power stations. It produces almost 10% of world total while Russia produces almost 11%. Today over 9% of Japan energy needs are met by the nuclear industry. More centers are being developed and the percentage has been set to rise to 17% (40% of Japan electricity) by the year 2010. There is the aim for decreasing oil percentage from 58% to 46%

Nuclear Reactors in Japan

Japan first two nuclear reactors were built at the end of the 1960. By 1980 there were 13 reactors. This had to rise to 41 by the end of 1991 the target was to have 55 reactors by the end of 20th C. It has different types of reactors but is also experimenting with newer fast breeder reactors (FBRs) which use reprocessed nuclear fuel Japan is already having a new uranium enrichment plant and is building a new fuel reprocessing plant. Limitation Japan is facing in relation to nuclear energy development.

1. -Good sites for locating nuclear power stations are limited because Japan is mountainous while the nuclear plants need flat land and large water supply.

2. -Unstable land, which experiences over 7000 earthquakes every year is a problem. Nuclear energy needs stable land for safety but Japan is in the zone of convergence (weak zone).

3. -Pressure on the land is another problem. The land is small and several reactors are located on the same site. For example Wakasa bay has 15 separate reactors around it that cause the problem of pressure on land.

4. -There is an increasing opposition to the growth of nuclear power in Japan. A number of pressure group actively opposes the nuclear programme. Some like the CNIC citizens nuclear information Centre) regularly publish antinuclear information. Protests are becoming more common. The concern centers on possible radiation leaks and the difficult in the disposal of nuclear waster

FUEL WOOD

It is non – renewable fossil fuel. It provided by trees. The main producers are the low economically developed countries (LDC) in Africa and Asia fuel wood can be converted to charcoal by heating the firewood under limited supply of oxygen. It is used for cooking, heating.

Advantages

1 -It is easily available.

2 -The collection of fuel wood leads to deforestation, which in turn causes other problems like soil erosion desertification.

3 -It is non-renewable since replanting cannot keep pace with its consumption.

4 -It contributes to environmental pollution especially air pollution.

Renewable (sustainable – Alternative) Energy sources

HYDROELECTRIC POWER

1. Hydroelectric power (HEP) is power generated under the influence of the moving water.

Establishing the Generation Centre

1.The reservoir or dam or barrage is contracted normally across the river or along the coastal strip where tidal waves are common.
2. The powerhouse is contracted with turbines installed.
3. Then water is directed to the turbine chamber. Its pressure causes the rotation of the turbines.
4. As the turbines rotate the generators also rotate to produce electric power.
5. The power generated is then transported to the transformer from where it is transmitted to the consumer.
6. There should be reliable market where electric power can be supplier like the mining areas.

Necessary conditions for Harnessing HEP

The following are the conditions or factors necessary for harnessing or generating hydroelectric power;

1. -Reliable rainfall over high mountains so as to ensure the supply of water that can drive the turbines.

2. -Presence of big sources of water like rivers, lakes, oceans and springs so as to have a constant water supply. The volume of the river should not fluctuate

3. -Presence of a good site like waterfalls, impermeable rock base and narrow deep river stream where the dm and the power plant can be contracted.

4. -There should be enough skilled labour for contracting the dam and running the project.

5. -There should be reliable capital availability in order to construct the dam.

6. -There should be reliable market where electric power can supplied like the mining areas, homesteads, advanced mechanized agriculture and industries.

HEP Generating centres in the world

Africa includes

1. Kariba dam on the Zambezi River between Zimbabwe and Zambia.
2. Aswan high dam in Egypt on the River Nile.
3. The Akosombo dam in Ghana on the Volta river.
4. Inga dam in the democratic republic of congo on the Zaire river.
5. Owen falls in Uganda on the Nile River.
6. Kainji dam on the River Niger in Nigeria.
7. Seven forks in Kenya on the Tana River.
8. Mtera dam, kidatu dam, kihansi, Nyumba ya mungu dam, hale dam, kihansi, Rusumo falls etc in Tanzania.
9. Kabora Basa in Mozambique on the river Limpopo.
10. Kafue dam in Zambia.
11. Sennar dam in Sudan on the Blue Nile tributary.
12. Hedrick Verwoerd, Vaal, Torquay, P.K leroux dams on the orange river clan William dam on the olifants all in south Africa.

Advantages of H.E.P

1. It is very clean environmentally – friendly.
2. The reservoirs/dams can help in the control o floods and provision of water in the time of shortage.
3. It is often located in remote, mountainous areas where the population is low.
4. It stimulated the industrial development in the country. Eg iron steel industry in Sweden and electronic industries in south Korea have benefited a lot from the electric power.
5. It has led to the improvement in the communicating system like telecommunication, internet services, radio, TV and satellites that depend on electricity.

Disadvantages of H.E.P

1. The construction of dam leads to the flooding of large areas and people displacement like the Akosombo dam in Ghana.
2. It is easily affected by lack of rainfall and silting of the dams.
3. The pylons which are constructed can lead to visual pollution.
4. The dams also led to the outbreak of diseases.

- North America HEP centers include Niagara Falls on the St. Lawrence River Hoover dam on the Colorado River and the Guntersville on the Tennessee River.

H.E.P IN AFRICA

Factor which favour HEP production of in Africa;

1. The presence of water bodies likes large rivers, lakes and the ocean that assure the supply of water.
2. The presence waterfalls that provide good centers for installing the turbines.
3. There is enough space for dam construction in Africa so that water and be kept for use all the year through.
4. Nature of the rock that s impermeable pre - Cambrian rock provides a good base for the construction of dams..
5. Political stability in same countries like Tanzania encourages the development of HEP centers.
6. Industrial development that has been taking place provides market for HEP.

Importance of HEP in Africa;

1. It stimulates the development of Industries.
2. Encourages the environmental conservation since it reduces the dependence of the forest for power.
3. It encourages the development of agricultural sector tourism and the mining section.
4. It promotes living standard of the people.
5. HEP can be exported to other counties and bring some foreign currency.
6. It encourages the development of science and technology especially in the communication system like internet service, radar , radio and Television.

Problems (bottlenecks) encountered when harnessing HEP in Africa;

Africa has a highest potential for HEP power in the world and it is thought to that tropical Africa possesses 23% of the world total potential of HEP. The potentials due to the presence of many rivers some of which have very large catchment areas and other water bodies great amount of rainfall especially in the equatorial zone and highlands and the presence of waterfalls. But it has least output of electricity (only 1%) due to the following limiting factors.

1. Seasonal fluctuation in the volume of the river, which make it difficult to turn the turbines. Sometimes the rivers are flooded because of high rainfall and sometimes they have very low volume of dry because of poor rainfall.

2. Excessive evaporation of water, which leads to the reduction of water in the rivers and other water bodies.

3. Water in the water bodies like the dam stands to disappear underground through percolation. This also causes the decrease in the volume of water.

4. Poor capital availability for constructing the dams. This is due to the fact that most African countries like Tanzania have poor economic base.

5. Inadequate availability of skilled labour like engineers and technician.

6. Poor market especially where the industrial base in poor. E.g Tanzania.

7. Lack of communication network of link the areas to production and the areas of consumption.

8. Destruction of the power lines or transmission cable as a result of civil wars some of the wires or cables are stolen by people

9. Silting of dams, which leads which leads to the reduction in the volume of the water.

10. Lack of appropriate technology among the people in the countries not all areas suitable for harnessing hydroelectric power are used because of the above factors.

HEP in Tanzania

HEP in Tanzania will continues being exploited because of the following factors;

1. It is relatively cheaply available compared to other sources due to its several HEP sources of high potential. For example there are many great rivers and lakes with high HEP potential.
2. Fossil fuel prices (eg oil) are increasing at a high rate.
3. There is a strong need to stimulate the fishing industry, mining agriculture and manufacturing at a high rate
4. Tanzania has embarked on the comprehensive programme of rural electrification and this can easily be done through HEP production.
5. HEP centers in Tanzania are so large hence not so dangerous to the environment. Hence the use of HEP will be one way of reducing the problems of deforestation hitting the country at large.

TIDAL POWER SOURCE

It is renewable; the power is produced when the tidal water along the coast drive the turbines. The main producers are France, the former USSR china and Canada. The tidal energy is used in producing electricity.

Advantages

1. It is clean the hence does not pollute the environment.
2. The barrages built for tidal energy production help in protection the coast from erosion.
3. If the scheme is large a lot of electricity is produced.
4. The supply of tidal power can encourage the development of fishing industries.

Disadvantages

1. Tidal power centres are very expensive to builds
2. There are few suitable sites into world. And the location should be along the coast; hence the areas far away from the coast cannot get disadvantages.
3. If can lead to the destruction of the coastal areas and disruption of shipping system.

SOLAR ENERGY

It is renewable energy coming from the sun, it is used for direct heating drying clothiers and crops as well as production of electricity potential areas are the tropical areas where there is abundant supply and ikutha health centres in Machakos and Kitui districts ad some parts of Tanzania

Advantages of Solar energy

1. It could be used in many parts of the world.
2. The supply is unlimited (renewable energy).
3. It is non pollutant (it is clean).
4. It is efficient.
5. It is easy to install in new buildings.
6. Solar energy can lead to the development of tourism in the country where there is plenty of sunshine, For example in East Africa many supply of sunshine when it is winter back in their countries.
7. Solar energy provides vitamin D in the bodies, which is good development of strong bones. Deficiencies of vitamin D in the body can cause rickets in human beings.

8. Solar energy facilitates the rainfall formation through evaporation of water from the surface of the earth.

Disadvantages of solar energy

1. It is expensive to install and hence needs high capital for buying some equipment.
2. When it is cloudy or at night the supply of sunshine stops and hence leads to problems of energy supply.
3. It is unlikely to produce large amounts of energy compared to HEP.

WIND ENERGY

It is the energy produced by the moving air mass. Wind is a renewable source of energy since it does not get exhausted. Wind energy can be used in generating electricity and pumping water from the deeper levels in the ground. It is also important in pollination of flowers, distributing rainfall by blowing the clouds regulating eh temperatures and accelerating evaporation. Areas where wind energy is used are Denmark California in USA UK where wind energy is used are Denmark California in USA, UK where there are many wind farms in Tanzania there several turbines, which have been installed in Singida and Dodoma for pumping water from the ground. The use if wind energy had been facilitation by the fact that Tanzania is blessed to have a consistent wind movement wind energy help in irrigation areas in the semi arid plateaus and generating electricity though at a small scale. The group of turbines installed at a certain place is referred to as wind farm.

Advantage of wind energy

1. It is very clean type of energy since there are no wasters produces like in coal or petroleum.
2. It is naturally non – pollutant to air and no problem of global warming.
3. It is cheap to harness or run.
4. Small scale and large scale schemes are possible.
5. It is used in producing electricity. This is done through driving turbines.
6. The land between the turbines can still be farmed.

Disadvantages of wind energy

1. Wind is unpredictable and not constant. When the wind stops the energy production stops too.

2. It leads to visual pollution and noise pollution in areas which are quiet

3. Many turbines are needed to produce a lot of energy and hence.

GEOTHERMAL POWER

It is also a renewable energy source. It is the heat energy generated from the inertial of the earth. This is generated through volcanic eruptions like geysers and hot springs. Hot water from the ground can be tape through into the hot rocks that contain water. As water in thrown out with a great force it can drive the turbine which in turn can lead to the generation of electricity. Examples of the areas are Iceland, Kenya Japan, New Zealand the former USSR Mexico, El Salvador and Hungry in Tanzania potential areas for geothermal power Mbeya in Usangu valley, Arusha. The Rift valley province in Kenya is the potential area for producing geothermal energy. There is a geothermal station known as Olkaria near Naivasha with 16 well

Advantages of Geothermal Energy;

1. It is used for generating electricity and direct heating.

2. There are many potential areas especially where volcanic eruptions take place or have been taking place.

3. It can attract tourist and lead to the eating and warming the residential areas in winter.

4. It encourages the development of communication network like internet services which need electric power to operate

5. In cold area geothermal power is used for heating an dwarfing he residential areas in winter.

Disadvantages of Geothermal Power;

1. Hot water from the ground can introduce sulphur gases in the atmosphere when being tapped. This can later on cause acid rainfall.

2. Geothermal plants are expensive to develop.

3. Very high temperatures can create maintenance problem since some metallic parts can melt.

4. Geothermal power stations are developed in areas which are weak like the rift valley areas with volcanic eruptions. These eruption scan interfere with the supply of energy if the contraction has been poor.

Factors Limiting the Development of Geothermal power in Tanzania;

1. Poor or low capital available for being invested in the installation of the geothermal plants.

2. The presence of other sources of energy which are currently supplying power like HEP, fuel wood, wind oil etc.

3. Low rate of exploration of potential areas going on currently is another limiting factor. The researchers are costly.

4. Low market in the country since the country is still poor and it cannot afford the coast associated with the supply of geothermal power once it is established.

5. Low ability affording the charges for the supply.

6. There is low level of technology among many people of the country.

BIOGAS

It is a renewable source of energy. It is derived front eh decay of plant and animal (including human) water matter. The gases produces as a result of fermentation or decay of these wastes include ethanol and methane gases. Biogas is used for heating, lighting and generating electricity. The main producers are Brazil, China, Japan, Germany, Denmark, India, Tanzania and Kenya.

Advantages of Biogas;

1. It is cheaply produces and widely used. It is affordable in the developing countries.
2. It needs intermediate technology (not advanced technology).
3. It can be used at a local level.
4. It helps in waste management since the wastes are recycled. Hence pollution in controlled.
5. The remnants from the digesters can be used as fertilizer in the farms to encourage crops production.
6. It improves the living standard of the people since they get energy which is cheap.
7. The gas can be exported to other countries and bring foreign currency.

Disadvantages of Biogas

1. It needs high care in handling otherwise it can cause destruction after burning because of careless handling.

2. People needs high care in handling otherwise it can cause destruction after brining because of careless handling.
3. It can be expensive to set up buying the digesters requires a lot of capital.
4. Emission of methane gas leads to air pollution.
5. Other wasters used as fertilizers can cause water pollution and spread of diseases.

BIOGAS IN TANZANIA

The systematic biogas popularisation programme in Tanzania was begun in 1975 by the small Development Organisation (SIDO) under technical cooperation agreements with khadi and village industries commission of India. Six demonstration plants of India design and with capacity ranging from 2 to 8 cubic metres were installed in various areas of Tanzania. The cost of these initial in plants ranges from 6000 to 8000 shillings.

By the end of 1979, 86 biogas plants had been installed in various regions of Tanzania. Out of those, 59 were working satisfactorily, the gas production rate of these plants ranged from 2 to 20 cubic metres of gas per plant per day. The 86 biogas plants were mostly at primary schools, rural health centres and rural training centres. It was anticipated that looting the biogas plants in rural areas would aid very much the transfer of this technology to rural areas and hence raise the standard of living as well as facilitate combating the problem of deforestation.

More plants have been established in many areas or regions of Tanzania these include Arusha, Mwanza, Tabora, shinyanga, Mara, Dar es salaam, Rukwa, Mbeya, Iringa, Tanga, Kagera, Morogoro (e.g. at Lutheran Junior seminary) Dodoma and Singida. Most of these biogas plants were constructed by SIDO. But recently local people are also involved in the construction. SIDO but recently local people are also involved in the construction. SIDO now considers that the demonstration phase of its biogas plants for community cooking, heating and lighting needs of be used for water pumping and electricity generation.

The ministry of energy and minerals has been engaged in feasibility study on the use of biogas to run small diseases engines of up to about 9kw (12hp) The objective is to reduce diesel fuel consumption in engines associated with rural supply.

What factors have influenced the development of biogas Tanzania?

1. The need to cut down costs on the other sources of energy.

2. To do away with over dependence on fuel wood as the source of energy in rural areas.

3. Abundant supply of plants and animals waster. For example the population of cattle in Tanzania than 11 million. This generates more than 40 tons of cow dung annually. This is large generates more than 40 tons of cow dung annually. This is large untapped biogas energy potential.

4. The need to raise the standard o life in the rural areas.

5. The government assistance through the missionaries e.g. in Mwanza at Kwimba, Tabora and Morogoro at Lutheran Junior Seminary.

Major constraints in the wide spread use of biogas energy in Tanzania;

1. Shortage of building materials for digesters.

2. Problems of transporting building materials and raw materials for the digesters.

3. Cost of digesters tends to the high thus most of local people cannot afford getting them.

4. People rigidity in accepting new technology because of being used to fuel wood. Traditionally most people have low level of technology.

NB

Solar energy, wind energy, geothermal power, tidal power, ocean waves and biogas are currently advocated alternative energy sources because of the advantage that apart from being renewable, they are also environmentally friendly since they are largely less or non pollutant sources of energy.

Strategies for Tanzania to Harness Power and Energy Resources

1. The government should support the establishment of geothermal power generating stations like what is being done in Kenya geothermal power in more reliable than HEP.

2. There should be more emphasis on the use of wind, waves and biogas as well as solar energy in the villages. This is very important because electricity tariffs are very high and many people in rural areas cannot afford.

3. Constructing more water reservoirs like dams in order to ensure water availability all the year round.

4. Establishing some industries in order to expand market and attain an economic productive use of energy produced by centers like HEP stations etc.

5. Planting more vegetation in order than can provide biomass for energy generation.

6. Peace in the country should be maintained in order that the present energy sources can be expanded smoothly. Also when where peace there is can't be destruction of the established energy production centers.

7. There should be population control so that the energy sources cannot be over exploited and lead to power supply problems and environmental degradation iron sheets for roofing the building etc

8. It also supplies energy since some minerals are energy resource like coal, petroleum, uranium and natural.

Factors that influence the development of mining industry include the following;

1. Availability of capital to be invested in the mining industry like buying the machines.

2. Nature of transport system. If the transport system is efficient mining develop fast but if the transport is poor then mining does not develop fast.

3. Labour availability is another factor that influences the development of mining sector. For mining to develop fast there should be ready available labour but if labour is not available then mining become poor.

REVISION QUESTIONS

1. Identify the conditions necessary for Harnessing HEP.

2. Show the advantage of HEP in Tanzania.

3. What are the obstacles limiting the development of HEP in Tanzania?

4. Explain how water can bemused in generating HEP.

5. Explain how water can be used in generating HEP.

6. Mention six hydroelectric power centers in Africa and their countries.

7. What should Tanzania do to improve its HEP potential?

8. Mention example of energy resources according to
   (a) Non – renewable resources
   (b) Renewable resources
   (c) Thermal energy
   (d) Fossil fuel energy sources

9. Define the following
   (a) Non – renewable (Exhaustible resources)
   (b) Renewable (or inexhaustible or alternative) resources
   (c) Geothermal power

(d) Hydroelectric power
(e) Biogas
(f) Solar power or energy

10. Explain the origin of
(a) Oil (petroleum)
(b) Biogas
(c) Coal
(d) Natural gas
(e) Nuclear power

11. Outline the uses of each of the following
(a) Solar energy
(b) Hydroelectric power
(c) Wind power
(d) Geothermal power
(e) Biogas
(f) Nuclear power

12. Mention the African countries where nuclear power is produced

13. Explain how biogas energy is produced

14. Account for the decline of coal as coal as the dominant power source in the world

15. Identify and explain the advantage and disadvantage of nuclear power providing concrete examples from any countries of your choice

16. Discuss the developed and potential energy sources in Africa

17. Outline the advantages and disadvantage of
(a) Hydroelectric power
(b) Biogas
(c) Geothermal power
(d) Solar energy
(e) Wind power
(f) Fuel wood and charcoal
(g) Coal

18. Outline the economic importance of the following energy sources
(a) Hydroelectric power
(b) Coal
(c) Oil

19. Mention the river where each the following dams is located
(a) Aswan High Dam

(b) Akosombo dam
(c) Kariba dam
(d) H.F Verwoerd dam
(e) Kabora Bassa dam
(f) Kainji dam
(g) Mtera dam
(h) Nyumba ya mungu dam
(i) Kidatu Dam

20.Outline the four factors that led to the development of biogas in Tanzania

21.Show the impact of fuel wood exploitation on the environment

22.Biogas exploitation is one way of waste management. Explain how this is true

23.Identify for pints to justify (support) that Tanzania has high HEP potential

24.Show the factors hindering exploitation of HEP in Tanzania

25.Suggest the ways that Tanzania can use in harnessing its HEP

5.4 SUSTAINABLE MINING

MINERAL EXTRACTION (MINING INDUSTRY)

Mining is the activity that involves the extraction of minerals from the ground.

Major categories (classification) of minerals: Minerals can be classified into metal and non – metal

Non – metallic minerals include: Salt phosphate potash nitrates mineral oil and natural gas

Metallic mineral include: Gold zinc, copper iron tin silver lead chromium, nickel, cobalt, manages, aluminum, tin etc

DISTRIBUTION OF MINERALS FOUND IN THE WORLD

1.**Coal is found**: USA in Pennsylvania, West Virginia, Ohio, interior states like Illinois, Indian Kansas, Oklahoma and the Gulf province in states like Texas, Alabama the former USSR in Moscow, Donetz Coal Basin, and Kuznetstk coal Basin, Other countries include

China, United Kingdom, South Africa, Zimbabwe at wankie, Zambia, Nigeria, Botswana, The democratic republic of Cong, Mozambique, Morocco, Malawi sudan and Tanzania from the Ruhuhu basin, Ketewaka-Mchuchuma and Songwe Kiwira.

2.**Gold is found** in south Africa, Ghana, Tanzania, Zimbabwe, Democratic Republic of Congo, Uganda and Kenya.

3. **Salt minerals** in Tanzania along the coast uvinza in Kigoma and china.

4. **Copper in Zambia**, The democratic Republic of Congo Uganda (kilembe) Mauritania, Botswana, Chile, Canada, the former USSR and USA.

5. **Natural gas** found in Tanzania at Songosongo island in Kilwa Nigeria and Middle East.

6.**Diamond found** in Tanzania (Mwadui), South Africa, the Democratic Republic of Congo, Namibia, Sierra Leone and Guinea.

7.**Phosphate** in Tororo-Uganda and Morocco at Khourigba, Youssonfia and Ben Guerir within the Maseta.

8.**Bauxite** is the area of Aluminum. It is located in Guinea, Ghana and Cameroon.

9. **Iron ore** in German, Sweden, USA, china, Brazil, Australia, France, UK, Liberia, Mauritania, Zimbabwe, Gabon, Algeria, Angola, and South Africa.

10. **Tanzanite** in Tanzania only

MINING METHODS

Various methods are used in activity depending on the occurrence of the concerned mineral easiness of the method and how cheap it is. The common methods of mining include;

1. Open Cost Method (strip Method)

It is the method that involves the removal of the upper surface layer of soil where the mineral deposits the horizontally near the surface. The method is cheap.

2. Underground (Shaft) methods

It is the method which is used in extracting the minerals which are found deep in the group. It involved digging deep hole (shift) to lower in the ground.

3. Placer method mining

It is the simple method, which is used in extracting alluvial mineral by using the pans in the river valley. It is used in diamond mining in South Africa, it involves digging out the sand and gravel from the river basin swirling it round with water in shallow pan. Then the pan is tilted in such a way that the lighter and/or gravel is washed over the side, leaving the heavier mineral at the bottom of the pan.

Contribution of the mining industry to the economy (economic importance of mining industry) of any country;

a. The mining leads to the development of industries in the country for example steel cutting industry, coal has led to the development heavy industries in China, USA and chemical industries.

b. Mining contributes to the earning of foreign currency in the country for example copper in Zambia Gold in South Africa, oil in Nigeria, Libya, Algeria, Middle east and Kuwait.

c. Mining industry provides employment opportunities to the people e.g. In Zambia copper mining employs a lot of people in South Africa in the Rand mining area).

d. Mining stimulates the development of transport and communication systems in any country. For example in South Africa mining has led to the development of a dense network of Roads and railways lines in the Eastern part.

e. It encourages the development of other economic sectors since it generates capital for the country. For example mining in China has led to heavy investment in Agricultural machinery.

f. Mining also leads to the improvement in the international relations through forming the international organization for the countries mining and exporting certain type of mineral. For example Nigeria is the member of OPEC to the oil mining industry

g. Mining leads to the development of towns and large cities like the industrial conurbation of Rand in South Africa conurbation is the large zone formed as a result of the combination of

many towns into one zone. Also in Tanzania Mwadui has grown because of Diamond mining, Mpanda in Rukwa and Chunya in Mbeya because of gold mining and other minerals.

h. Also mining brings beauty accessories and buildings decolation materials.

i. Mining has stimulated the construction activity especially in the supply of corrugated iron sheets for rooting the building etc.

j. It also supplies energy since some minerals are energy resource like coal, petroleum, uranium an natural gas.

Factors that influence the development of mining industry include the following;

1. Availability of capital to the invested in the mining industry like buying the machines.

2. Nature of transport system, If the transport system is efficient mining develop fast but if the transport is poor then mining does not develop fast.

3. Labor availability is another factor that influences the development of mining sector. For mining to develop fast there should be readily available labor but if labor is not available then should be readily available labor but is not available then mining becomes poor

4. Nature of market if the market is goods then mining industry grown fast but if it is poor mining industry develops slowly.

5. Water availability also leads to fast development of the mining are slow if the supply of water is poor. Water is needed for cooling the engineers of the machines and cleaning the minerals

6. Nature of the government policy. If the policy is supportive the mining industry develops fast but if the government is non supportive then the mining industry develops so slowly

7. The availability of deposits and their value if the deposits are large and valuable mining takes place fast

Problems facing the mining industry in Africa and other parts of the words;

1. Decline or exhausting of the mineral deposits because of over exploitation like coal, copper in Zambia, and some parts of USA and south Africa.

2. Lack of skilled labor in the developing countries like Tanzania this has led to poor exploration and low yield.

3. Lack of capital in the developing country has led to the decline in the mining industry.

4. Some countries lack important mineral deposits like Japan and poor quality like coal in Tanzania.

5. Poor transport system especially in the developing countries have let to poor mining activity. Some parts of central Tanzania have poor loads which are impassable during the wet season.

6. Competition with other economic sectors for water supply is another problem. For example is south Africa water is scarce and the available is competed for the Agricultural sectored, mining manufacturing industry

7. There is a severe problem of constant power supply, this affects the mining industry.

8. Poor conditions of workers in the mining areas lead to the problem in labor supply.

9. Political problems especially civil wars lead to the poor mining development causes by labor unrest.

10.There are problems of local market especially in the developing world.

11. Also there is a problem of price fluctuation in the world market which affect the development of the mining industry in many countries in the world.

12.There are problems of food supply in some countries like in Zambia in Africa. This also led to the poor mining developments.

Problems caused by the mining Industry;

1. Mining leads to environmental problems like land degradation soil pollution water pollution and deforestation. When the mineral get exhausted and the land is left derelict after being abandoned.

2. It attracts people causing high population pressure in the mining centers which in turn causes many social and economic problem like poor housing unemployment.

3. Mining leads to the death of people due to accident s caused by the collapse of mines.

4. Mining causes the decline of the economic sectors especially agriculture since many people rush to the mining centers to soppy.

5.Mining industry has also led to the occurrence of political conflict like wars which are taking place in the Democratic Republic of oil.

6.Over concentration on the mining activity leads to the problem of food supply because people give low priority to agriculture. This has been the case in Zambia where food is being imported from other countries.

Effects of Mining to the environment;

1.It leads to environment pollution like water pollution, air pollution soil pollution and sound pollution(noise).

2.Mining causes land dereliction (abandoning of the exhaust land) This destroys the nature of the landscape and leads to mineral resource exhausting.

3. It accelerated deforestation as a result of clearing of vegetation so as to establish the mining centers.

4. The size of the land is reduced and the soil structure and texture are destroyed because o the mixture with fragments of rock and hence plant growth cannot take place easily.

5.Mining leads to the disappear race of valuable plant species.

6.Green house effect and global warming can occur as a result of the use of energy generating minerals like coal, uranium etc. These minerals produce gases like carbon dioxide, which pollute the atmosphere.

7. The pits which are flooded with water at as mosquito breeding places and hence accelerate the spread of malaria.

CASE STUDIES

GOLD MINING IN SOUTH AFRICA

Gold was first discovered near olefins river travail in 1868. But true mining began in 1886 with deposits are Witwatersrand between Krugersdorp and springs in Transvaal

Occurrence

It is found in the rock layers known as reefs which vary in thickness from a few centimeters to more than a mile. It is the most valuable mineral and has been highly valued throughout the history. Today it is widely used as the basis of world's money and jewellery. South Africa is the leading produces into the world and it has the largest reserves. About 56% of the worlds output is produced from South Africa.

Distribution

The main mining area is at Witwatersrand in Transvaal and is the single major mineral producing in South Africa. The Witwatersrand goldmines are close to Johannesburg, a city that grew fast because of gold. Another rich area is in the Orange Free State centered on odendaalsrus where mining began in 1948 and stretches in a 400km arc as well as Natal, but the mines in the western rand are the largest producers in the country.

Methods of Gold mining

Formerly open cast method was dominant since the god seams were near the surface. But today mining involves shaft method. The rocks in the reef is called banked and it is it which is mine.

Processing

The banked (gold – bearing rock) is crushed into fine powdery dust and then mixed with water (stirred) until it becomes liquid mud or slime. Then cyanide solution is added to dissolve gold content. Then it is mixed with zinc dust to cause gold to precipitate out, and then gold is smutted and then moulded into bars at Hermiston in the rand. During the process of purifying gold, uranium is also extracted uranium is used for the production of atomic (nuclear) energy.

Factors that facilitated the Development of Gold mining in South Africa;

1. The presence of large deposits in the country especially in the rand the large deposits have made south Africa the leading in the world.

2. The use of advanced technology into exploration mining and processing of gold. Extensive exploration was done by the foreigners and companies who got involved in the gold mining in South Africa. Other companies are Johannesburg Consolidated Investment Limited (JCIL) and Johnnies Industrial corporation.

3. Availability of cheap labor in mining areas was another factor that facilitated the development of gold mining. The companies were using migrant labor from the neighboring countries like Malawi and Mozambique. The laborers were being paid low wages so as to keep the cost of production low and get higher profit.

4. The development of efficient transport network in the mining areas had a great contribution sector, For example railway construction began at Cape Town 1859 and today a large portion of it is electrified. Also the development of roads in the country has enhanced the gold mining activity into the country. There are ports like coupe town, Durban and Port Elizabeth help in the export of gold.

5. Large market into the country because of the presence of many industries. There are so many metal working and engineering industries. Also there is a great external market of gold. Gold accounts for 35% of export trade into eh followed by wool.

6. Small size of the arable land has led to the concentration on the mining activity.

7. The value of gold at a global level especially in the marking money and other uses has make the government in south Africa to strongly concentrate on the gold mining.

The Role of gold mining in South Africa;

1. It has created employment opportunities to the people of not only of south Africa also from outside the country like Malawi Tanzania and Mozambique's who went there as migrant laborers.

2. It has stimulated the development of towns like Johannesburg as a mining and business center in Transvaal.

3. It has been contributing to the generation of the government revenue and capital to be invested for further economic development.

4. It has stimulated the development of industries in the country and other mining activities like uranium, platinum etc.

5. There has been more development of social services like education.

6. It has earned south Africa an international repute and the worlds evading.

7. It has stimulated the development of efficient and effective transport and communication system like railways lines roads lines, roads airways and seaports that encourage exportation of goods.

Negative impacts of Gold Mining in South Africa;

1. Gold mining contributed to domination of South Africa and the Boers and the introduction of the apartheid policy in the country. The apartheid system brought problems of racialism and segregation whose relics can be seen even today. There are frequent conflict, which offer between the Africans and other nationals.

2. It has contributed to the occurrence of environmental degradation because of creation of pits and this has led to the disappearance of vegetation. Other environmental problems include air pollution water pollution soil pollution and noise pollution.

3. Creation of mines has led to the reduction in the size of the arable land and hence the decline in agriculture.

4. There has occurred high population in the mining areas and towns creating some problem of pressure for land, poor housing diseases and unemployment.

5. The problem associated with the decline in the prices and exhaustion have led to the laying off (redundancy) of some workers in the mining areas for example in 1990 at least 40,000

gold mine workers were laid off in south Africa and this continued through 1993. Layoffs have then contributed to the increase in the rimes and other vices like prostitution etc.

Limitation of Gold Mining in South Africa;

1. Labor unrest is still a problem because of conflicts, which have been prevailing since the area of apartheid policy.

2. The rising cost of production because of the deepening of gold mines and some of the seams are smaller than the country rock bringing problems of extraction.

3. The machines have become so old that they need replacement. The old condition of the machines leads to the decrease in efficiency and effectiveness causing the decline in production.

4. There are raising coast of goods and services especially food supply medicine and education. These affect gold mining extend.

5. There is a big problem of water supply since South Africa does not experience heavy rains in most of its parts especially the western part. Therefore water available is cooperated for by different sector like agriculture. Industry mining and domestic requirement.

6. The collapse and flooding of the mines is another high ring factor the collapse leads to the killing of the miners and flooding leads to delays because removing of water from the mines takes long time causing time wastage.

7. Some mines get exhaust and are closed done for example in 1994 rand gold closed Durban gold mine leading to the laying off of the workers and decrease into the total production.

8. The world prices are not stable, they have been fluctuating such that in some years prices have going high and in some years it has been going down. This has contributed to the problems of mining in South Africa because some companies could start paying the workers so poorly to raise the profile. For example the worlds prices fell in 1989 and the industry found that many of the low grade ores were no longer profitable and nearly a half of the gold mines in operation were running at loss. Hence the gold deposits of poor grades bring low profit or loss during when the prices full.

DIAMOND MINING IN SOUTH AFRICA

It is the hardest mineral, it is a pure carbon crystal metamorphosed under intense heat. In South Africa diamond was discovered in 1967 and true mining began in 1871 at Kimberley. The Kimberley diamonds fields and later discoveries in Gauteng and along the Atlantic coast emerged as major sources of gem quality diamonds security. South Africa position as the world's leading producer into hem in – twentieth center. The De Beers consolidated mines company

controlled mot of diamond mining and influenced international trade through a diamond – producers alliance of cartel (the central selling organization).

There are two types of diamond deposits that occur in South Africa and these include;

1. The major deposits which occur in the volcanic kimberlite pipes near Kimberley. Other place are Pretoria, jagersfontein koffiefontin and the recent mine (finsch mine) east of postmansborg. Alluvial diamond deposits that are mine by small scale miners in the orange, Vaal and Hatz valleys.

Uses of Diamond;

- Diamond is used for making jewels grinding mills sharpening metal manufacturing the drilling bits, making cutting instruments like for cutting glass and lather machines and diamond dust for polishing.
- The methods involved in the mining process are **placer method** or **alluvial diamond** mined at the small scale in the orange, veal and Hatz valleys and shaft method for the diamond found so deep in the ground. Open cast method which was common at fish mine but was abandoned because of flooding and collapse of miner.
- Diamond mining in South Africa has been facing several problems most of which are similar to those which have been affecting gold mining that is price fluctuation, labor unrest exhaustion, food shortage for the workers and water problems.
- In terms of price fluctuation the price of diamond dropped in 1987 such that the De Beers was required to support the market by withholding diamond from the dealers. During this time the annual production of more 10 million carats in 1985 and in 1987 dropped to 9.1 million in the late 1980.

IRON MINING IN THE USA

Iron Ore Distribution

Iron Ore is mined in four main region sand these can be identified as follows;

1. **Lake Superior region**: Is the greatest region with the largest amount coming from the Mesabi rangers. Other deposits occur in ranges. The area is soft and easily mined with open cast method, shaft method is also use in some ranges.
The ore is soft and easily mined with open cast method shaft method is also used in some ranges where the deposits are situated deeply. The problem is the high grade ores are exhausting, low grade ores are still abundant and they have to be treated before shipping to upgrade their are content leading to high cost.

2. **North eastern Region:** Mainly magnetite ores are mined in the Adirondacks region of New York and Cornwall areas of Pennsylvania. They have the advantage of central location near the industrial cities of New York and Pittsburgh.

3. **The south – Eastern Region:** This region centered at Birmingham Alabama, produces both haematite and limonite area. It is favorably located near the coalfields of the southern Appalachians and serves the iron and steel industry of Birmingham.

4. **The western Region:** It includes many scattered field in the western USA in the state of Utah, Nevada, Wyoming and California. The ores are transported to steelworks at Sam Francisco, los angels, pueblo, Colorado, Provo and Utah.

Factors that have stimulated the development of iron Ore mining in the USA;

1. The presence of all types of iron are some of which are of high grade.

2. Easy mining where the iron ores are near to the surface like in the lake superior region in which open cost method is used.

3. The use of advanced technology in the exploration mining and processing of iron are this has led to the production of iron of good grade.

4. Advanced transport and communication system. The transport system has made the ferrying of iron are to the processing industries become easy as well as the distribution of power like coal to the iron industries and the iron products to the customer.

5. Presence of internal market because of many engineering industries in the countries for example there are iron and steel industries at Birmingham and Pittsburgh which have creates a strong market for iron.

6. Large capital availability because of the strong economic base of the country is rich and hence coulee easily invest in the mining of iron are mining industry.

7. Labor availability has also been another driving factor towards the development of iron mining in the USA iron mining needs labor otherwise it can't take place easily.

8. The government also has played an instrumental role through encouraging the development of heavy industries. This has been due to the fact that the goal is to attain high level of industrialization and maintain the advanced economic level in the country.

9. Hard working spirit strong determination among the people has been another vehement dynamo propelling the development of iron mining so as to attain industrial development and even surpass other countries in the development of economy in the country.

10. The country, despite terrorist attacks which is the global issue, has strong defense force which has been capable of maintaining instituting strong security in the country landing to the smooth running of the fundamental activities including mining of iron ore deposits.

Importance of Iron Mining in the USA;

1. It has led to the development of metallurgical (heavy) industries like iron and steel industries found in towns of Pittsburgh, sun Francisco, los Angels, Pueblo, carload, prove, Utah, southern end of the lake Michigan (around Chicago and Gary) near the western and of the lake eerie (around Detroit and Toledo) around Youngstown.

2. It has to the development of transport and communication, Locomotives and cars are made because of the influence of iron mining in the country.

3. It has contributed to the generation of export earnings this is because of a very large market or iron outside the country.

4. Employment opportunities have been created solving the problem of unemployment.

5. It has promoted the iron are mining industry since it needs this energy for smelting.

6. The capital generation by iron mining has contributed to the strong investment in the other sectors like tourism and agriculture.

7. Iron mining has also facilitated the development of towns like Pittsburgh which is referred to as the iron and steel capital of the world.

8. It has also contributed the generation of the government revenue which is used in the running of different social political and economic matter.

Obstacles facing Iron mining in the USA;

1. Some of high grade deposits especially around the lake superior are exhausting since they have been extracted so excessively.

2. Mines are becoming deeper and deeper leading to higher costs of production.

3. Abundance of low grade iron are also made the country incur a lot of costs in upgrading the quality of the ore content, especially in the lake superior region.

4. There is a strong challenge from other countries like west Germany the former USSR and Japan, UK France and some African countries which are posing stiff competition to the US most of these countries are highly determined to become self reliant on some of resources like iron are in case they are available within the country.

Problems posed by the Iron ore Mining Industry in the USA:

1. Land degradation as most of it has long been mined either through open cast of shaft method.

2. Environmental pollution due to the use of coal as the source of energy in the processing of iron ore. The brining of coal has been emitting great quantities of greenhouse gases like carbon monoxide and carbon dioxide, which in turn have contributed to air pollution causing acid rain etc. As a return of acid rains there has been a great problem of soil pollution in many parts leading to the decline in agriculture and water polluting cause health problems to man and aquatic organism. USA is renowned in terms of being the major contributor in the environmental pollution.

3. When mineral deposits get exhausted cause the problem of unemployment. Jobless people into various vicious activities like burglary, robbery and prostitution.

4. Overpopulation because of in migration of people who have been attracted by the iron mining industry.

5. It has also accelerated the increase in the urban problems like congestion or traffic jams. This has been due to the making of many cars as regular large scale iron mining.

IRON IN LIBERIA

Iron mining is very important to the economy of Liberia. The areas with mineral deposits include Bomi Hills, Bong mountains, Nimibia mountains and Bie Mountain ranges. Open cast method is widely used.

Factors for the Development of Iron Mining in Liberia;

1. Availability of iron are both high grade and low grade.
2. Development of the railway to Bomi hills from Monrovia.
3. Labor availability since west Africa has high population.

Advantages of Iron mining in Liberia;

1. It has contributed to the export earning.
2. It has contributed to the development of industries especially steel industry at Buchanan.
3. It has encouraged the development of towns.
4. The mining industry has stimulated the development of social services like schools, hospitals, shops and policy station.
5. It has led to the improvement of deport facilities such Buchanan.
6. Iron mines have provide the market for the locally produced food stuffs.
7. It has stimulated the development of infrastructure like the rally's system etc.

Problems facing Iron mining;

1. Competition from others like south Africa which also produce iron.
2. There is exhaustion of deposits in the mining areas.
3. Poor transport from other west African countries.
4. The deposits are scattered.

5. Civil war between governments and the rebels, which are taking place in the country, bring problems in the iron ore mining and iron extraction.

IRON IN SWEDEN

Sweden is endowed with iron minerals among other types of minerals. Areas where iron mining takes place include places around kiruna and other mining centers at Gulliver and Svapavaara.

Factors for the development of Iron mining in Sweden;

1. The development of the railway stimulated the iron mining industry.
2. High market in Europe due to the developed industry especially in Germany.
3. Power supply from the great hydroelectric plant at Porjus etc.
4. The use of advanced technology.
5. The government support on the industrial development.
6. Constant water supply needed in the cooling of engines and cleaning.
7. High government stability has encouraged the mining industry.
8. Availability of high grade iron deposits.

Importance of Iron Industry in Sweden;

1. Creation of employment opportunities.

2. It has stimulated the development of transport and communication.

3. It has led to the development of heavy industries including steel and iron industry as well as car and ship building industry. Volvo and Scania cars are produced in Sweden.

4. It has promoted agriculture, forestry and tourism.
5. International trade has expanded.
6. Towns have developed due to the contribution of iron ore mining.
7. Social services have improved to a great extent.

Problems facing Iron industry in Sweden;

- Formation of ice in winter at the Lulea port complicated the transportation. To solve this problem another link was formed to ice free port at Narvik.
- . Exhaustion of the iron deposits due to excessive extraction.
- . Stiff challenge from the environmentalists who are against the current trend of fast industrial development.

TIN IN NIGERIA

Nigeria has large deposits of tin ore called cassiterite. It is found in the Jos (Bauchi) plateau. Nigeria is the sixth country in the world.

Use of Tin

Tin is used in canning, soldering (sealing up joints or leaks in metal objects), alloying (eg mixing with copper to get bronze) and roofing materials like the corrugated iron sheets.

The common method used in mining is open cast method where there are shallow deposits. For deep deposits massive mechanical grabs are used.

Processing

Tin is smelted and cooled into blocks of pure metal. These blocks are called **ingots.** Then ingots arerailed to Port Harcourt for export.

Limitations that Nigeria is facing in terms of tin mining include:

1. -Exhaustion of the deposits leading to decline in the total production and unemployment.

2. -Price fluctuation in the world market such that sometimes prices become so low discouraging tin mining.

3. -Labor supply is poor due to flow of people to more valuable minerals.

4. -New deposits have been discovered in the countries posing a great challenge to tin mining in Nigeria.

COPPER MINING

Copper is found in every continent and small quantities are produced by a large number of countries. The leading producers are the USA (17% of the world total), the former USSR (14% of the world total), Chile, Zambia, The democratic republic of Congo (DRC) and Canada. In East Africa Uganda also produces copper. World total output is about 8 millions tones.

Copper mining and processing;

Most copper mines are operated by open cast method while in some areas shaft method is used where the deposits are deep. After excavation copper is usually mingled with such enormous proportion of wastes.

In the processing stage copper ores are first crushed and mechanically sorted and then washed with water using the floatation or gravitational process in the same way as in alluvial mining, so that heavier copper bearing particles are separated from the unwanted material. The concentrate is then dried and sent to the copper smelters who are usually located near coal-fields or any source of cheap fuel where it is reduced to copper blisters contain traces of other metals such as gold and zinc and these are removed through further refining. Refining is done electrically.

COPPER MINING IN ZAMBIA

Historical background

The development of copper mining in 1909 after a railway line had reached Kabwe. But at the beginning copper mining was retarded by diseases, inaccessibility and technical ignorance and World War 1

Mining zone

Mining takes place in the Zambian belt which covers a zone of about 110 km long and accounts for 10% of the world's total production. The region contains 25% of the world's proven copper reserves. Copper mining in Zambia is carried out in a number of mines which include Roan Antelope and Nkana which were opened after WWII include Chibuluma (1995) Bancroft (1957) and Chambishi (1965). The Anglo-American corporation has highly been involving itself in operating these mines. Other mines which have been opened recently are Bwanakubwa and Nampundwe. Mining methods include pen cast method especially at Nchanga and Chambishi and Shaft method especially at Roan Antelope, Rhokhana, Chibuluma, Kitwe, Chingola, Mafulira and Bancroft.

Contribution of Copper to the development of Zambia;

1. -It has highly been the main economic pillar of the country. It is the main export product in the countries. Zambia has been ranking the second in terms of copper production in the world the first being the United States. Copper contributes about 90% of the export earnings in the country.

2. -It has facilitated the development of power stations like hydroelectric power centers at the Kariba and Kafue dams.

3. -It has contributed to the creation of employment opportunities in the country.

4. -It has stimulated the industrial development. For example smelting industry has been developed at Mufulira, Kitwe, Luanshya and Ndola.

5. -Towns have developed as a result on mining.

6. -It has stimulated the development of infrastructure like railway and road network.

7. -There has been improvement in the social services like education, medical services etc.

8. -It has earned the country an international recognition as the second largest producer of copper after the US.

9. -It has enhanced the rise in the living standard of the people especially those employed in the mining section.

10 -It has created market for agricultural food products.

11 -It has also stimulated international relations with other countries.

Problems Facing Copper mining;

1. -Price fluctuation which has been taking place especially involving the falling of the world market.

2. -Shortage of food due to the decline of agriculture caused by the concentration on the mining activities rather than agriculture.

3. -Some mines have been getting exhausted leading to the decline in the total production of copper in the country.

4. -It also faces a great need for fuel required for refining copper in the processing industries. This is due to the fact that power supply centers are also facing many hindering problems like unreliable power generation due to water level problems etc.

5. -There is a problem of labor following the exodus of many people from Zambia to South Africa in the land.

6. -It also faces the problem of land lockedness. This has made Zambia incur a lot of costs in transporting copper through other countries like Tanzania (Dar es salaam), Angola (Lobito) and Mozambique (Beira).

7. -There are problems of political instability especially in the neighboring countries and these affects Zambia's transport schedules. For example conflicts in southern Mozambique and Angola have forced Zambia to rely on TAZARA line which today has become over burdened especially at Dar es Salaam. Political insecurity has also kept away the expatriate staff vital to the smooth operation of the mines.

8. -The decline in the earnings from copper has even made it difficult for the government to maintain the existing transport network in the country.

9. -Flooding in the mines is another problem, which reduce efficiency and effectiveness in copper mining in the country. Flooding implies that time has to be wasted in removing water from the pits before resuming the process of mining.

10 -Diseases like Malaria, HIV/ AIDs and Ebola have also been another big problem in the region. These cause deterioration of health and death of people.

11 -Lack of capital to be invested in father exploration and mining of copper.

Problems caused by copper mining.

1. -Land degradation and dereliction due to the excavation and exhaustion of the mines. Dereliction creates an ugly landscape in the areas concerned with mining.

2. -Copper mining has contributed to the decline in agriculture leading to food shortage such that the country imports food from other countries. Most of the people prefer mining to cultivation.

3. -It has also led to rural-urban migration leading to over concentration of people in the mining towns, creating pressure for land.

4. -Political instability has been due to the struggle for the control of the copper belt.

COPPER MINING IN THE DEMOCRATIC REPUBLIC OF CONGO (DRC)

Copper mining is also taking place in the Democratic Republic of Congo. Mining takes place in the Katanga Copper belt which is the continuation of Zambia copper belt. The Katanga (Shaba) – Copper belt forms the backbone (Cornerstone) of the country's mining industry. The Katanga copper belt extends 320 km from Lubumbashi westwards to Kolwezi. In the DRC (Zaire) full exploitation began when the railway from the south reached Lubumbashi 1910. Open cast method dominates since deposits lie near to the surface except at Kipushi. The open cast centers are Kolwezi, Ruwe, and Musonoikamoto etc. Refining is done at Likasi, Shituri and Luilu.

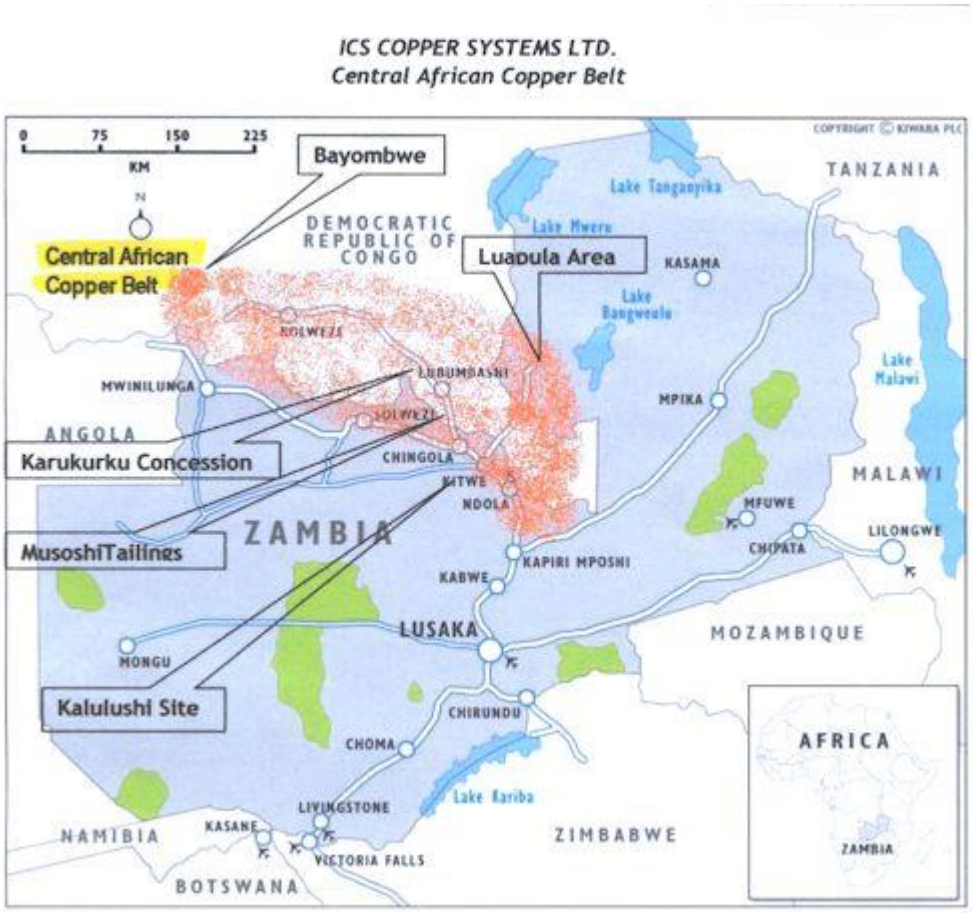
Smelting is done at Lubumbashi, Likasi and Kolwezi. After smelting it is sent to Lobito, Matadi, Beira and Dar es Salaam ports for export.

Contribution of copper to the development of the country;

- Copper mining has contributed to the generation of the government revenue.
- creation of capital to be invested in different economic sectors.
- improvement in transport and communication especially the construction of railway and roads.
- development of power centers at Lufira and Luabara rivers for supplying energy to the mining centers and smelting industries.
- stimulation of the development of towns like Lubumbashi, creation of employment opportunities and stimulation of industrial development.

Problem facing Copper mining in the DRC;

Problems faced in the copper mining include mineral exhaustion leading to the decline of total output, deepening of the mines causing the rise in the operating costs, Land lockedness causing the increase in the transport costs when passing through other countries, Diseases affecting the health of the people like Ebola, the ongoing political conflicts make people restless and fail to deal with mining effectively, poor coal from Luera for providing energy and world's price fluctuation. If it were not for the conflicts the DRC could have overtaken Zambia in the production of Copper.



PHOSPHATES IN MOROCCO

In Morocco, phosphates are the most important mineral and the country is the world's leading exporter of this mineral. High quality phosphates are mined since 1964. There are about 60 phosphates mines but the main mine deposits are those at Khouribga, Youssonfia (Louis Gentil) and Ben Guerir within Maseta. Phosphate mining is state owned. Phosphates are used for manufacturing fertilizer.

The factors which facilitated the development of phosphate mining in Morocco;

1. -Agricultural development in many parts of Africa especially following the strong need for fertilizers in order to expand agricultural production of food crops so as to provide food for the burgeoning population as well as cash crop production.

2. -Capital availability that could be invested in the mining sector and establishment of industries for manufacturing for super phosphate fertilizers in the country.

3. -High demand for fertilizers from outside Africa stimulated the zeal to develop phosphate mining.

4. -The presence of high quality large reserves that amount to 50 billion metric tons encouraged the Government to invest in phosphate mining.

5. -Efficient transport system especially the railway line linking the mineral deposits to the Casablanca and safi ports for export. For example railway line to Ben Guerir is electrified.

6. -Power supply from major Hydro-electric plants located on the Quel el-abid (Bi el Quadaneaam) and Afourer Rivers. Morocco has better geographical conditions for the production of Hydro-electric power than the other countries in the Maghreb. Hydro-electric power provides about 72% of all the electricity produced in Morocco. Hence, the larger power supply has facilitated the development of phosphate mining in the country.

Advantage of phosphate mining in Morocco;

1. -Agricultural production has been promoted in many countries following the manufacture of fertilizer and the improvement of soil quality. In Morocco major agricultural development schemes have been developed and phosphate fertilizer is largely used in the production process. The problem of food shortage has been reduced in many parts of continent since some countries even produce surplus and supply to the countries, which face the problem of food shortage due to agricultural crisis.

2. -It has contributed to the creation of employment in the county. People are employed in the phosphate mining areas and in the phosphate manufacturing industries.

3. -It has provided a great market to the hydro-electric power produced in the major power centers.

4. -The export of phosphates fertilizer and phosphate minerals has earned the country foreign currency.

5. -It has stimulated the development of industries like fertilizer manufacturing industries and agricultural products processing industries.

Other countries which produces phosphates;

1. **Uganda** with estimated reserves of 200 million tons at Tororo. The ores contain 13% of phosphate and is used for manufacturing fertilizers.

2. **Tanzania** has a reserve of 10 million tons of high quality phosphates found at Minjingu near Lake Manyara. Other deposits occur in Togo and Senegal.

URANIUM

Uranium is used for generating nuclear energy. The countries which produce uranium are South Africa, Niger, Canada, France etc

URANIUM IN NIGER

It is produced in the northern part of the country where the reserves are estimated to be more than 160,000 metric tons. They were being exploited at the rate of 3,000 metric tons per year in 1999's. Uranium accounts for ¾ of the country's annual mineral exports.

REVISION QUESTIONS

1. 1. Identify the factors that determine the development of mining industry in the country.

2. 2. Show the role of mining industry in the economic development of the country

3. 3. Why is mining industry referred to as a robber industry?

4. 4. Show the factors that have facilitated the development of mining industry in:-
   (a) Sweden (Iron mining)
   (b) USA (Coal mining)
   (c) South Africa (Diamond)
   (d) The DRC (Copper mining)
   (e) Zambia (Copper mining)
   (f) Tanzania (Gold Mining)
   (g) Uganda (Copper mining)
   (h) South Africa (Gold and Diamond mining)

5. 5. Identify the factors limiting the development of mining industry in Tanzania.

6. 6. Show the problems facing coal mining in USA

7. 7. Explain the effect of the mining industry on the environment

8. 8. How can mining cause:
   (a) Water pollution?
   (b) Air pollution.
   (c) Noise pollution.
   (d) Soil pollution.
   (e) Global warming.

9. 9. Identify different methods used in the mining process.

10 10. Choose any of the mining methods and show its advantages and disadvantages.

11 11. To what extent can one argue that Zambia is the mining country?

12 12. Account for the declining trend of copper mining in the democratic republic of Congo

13 13. Explain the distribution of copper deposits in Zambia and The Democratic Republic of Congo.

14 14. What are the prospects and problems of mining in East Africa?

15 15 Mining in Tanzania has a bright future. Discuss.

REGIONAL FOCAL STUDIES - 5.6 SUSTAINABLE FISHING

Fishing industry or fisheries
Refers to the activity (activities) that involves establishment, development and exploitation of different fish resources. This is carried out in the water bodies both man made and natural. Fishing has developed much in the world especially in the temperate regions where water is cool and the fishing grounds are many. Fishing is well developed in the countries like Norway, Japan, Canada, Russia and other African countries like South Africa, Namibia and Angola. East African fishing industry is not well developed despite having many water bodies and a long coastal line.

Fishing is referred to as a robber industry because in many parts of the world catching is not balanced by replenishing the fish stock. This has been due to the introduction of faster and more powerful fishing vessels and modern fishing equipment to meet the ever increasing demand for more food needed for the burgeoning population. Hence fishing is excessive compared to replacement by reproduction.

Conditions that favor the development of fishing industry

1. **1. Cool climate with temperature lower than 20C**. The cool water of temperate seas are more suited for the breeding of fish than the tropical water. Valuable species like salmon, cod, herring, haddock, and mackerel are found in the temperate seas.

2. **2. Availability of planktons**. Planktons are used as food by fish and hence fish are plentiful where there is a lot of plankton. Plankton flourishes under cool and shallow water and in the presence of plenty of mineral salt.

3. **3. Physical environment along the coastal** characterized by indentations provide ideal sites for ports. Some of the greatest fishing ports of the world like St.John (New found land) and Bergen (Norway) are found along the intended coastlines.

Types of fish

There are three categories of fish that are salt water fish, fresh water fish and anadromous fish.

1. Salt-water fish

Include the fish species that live in the seas, oceans, and salty lakes, Herring, which is most common in Norway, Ice-Land, Sweden, Japan and China is an example of salt water fish.

Salt water fish can be divided into;

1. **a. Pelagic species**. The species that live close to the surface water of the oceans and the seas. They move in large shoals. The most common species are Herring and Mackerel found in the Mediterranean Sea and off the coast of west Europe, Sardines found in the Mediterranean sea. New England and North America. Anchovies small fish mainly caught off the coast of Peru. Anchovies are used for making fish meal that is fed to animals and as fertilizer and Menhaden found off the coast of North America. It accounts for 1/3 of total catch in USA. Menhaden is used for fertilizers and animal feed. It has very high content of nitrates and phosphorus .Others are pilchard.

2. **b. Dermesal species**. These are species found at the bottom of the seas and oceans. The most important species include cod, which is a large fish of 1.5 meters long used for extracting oil. It is mainly fished from the North sea off the coast of Norway and Iceland. Other demises fish species are Tuna, Haddock, Hake, Snapper, group and Halibut. These are fished off the coast of British Columbia.

2. Fresh Water Fish;

These include the species that live in the lakes like Lake Tanganyika and Victoria, Edward, Albert and Turkana, and rivers like Ugalla river, Rufiji and Kagera rivers. They are not as important as salt water species and do not swim in shoals. Fresh water fishing in Europe and USA is a part time occupation.

In USA it takes place in the great lakes (i.e Michigan, Huron, Superior, Erie and Ontario). These are the most important inland fishing grounds. The species found are perch, pike, trout and salmon. In Russia, Japan and China inland Fishing is important. Inland Fishing in Africa takes place in the lake Victoria, Lake Tanganyika, Lake Malawi, Lake Turkana where Nile perch is fished, and Lake Naivasha.

3. Anadromous Fishing;

These are species spawn in rivers but spend their lifetime in oceans and seas. They later return to rivers to spawn and die. The most common species include Salmon. This is most fished in North America. Salmon travels in large numbers. Once fished it can be conserved while fresh or sometimes smoked and canned. There are canning factories in Canada (at Vancouver).

Fishing Methods used include;

1. **a. Drifting** in which the drift nets hang vertically like the table tennis. The method is used in catching pelagic fish. The fish gills are caught in the mesh when the fish is trying to swim across the drift net.

2. **b. Trawling** in which the trawl net is used. This is bag shaped net used in catching the dermises fish as it is dragged by using the trawler.

3. **c. Seining** that involve the use of haul seine and purse seine. They have intermediate features between drift net and trawler. Haul seine net looks like a drift net but is smaller and the purse seine net looks like a trawl net but also smaller in size. The seine net is pulled to surround the shoal of fish It is used by fishermen in small boats or by land based fishermen.

4. **d. Lining** in which lines fitted with hooks are use to catch fish. It is used where trawlers and seine nets cannot be used especially where the sea floor is rugged. It is used for large fish like tuna. Two types of line are used that is Hand-line (haul line) which is a line with a single baited hook cast from the deck. It can be drawn from water when the float indicates that the fish has been hooked. It is popular for spot fishing but uneconomical. Long lines is associated with many hooks (500 to 5000) attached to it. It can be several kilometers towed by dories or large streamer.

5. **e. Whaling** by the use of power fired harpoons which normally carry an explosive charge. It is used for catching whales especially in Japan.

Other methods, which are used especially In East Africa are **bows and arrows and spears** (but this method is in decline), The use of fish baskets and fish traps, scoop nets, cast nets called Kitagala In lake Victoria, gill nets and the use of poisonous chemicals and dynamite as it is being done along the coast. Most of traditional methods are destructive to the fish species and their habitats.

FISHING IN NORWAY

Fishing industry is well developed in Norway and it takes place in the North Sea. It is leading country in Europe. Fishing is done in the sea because fish farming inland is difficult due to the harsh climate. The species commonly fishing are cold and herring. The development has been due to the following factors;

1. 1. Presence of the continental shelf that provide shallow water and fish food (planktons). This is far due to the sunlight penetration in the shallow water that encourages the growth of planktons. The water do not exceed a depth of 185m (about 600ft).

2. 2. Long indented coastline, which provide fishing grounds and sheltered harbors.

3. 3. The North Atlantic Drift (the ocean current) which is warm has led to the favorable conditions for fish industry development. The drift also brings and distributes food along the coast.

4. 4. The need for raw material for oil making industries has encouraged the fishing industry.

5. 5. Limited agricultural land, forest and mineral deposits have made people opt for fishing activities. Some of the land is no longer productive.

6. 6. The high demand balanced diet in the urban areas has provided market for industry.

7. 7. Good transport and communication has also encouraged. For example there are advanced ports like scavenger, Oslo, Moss, Trondheim, Alison, and Haguesund.

8. 8. The use of advanced fishing facilities like refrigerated cargo vessels for transporting to other parts of the world. These have been a result of the use of advanced technology. Some of the fish is exported while frozen to Britain for fried- fish trade.

9. 9. There has been strong government support on the fishing industry.

10. Power availability especially HEP has stimulated the development of the fishing industry.

11. Presence of wide variety of fish species like Capelin, cod, Herring, Brisling, Haddock, Sprats, Mackerel, whale, and dogfish (rock salmon). Also there has been introduction of exotic species, which are commercially more desirable.

12. Capital to be invested in fisheries is readily available.

13. The use of modern fishing methods like trawling and drift netting.

Norwegian fishing grounds

FISHING IN JAPAN

Japan is one of the three most important fishing countries in the world and its per capital consumption of fish is the biggest in the world. Inshore fishing along the coast and offshore fishing in the deep sea are taking place. Modern fishing vessels operate in the Pacific Ocean. Fishing vessels are owned by large corporations. Most vessels are refrigerated and have processing facilities. Whaling is also taking place and whaling is the second largest whaling nation in the world. The species include Cod, herring and salmon.

Factors that have facilitated the development of Fishing Industry in Japan;

1. -The broad continental shelf of the North West pacific shallow water and the meeting of warm Kuroshio and cold Oyashio currents help to produce ideal conditions for the growth of plankton. Hence both pelagic and Dermesel fish are abundant.

2. -The presence of many inlets (indentations) which provide good breeding grounds for fish and the development of fishing ports.

3. -Traditionally, the Japanese have been traveling far in the sea or oceans hence they have long experience in sea faring voyages. So this facilitated the fishing industry.

4. -Pressure on agricultural resources has made Japan turn her attention to the fishing industry.The land is mountainous and hence not good for agriculture.

5. -Modern industrial and technological development has extended to fishing industry. This has made fishing industry become efficient and effective.

6. -Reliable market in the country and outside has encouraged the development of the fishing industry. In Japan, fish is the great source of food. The ready market has been promoted by good preservation and processing methods.

7. -Availability of capital which was invested in the fishing industry, lead to great developments.

8. -Banks and other institutions have been offering a financial support and technical advice in the development of the fishing industry.

9. -The strong government support in establishing research centers for the development or promotion of the fishing industry.

10 -The presence of many islands in Japan has led to the existence of extensive fishing grounds.

Limitations of Fishing Industry in Japan;

1. Restrictions imposed on Japan to limit its area for fishing. Each territory identified its own fishing grounds and there was to be no any interference from other countries. Formerly Japan had greater freedom in fishing in the ocean but that freedom is no longer there. This has impacts on Japan and has made Japan to put more emphasis on agriculture (Fish farming) Aquaculture in Japan accounts for 1/10 of Japan's fishing industry.

Factors that have stimulated the development of Fish farming in Japan;

1. -Advanced technology among the people has contributed greatly.

2. -Restrictions imposed on Japan on the use of the seawater have made people opt for fish farming. Fishing is therefore restricted to certain distance from the land. So it cannot go very far in the ocean in terms of fishing.

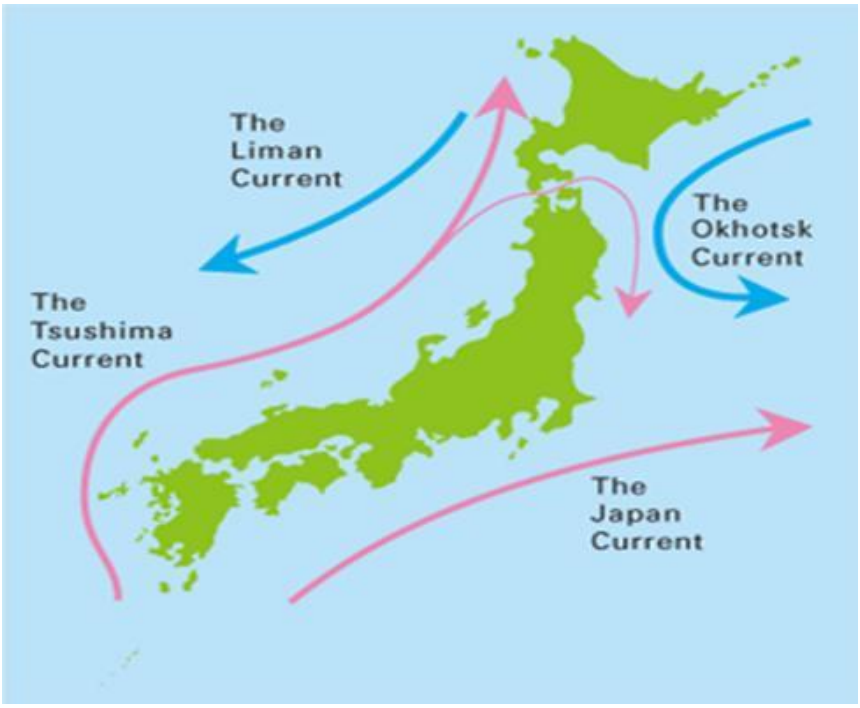
3. -Capital is available since the country is economically well advanced.

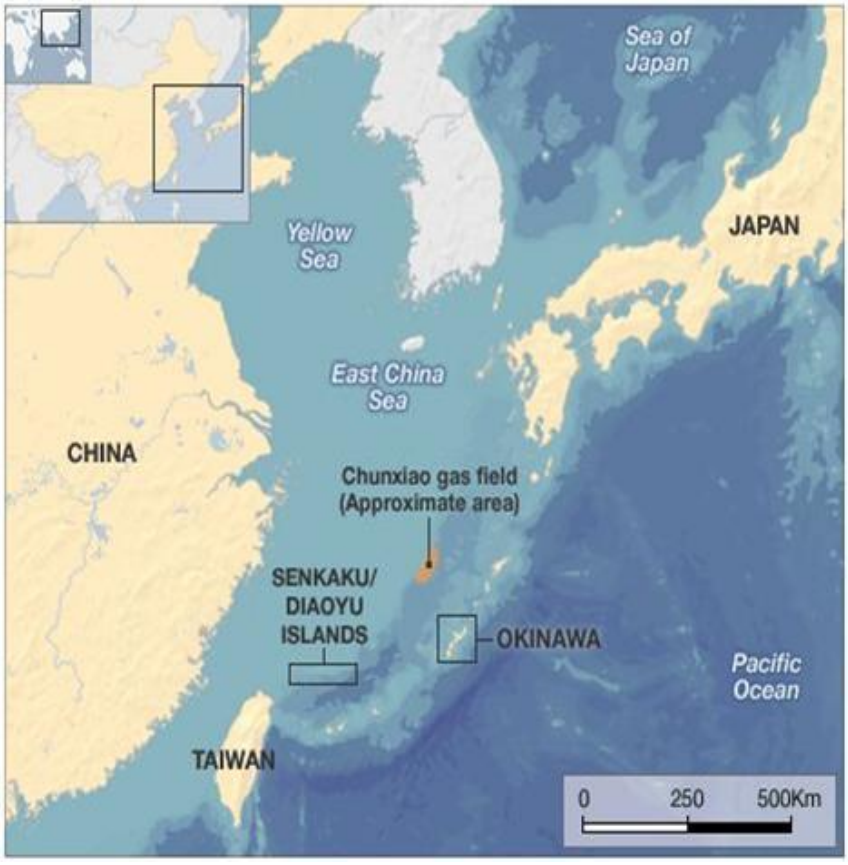
4. -The government plan to reduce over fishing problem in the sea has encouraged the development of fish farming.

5. -The need to promote researches on fish has stimulated the development of the fish industry.

6. -Easy availability of food for fish.

7. -Reliable market in the country since the people use fish as the major source of food.





The seas around Japan and the Pacific Ocean are the fishing grounds of Japan.

Importance of Fishing Industry in Norway and Japan;

1. -It has provided employment opportunities to people since other resources like minerals; forests and land are limited both in Japan and Norway.

2. -It has stimulated the development of oil manufacturing industries since fish is used as raw materials for that industry.

3. -It has encouraged the development of ship building industry both in Norway and Japan. Hence the sea transport has improved.

4. -The fish industry has also stimulated the development of HEP centers in the countries.

Problems facing fishing industry in Norway and Japan;

1) Over fishing due to over dependence on the fish rather than other resources like land, minerals and forests, which are also limited, also over exploitation is caused by some fishing methods that kill even unwanted species. Hence the number of species has decreased especially the blue whale.

2) The introduction of new species to compete with the native species has been difficult since the new species are not well used to the conditions in those countries.

3) Land reclamation carried out in those countries has disturbed the habitats.

4) Water pollution has affected the fish, some fish species die because of oil spill or poisonous chemicals. Pollution with mercury has been a big problem in Japan nowadays.

5) Competition from other nations which have also developed the same industry has reduced the market of fish from Norway and Japan.

6) Restrictions on the use of the sea water have also reduced the distance over which the countries can fish. The international agreement insists that countries should stick to their own fishing zones.

7) Poaching is another problem, which has led to the disappearance of some valuable species.

8) Sometimes the breakdown of the machines leads to the decomposition of fishes when being transported or stored.

9) Strong storm waves are encountered when fishing in the deep sea water.

10)The local market is highly competitive and the external market is limited as other countries are now involved in the fishing activity.

FISHING IN CANADA

The annual output of Canadian fisheries is a little larger than that of Britain. Fisheries were threatened by trawlers in 1970s and these to overfishing. The chief fish in Canada include salmon, cod, lobsters, herring, haddock, scallops, halibut, flounders, sole, sardine, and whitefish. Much of fish in Canada is exported due to small internal market caused by small population. Fish is exported "wet" to USA and "dry" to Latin America and South Western Europe.

Fishing grounds in Canada are located in two main areas.

In the eastern Canada where there are fishing grounds, which extend for about 1600 km (almost 1000 miles) from cape cod to new found land, off the coast of Canada. In the western Canada fishing grounds are located in British Columbia on the pacific seaboard. This smaller catches than the eastern coast. Herring, Salmon, Hake and crabs are the main species. Halibut catches have declined sharply. Vancouver is the heart of the western Canadian fishing industry. The fishing conservation methods are being undertaken so as to maintain yields.

Also, there are inland fisheries in Canada. These produce salmon, trout, eel, and whitefish, which are, caught in chief rivers and lakes e.g. River. Skeena, River Fraser, great lakes and great lakes and the great slave lakes.

Factors for the success of fishing industry in Canada;

1) The use of advanced technology, which has made people, use advanced methods like trawling and fishing fleets in the fishing process.

2) Widening of the fishing area to deeper parts of the Atlantic Ocean.

3) Great number of fish and fish species, which are fished in large quantities.

4) Ready market outside for example the U.S.A while the internal market is not large because of small population of the country.

5) Then poor soils and harsh climate in the northern parts of the country have made people turn to the sea for fishing to sustain their livelihood.

6) The eastern fishing ground are located near the meeting of the warm Northern Atlantic Drift and the cold Labrador current which results in the rapid growth of the plankton and hence water are rich in fish.

Fishing is both inshore and offshore, with the main catch being cod, haddock, and sardines. The inshore fishing is carried out by small boats called dories while the offshore fishing which centers on Holifax, st. John and Lunenburg, is undertaken by large vessels which stay at sea up to three weeks.

Importance of fishing industry in Canada

1) It has created employment opportunities in the country.

2) It is one of the sources of income to the country and hence it contributes to the generation of the government revenue and individual income.

3) It has encouraged the development of the industries by providing capital and raw materials for making fertilizers and margarine.

4) It has also stimulated the development of transport and communication. Some ports have developed as fishing ports, which are used to exporting fish to other countries.

5) Some towns have grown due to the fishing industries especially along the coastal areas.

6) It has also led to the development of tourism in the country. Some tourists go for sport fishing activities as part of the entertainment.

7) It is a source of food, which countries a lot of protein necessary for people's health and growth.

Problems facing the fishing industry in Canada;

These include overfishing, diseases, which attack fish, water pollution, due to wastes from industries and small internal markets due to a small population.

FISHING IN RUSSIA

Russia is continually expanding its sea fisheries. It has done so by excluding Japan fleets on the Pacific border. The agreement for high sea fisheries of the Northwest Pacific Ocean was concluded with Japan to restrict the freedom of open water fishing.

The bulk of the catch in Russia is made up of salmon from the Kuriles, Sakhalin, and Kamchatka. Other fish caught include pollack, tuna, sardine, cod, mackerel, sharks and whales. Russia is the leading whaling nation in the world followed by a Japan.

Large quantities of fresh water fish including sturgeon, eels, carps, trout and salmon are also caught in the Siberian rivers and Caspian sea. The expansion of the Russian fishing has often been to the disadvantage of the longer established fishing nations, especially Norway.

The success in the fishing industry in Russia has been due to:

1) The governments drive on the increased fish output by expanding the fishing area.

2) Availability of many fish varieties as a result of good cool waters in the ocean.

3) Ready market within and outside the country.

4) The use of advanced technology in the fishing process

5) Restriction against interference from other nations like Japan and Norway.

FISHING IN EAST AFRICA

It has both marine and fresh water fishing activities. Some of fish species found in East Africa are Nile perch, Tilapia, Marlin, Limnothrissa (dagga), cod haddock, sole, plaice, mullet, crustacean, prawns, eel fish and trout.

Problems facing the fishing industry in east Africa

Despite many water bodies and a long coastal strip in East Africa has not managed to develop advanced fishing industry. This has been due to the following reasons.

1) Poor method of fishing because of low level of technology. Some of the methods used like poisonous chemicals and dynamite are destructive to the fish species and their habitats. Others do not give good catch since they are too simple such as hand lines and baskets.

2) The largest number of fishermen does not have capital to invest in the more advanced method of fishing.

3) The fishermen also do not cooperate in order to be assisted in terms of advice and financial support.

4) The tropical waters are too saline and of high temperature hence they discourage high fish reproduction. The fish also is of poor quality and unpalatable due to this aspect.

5) The continental is narrow limiting the number of fish grounds in East Africa.

6) There is low internal market due to poverty and external market because of stiff competition posed by other countries.

7) The volume fluctuation in the water bodies has handicapped the industry.

8) Poor research activities on the fish resources have been another problem.

9) Restriction by the environmentalists who discourage the development of more fish projects claiming that they cause destruction of forest and water pollution.

10) Inadequate infrastructure is also limiting the industry. There are poor roads, poor storage facilities e.t.c.

11) Water borne diseases, which affect both the fisherman and the fish, have led to the dwindling of the fish industry.

12) Poor government support on the industry.

13) High population has accelerated overfishing and illegal fishing in protected areas

14) The fishing industry is affected by dangerous animals like crocodiles and hippopotamus, which attack the fishermen and eat fish.

15) The introduction of new species has led to the disappearance of native species in the lakes. For example Nile perch in the Lake Victoria has led to the decrease of tilapia since they feed on them.

16) Water pollution of water as a result of waste disposal and oil spills prevent oxygen from getting into the water body and hot water cause abrupt rise in temperature.

17) Poor power supply.

Measures to solve the problems facing the fishing industry in east Africa

1) Improvement in the processing and storage methods like the use of refrigerators. Also smoking plants for fish preservation have been introduced in Zanzibar and the fish freezing center in Kigoma.

2) Fishermen have been encouraged to form cooperatives so that they can be assisted. The government of Tanzania for example is encouraging the people to cooperate so that they can be assisted easily in terms of education and financial assistance.

3) Training of the fisheries officers has been initiated.

4) There is the use of mass media programs to educate the people on how to conserve fish resources.

5) There should be control of pollution and this should be associated with strict monitoring system.

6) Restocking the over-fished ground especially at the coast of East Africa.

7) Fish farming (aquaculture) should be expanded and more fish hatcheries have to be established.

8) There should be intensification of research on fisheries. This is important for understanding the habitats and the feeding habits of the fish as well as getting data on the salinity of the ocean.

FISHING FARMING IN EAST AFRICA

Fish farming or aqua culture is the practice of rearing fish of certain selected species, in the ponds or tanks at home or near homesteads. These are constructed near large water bodies like lakes and rivers.

In Kenya there are estimated to be some 30,000 fish ponds in western Kenya alone, but of these 3000 are in operation. Fish farming is supported by hatcheries where farmers buy the fingerlings.

Fish farming needs careful attention. The fish must be well fed and the pond kept clean. In Kenya most of the fish farms and hatcheries are owned and run by individuals, but some companies are also involved.

Advantages of fish farming;

1) It ensures an increased and constant supply of fish in the country.

2) It is also a source of income since the fish can be sold both within the country and outside the country.

3) The idle land is utilized and hence is made productive.

4) It solves the problem of overfishing in the large water bodies.

5) The products are of good size and quality due to careful attention given to the fish by the farmers.

6) There are no much problems of water pollution since the ponds are kept clean.

7) Fish farming can encourage the development of trade and tourism.

General importance of fishing industry to the respective countries

1) It provides food as a source of protein.

2) Provides foreign currency when exported.

3) It contributes to the national income of the respective country.

4) Fishing helps the country to diversify their economy instead of having mono-economy, which is dangerous mono- economy involves the state in which the country depends on only one economic activity.

5) It provides employment to the people.

6) It encourages the development of industries since it acts as a source of raw materials and capital.

7) It promotes the living standard of the people by having balanced diet and improving the supply of social services.

8) Fishing leads to the development of tourism especially when sport fishing is established.

General problems facing the fishing industry

1) Overfishing because of the increased number of population and the use of tools, which kill fish indiscriminately.

2) Water pollution due to the discharge of industrial wastes into the oceans and other water bodies. Japan is facing the problem of concentration of mercury in its fishing ground due to industrial discharge.

3) Many developing countries still use inefficient traditional methods hence the annual catch is low.

4) Developing countries are also plagued by the problem of poor transport and communication, poor facilities for preservation and processing etc.

5) There is also a problem of low or inadequate capital for investment.

Management and conservation measures

1) People should stop fishing immature fish and hence good fishing facilities should be introduced to achieve the goal.

2) Water bodies should be protected from pollution. People should not discharge harmful wastes into the ocean or other water bodies since they can cause death of fish and other organisms.

3) The over fished water bodies should be restocked in order to maintain the fishing activities.

4) The use of artificial fertilization of eggs should be encouraged in order to promote fishing activities.

5) Encouraging fish farming in the country in order to avoid the problem of overfishing and improve the supply of good quality fish.

6) More researches should be organized in order to have a profound knowledge on fish and fish farming and general conservation techniques.

7) There should be an international agreement on fisheries and the boundaries of the fishing regions should be identified to avoid interference and mismanagement.

8) Farmers or fishermen should be educated on better fishing methods so as to attain sustainable fishing techniques.

REGIONAL FOCAL STUDIES -5.5 SUSTAINABLE USE OF FORESTRY

Forest is an extensive area covered by different types of tree species, which can be either natural or man-made. The process in which an individual purposefully plants trees and takes care of them until the harvest time , and then after harvesting replants trees with proper managements, is referred to as **silviculture**.

Distribution of Forests in the world

In the tropical zone

There are evergreen rainforests of equatorial areas where there is high rainfall, tropical mansion climatic region, Savanna woodland in the area with alternating dry and wet seasons (occupying the largest party of Africa), coastal forest including mangrove vegetation. The equatorial rainforest is found in the areas like Congo, Amazonia as well as West Africa and Gabon. Tropical areas usually provide hard wood.

In the temperate Zone

There are hardwood species like oak, ash, beech and poplar for example in northern China, Japan, West, South and central Europe and eastern North America. Soft wood species of coniferous forest like pines, fir, and spruce in Norway, larch and Parana spine in South America (Brazil). Coniferous forests are located chiefly in the northern America, Central and East North America, Southern USA, Northern Europe like Sweden, Norway and Finland.

Main forest products

1. Poles for construction of houses and electrification.
2. Timber for furniture, construction of houses and bridges, containers, paper and railway sleepers.
3. Resigns for making rubber like in Brazil, Oil and gum
4. Fiber materials for human and animal consumption.
5. Fruits and flowers for human and animal consumption.
6. Tannin a substance used for converting hide into leather.

Importance of Forest

1. Forest forms a protective cover to the ground and hence prevents soil erosion from degrading the surface of the earth.
2. It also provides habitat for the animals and birds of different varieties.

3. Forests contribute to the modification of the climate especially through the rainfall formation and moisture conservation.

4. Forests also introduce oxygen to the environment, which is produced during photosynthesis. In this process the trees clean the air by absorbing carbon dioxide. Hence, the forest is an oxygen sink.

5. Trees are also a source of fuel energy since they are used for firewood and charcoal making.

6. They provide building materials like poles, timber.

7. The forest is also important in the paper and pulp industry from which writing materials are produced.

8. Some tree species are used for making medicine and some provide fruits as well as ornamental flowers.

9. It contributes to the soil development through rotting of leaves, which lead to formation of humus.

10. The liquid material from the trees is used for making gum, dyestuffs and other chemicals.

11. They maintain water sources like livers, catchment areas, springs, and lakes.

12. The forests are also used for scientific studies (research)

13. Tourism can develops since when there are many tree species, promote the scenic view and this attracts tourists. The forests also provide good center for recreation.

Timber industry is the activity, which involves the production of timber and other processes associated with timber production. Timber is the wood material delivered from the forest.

Factors that Encourages the development of Timber Industry in any Country include:

1. Availability of food species of forest trees. These species should in a great amount.

2. There should be a capital to be invested in the exploitation of the forests and timber production.

3. There should be minimal competition from other economic sectors like mining, agriculture etc.

4. There should be efficient and effective transport and communication in order to facilitate coordination of ferrying of timber products.

5. Advanced technology for effective extraction and management of the forest.

6. There should be a strong support from the government financial or through technical advice and organizing market for timber products generated in the country.

7. There should be reliable food supply for the people who are dealing with lumbering and timber industry in general.

8. Reliable water supply can also encourage the development of timber since water is needed for washing and cleaning as well as transportation (in rivers).

9. Power availability since timber industry needs a lot of power for running effectively. For example in Sweden great Hydro-electric power from the power plant at porous has stimulated the development of timber industry in the country.

10. Market availability both local and international is another impetus for the development of timber in the industry. Timber industry in Sweden grew fast due to the increased demand for sawn timber and paper in the world.

FOREST RESOURCES MANAGEMENT

This involves the control and the use of forest resources for different purposes. Forest management is part and parcel of forestry. Forestry refers to the science of managing forest resource for human use. The importance of forest management is to ensure that the adequate supplies of timber, water, wildlife, grazing and recreation areas are maintained. The forests in many parts of the world face the problem of poor management. This is associated with poor exploitation of resources which is excessive.

Effects of Poor Resources Management

It leads to deforestation since the trees are cut or areas are cleared without or with minimal replacement. Deforestation is caused by shifting cultivation, plantation agriculture, cutting trees for fuel, timber and settlement, rapid population growth that leads to the need for new areas for settlement and farms, development of transport and communication system, mining activities. Deforestation leads to the problems like increase in soil erosion, acceleration of the flooding phenomenon, reduction in the size of the arable land, excessive evaporation which causes drought, loss of different animal and plant species, decline in tourist industry, destruction of animal habitat, destruction of the catchment areas, acceleration of the advance of the desert, pollution of the atmosphere which can lead to the greenhouse effect and global warming.

Effect of Rapid Population Growth on forest resources;

1. It has led to the clearing of vegetation leading to deforestation.

2. There has been increased demand for firewood, timber charcoal and areas for settlement.

3. Valuable species have disappeared due to excessive cutting.

4. There had been an increase in distance from the homesteads to the forest resources since those found near homesteads have been cleared.

Problems Associated with Exploitation of forest Resources;

1. Poor capital especially in the developing countries like Tanzania and Congo.
2. In tropical areas there are so many species but few are commercially valuable.
3. Poor transport especially in the equatorial areas where the land is swampy or water logged due to high rainfall.
4. The trees in the tropical areas are so dense that exploiting is difficult.
5. Low technology which leads to the use of poor tools.
6. Coniferous trees in the temperate areas face the problem of acid rain due to industrial emissions and leaching. The addition of acid in the soil causes the death of trees.
7. Rapid population growth has led to the depletion of the forest in many places. The trees are cleared for establishing settlement areas and farms.
8. The forest industry is facing a stiff challenge posed by other economic sectors like development of industries and mining activities.

Solving the problem associated with Forest Exploitation (Forest Conservation Measures)

1. Planting trees where other trees have been cut (reforestation) and planting trees where there never existed any tree before (forestation).
2. Setting aside some areas and declaring them as protected areas.
3. Educating people on the importance of conserving the forest and persuading them to fully participate in all activities involving forests conservation.
4. There should be clear policies giving directives on the proper use of the forest resources.
5. There should be alternative energy resources used instead of depending on the trees. For example there should be the use of solar energy, geothermal power, biogas and HEP.
6. There should be careful land use planning in order to avoid destruction of trees.
7. Population control should be encouraged in the countries so to reduce pressure on the forest resources and the land in general.
8. Agricultural method should be improved so as to encourage proper land use. Methods like shifting cultivation should be discouraged.
9. Destocking (reducing the number of animals) should be encouraged among the past lists because having too many animals' leads to the destruction of vegetation.
10. Agro forestry should be encouraged in the countries.
11. There should be controlled cutting of trees for timber production.
12. New and fast growing trees species should be introduced.

Agro forestry means the practice of inter cropping trees and crops in the same farm. Trees can be inter cropped with crops like beans, bananas etc.

Advantages of inter cropping the trees with crops (Agro-forestry)

1. Trees prevent soil erosion while the crops like beans add nutrients to the soil.

2. A farmer gets a variety of profits from the same farm. That is forest products and crops products.

3. Family members get fuel wood from the homestead without traveling very far in search for firewood.

Disadvantage related to Agro- Forestry

1. When larger trees are inter cropped, the annual crops tend to suffer leading to decline in production. This is so because the larger trees tend to take up most of its moisture, nutrients and block the light from reaching the annual crops.

2. Some trees are harmful to crops since they produce poisonous substances.

3. Mechanization cannot be easily done because of the trees.

Example of areas with timber industry

Sweden, Canada and some parts of Japan where coniferous trees are providing most of the forest resources, Major species are oak, chestnut, spruce, Douglas fir, pin, and sugar maple. They have led to the development of timber industry, pulp and paper industry etc.

In Africa the Areas which have Forestry Industry include;

1. Southern Nigeria where sapele, and the great sawmills, veneer and plywood factories.

2. The Congo basin where Ocoume and Limba are the most important species. Cameroon utilizes the species like Iroko, Obeche and Mahogany.

3. Ivory Coast where there are plywood and veneer factories. The timber exported includes Mahogany, Makove, and Edinam etc.

4. Swaziland where pinus pastula trees. Swaziland has the forests like Nklangano forests and great forest, the forest industry is well planned and the government finances it. But the problem of forestry industry has been overgrazing. Cutting due to settlement and cultivation as well as frequent fires.

5. Gabon where timber industry is carried out by larger timber companies. The family members also account for 16% of the total production.

CASE STUDY

FORESTRY IN CANADA

Sixty percent of Canada is covered by forests and it is largely coniferous in which the main species are spruce, hemlock, cedar and Douglas fir. Spruce is mainly for making newsprint and Canada is the largest producer of the newsprint accounting for 36% of the world's total production. All these come from the eastern forests. Douglas fir is used for producing sawn wood and the western forests are the major producer of Douglas fir accounting for about 10% of the world's total production. Canada has a large surplus of timber because of the rugged landscape and sparse population. Because of these aspects there hasn't been extreme exploitation of forests compared to other countries.

Despite being endowed with a lot of trees, the production in Canada is much smaller than USA due to inaccessibility. The Canadian forests are found in areas where roads and railways do not reach. The prairie forests for example are quite inaccessible. They lie far from the main route ways, which run east to west across the prairies.

Main areas producing Timber in Canada

Two main timber producers in Canada are British Columbia and Eastern Canada forest zones.

The British Columbia

It is located in the western party of Canada. It has large forests of Douglas fir, hemlock, spruce and cedar. It produces sawn wood used for making furniture. British Columbia produces 50% of Canada's annual timber output. Its economy is supported by the incomes obtained from the exploitation of water and forest resources.

A number of factors have influenced easy exploitation of forest resources in British Columbia.

1. The rugged nature of the landscape has influenced forests to grow naturally. The rugged terrain does not allow the practice of other economic activities such as agriculture and makes the population movement rather hard

2. British Columbia is sparsely populated and this has allowed a large portion of the rugged forest landscape to remain forested in a virgin form.

3. Scientific advancement that has lead to the mechanization of forestry and promotion of efficiency.

4. Sound forestry management strategies have also promoted timber industry

5. Ideal climatic condition that is heavy rainfall, which supports the growing of forests naturally. Heavy rains are due to the moisture from the pacific ocean. Also the temperature is favorable making the work within the forestry area to go on throughout the year. The low temperatures that discourage settlement hence leave room for forests.

6. It is also blessed to have a large number of species, which command a high demand on world's market. The most important of these include Douglas fir, hemlock, red cedar, spruce and the balsam. These tree species have ensured the economy a constant supply of soft wood and hard wood at the same time. British Columbia is one of the world's leading exporters of forest products today.

7. There is availability of skilled labor force relevant to the forest exploitation. Forest operation has been mechanized and this has made the work quicker and more efficient.

8. Capital availability to be invested in the establishment of the forestry industry.

9. The province is served by the excellent cheap water transport, where possible, roads and railway lines connecting water bodies and lumbering areas have also been constructed to facilitate easy exploitation of the forests.

10. Its coastline is long and intended thus making accessibility good. 70% of Canada's accessible reserves are found in this region.

The logs are produced all the year round. Logging started from the Vancouver Island and along the coast. But due to the overproduction of these areas there has been the exploitation of forests on the mainland and the interior of British Columbia. Now a system of "Log high", "log low" has made logging possible throughout the year. Areas in higher, cooler altitudes are logged during summer when the forests are free of snow and ice. Winter logging is carried out at lower altitudes where the roads are kept open. Other areas are logged in spring and autumn.

Processing of forest logs centers around Port Alberni and Vancouver Island the logs are floated on the Strait of Georgia adjacent to Port Alberni. Here there is an integrated chain of mills. Timber based industries are in Vancouver, New Westminster and Chilliwack. Here there is production of plywood, from high grade Douglas fir, sawn wood from medium grade Douglas fir, hemlock and balsam. Low –grade logs and waste wood from other mills go to the pulp and paper mills. British Columbia is now a, major pulp and paper making region. Vancouver and Fraser valleys are the main pulping areas.

Problems Facing Timber Industry in British Columbia

There are mainly two problems facing British Columbia's forest industry:

The first is the problem **fire during summer.** Fire spreads rapidly destroying thousands of hectares of valuable timber. This problem is caused by holiday makers out on picnics, after the

picnics they don't put out the fires that they have started. Some even throw out cigarettes ends that often start out a fire.

However great efforts are being made to prevent fires from starting and detect quickly those areas where fire has broken out. Fire guards watch from control towers high above the trees. Regular patrols are made using helicopters to detect and report any fire outbreaks. Trained equipment and mobile fire-fighters are always ready to put off the fire. They in most cases use bombs to put off fire. In modern times a more simple method known as log patching has been adopted.

The second problem is **over exploitation** near Port Alberni and on the Vancouver areas. It is being solved through the policy of "log high" "log low". Silviculture has been introduced where by the trees are planted then replanted. The planted trees are cared for regularly and thinning is done frequently, the replanting of trees is referred to as reforestation.

Other problems:

1) The long gestation period due to harsh climatic conditions.
2) Inaccessibility of some places due to snowfall and rugged terrain.

Eastern Canada

The major lumbering areas are the Maritime Provinces and the St. Lawrence – great lakes region. The main species here are spruce, balsam, fir and variety of pines. The red spruce is the most important tree and the most ideal for pulping industries. Lumbering and timber industries are the concentrated in the provinces of Quebec and Ontario due to many rivers which fall from lauratian shield and into the lowlands of southern Ontario. The rivers are used in the following ways:

1)Production of H.E.P. required in the pulping industry and this is the major consumer of H.E.P. in CANADA.
2)Provision of cheap means transport of logs.
3)Provision of clear and unpolluted water for soaking and bleaching the pulp. Canada's pulp output makes 15% of the totals world production.

Canada is also leading in the production of newsprint. Eastern Canada makes all types of paper and also sawn wood, furniture and other timber products. The main producing centers are Quebec, Montreal, Toronto, Ottawa, St. John and Liverpool. Canada's pulp finds ready markets in the northern eastern U.S.A, Britain and the rest of Europe.

Problems Facing the Timber Industry in Canada;

1)Fires which occur frequently affect trees. Close monitoring has been put in place and fire control teams have been established so as to contain the problem.
2)There has been over- exploitation of the forest leading to deforestation and loss of valuable species. But the government has been educating people on proper ways of utilizing and managing the forest. Silviculture has been encouraged so as to replant trees and increase timber production.
3)Dry weather in summer is another problem since it encourages the outbreak of fires.

To promote timber production the government has encouraged research on new rising species, thus by improving transport systems to promote accessibility of some places and establishing more power sources for the expansion of the industry.

TIMBER INDUSTRY IN SWEDEN

Sweden is the land of many contrasts. Some parts are intensely cultivated as other parts of Europe while others are densely populated by dense forests or tundra. 11% of population is employed in farming, 1% in mining and 3% in forestry & timber industry while 22% in engineering. In Sweden, about 50% of the total land is covered by forests and this is so especially in the northern parts of the country.

Distribution of forests in Sweden;

It found at the dense stretches from latitudes 60^0N to beyond the Arctic Circle. Most trees are coniferous; spruce being commercially the most important species and other soft wood conifers include scots, pines, firs and larch. These tree species are exploited for swan wood, pulp and paper. The pulp industry is the most important. Towards the south deciduous trees such as beeches are felled.

Throughout the forest region timber is very accessible due to a large number of rivers and lakes, which provide natural water ways down which logs are floated to the Baltic coast, and Lake Vanerm. Rivers such as osters dal and ljusnan provide abundant HEP for saw mills and pulp mills. Other rivers were logs are floated include: R.Galve, R.Soderhamn, and R. Hamcaad. The main lumbering districts lie between Angerman River and Lake Siljan. Sundsvall at the mouth of river ljungan is the main center for saw mill and pulp mills. More than 50 such factories are located there. Other important river mouths on the Baltic coasts include: galve, soderhamn and harnosand.

In short timber industries in Sweden are located in towns like: harnosnad, Sundsvall, and areas around the Swedish lakes especially lake vanerm. Responding to the world shortage of newsprint the output of Swedish pulp mills has trebled 11 millions tones during the last 20 years. Sweden and Finland produce less than 2% each of the world's timber production, but their international

significance is greater than this implies surplus export. The timber yields are being increased by better drainage, fertilization, and by commercial use of bark, stumps and roots. Even so, Swedish pulp and saw mills now imports some timber.

Uses of Swedish timber;

1) Building materials like flooring, plywood, wallboard, fabricated doors and window frame.

2) Wood pulp obtained by chemical treatment of chips in huge vats. This is then exported in compressed sheets for the manufacture into the paper. By products of pulp produce paint, varnishes, cosmetics and ethyl- alcohol. The alcohol is blended with imported petroleum to make motor fuel;

3) Paper most paper mills located in central Sweden where industry is more advanced and where main home demand for paper lies. Paper is made at Orebro, Karlstad, Norrkoping and trollhattan.

4) Fuel resources since Sweden lacks coal for heating in the industry.

5) Manufacturing matches. The main center is Jonkoping where the safety match was invented.

6) Railway sleepers telephone poles, and sawn timber. The towns in the northern Sweden with timber industries are harnosand and Sundsvall and in the southern parts, the towns with timber and paper industries include Orebro, Karlstad, Norrkoping and trollhattan.

Factors for the success in timber industry in Sweden;

1) High accessibility of the forest zone due to the presence of many rivers that dissect the zone. The rivers are use for providing cheap transport. The logs are floated in the rivers to the processing industries.

2) Availability of heavy capital also facilitated the successful development of timber industry in Sweden.

3) Strong support of the government, which has been encouraging the proper use of the forest especially by introducing silviculture.

4) The peaceful politician atmosphere due to the government stability has encouraged effective engagement in the timber industry. People concentrate on production rather than solving political problems or conflicts.

5) Good climate conditions, which has allowed the coniferous forest and other deciduous trees to develop to a great extent. Large forest reserve (50% of the country's land) has led to reliable supply of forest resources.

6) Availability of water from rivers and lakes needed for cleaning and washing as well as cooling the machines.

7) The species available are of great value and they are highly adapted to the climatic regime of Sweden. The trees can both thrive through both winter and summer conditions due to adaptations.

8) The forest has not been so much disturbed due to population control in Sweden. Hence there are no much problems of population pressure the way it is with the African countries or other third world countries.

9) Reliable supply of power from HEP centers found on the rivers like oster, dal and ljusnan.

The role of timber industry in the development of Sweden;

1) It has contributed to export earnings. Sweden exports in surplus. It produces nearly 7% of the world pulp and is the major exporter.

2) Reforestation programs to ensure continued timber production have encouraged soil conservation.

3) There has been improvement in transport and communication especially water ways.

4) The industry has also encouraged the expansion of power supply stations. The increased power supply has stimulated the development of other sectors like iron mining and manufacturing industries.

5) Forestry research units have developed as a result of the expansion of timber industry.

6) It has provided employment to the people solving the problem of unemployment.

7) Economic stability contributed by the timber industry has also encouraged the absence of political instabilities in the country and hence there is peace dominating.

Problems associated with timber industry in Sweden;

1) Mechanization led to lay off of some of the people from the timber industry since their work has done by the machines.

2) The great demand for newsprint in the world has led to the problem of over exploitation and depletion of forest resources. To respond to this problem, cutting rates are now strictly controlled and silviculture has been introduced so as to encourage replanting of trees. In this exercise the native pines are being replaced by the Canadian lodge pole, which grows twice as fast. Drainage is being improved, fertilizers are being applied and also there is commercial use of bark, stumps and roots so as to increase timber yields. But still Swedish pulp and saw mills import some timber.

3) The great expansion of the forest industries has brought severe problems of pollution. Waterways are fouled by effluent containing chemicals used to treat or process timber as well as fibers. Some paper mills emit sulphurious gases, which bring about air pollution. Air pollution in turn contributes to global warming and occurrence of acid rain.

TIMBER INDUSTRY IN GABON

Until the mid 1950s Gabon was the leading exporter of timber in the whole tropical Africa. The country is the land of dense tropical rainforest and more than four fifths of the land is covered by tropical rain forests. Before the beginning of mineral exploitation during 1960s the economy was entirely dependent on timber extractions.

Forests are spread across the country except in the south and south eastern regions. These forests contain valuable softwood species like Ocoume. This species is particular good for producing plywood and veneers. Gabon has a monopoly in the world supply of Ocoume. It also has important reserves of hardwoods such as ebony and mahogany river ogowe, which runs through the forest region, is used for transportation in which the logs are floated and hence carried down to processing centers. Production of timber is largely undertaken by large European nations (timber companies) and to small extent individual family production, which accounts for 15% of the total output. There are about 17 plywood and timber dressing mills along river ogowe. The largest mill and the biggest exporter of plywood in the world is located at port Gentil. A new port known as Port Owendo has been constructed north of Libreville and is also used as an export point for timber products.

A new railway line has also been built linking port Owendo with the forest in the interior. Apart from carrying timber, this railway is important for ferrying uranium and manganese from franceville. A branch of railway line has also opened up the northern forests, permitting the development of iron ore mining. Gabon's economy is largely developed on forestry. Ocoume, mahogany and ebony are exported. Agriculture has not yet been fully developed though the

government has introduced cash crops such as cocoa, coffee, and ground nuts. Together with the mineral deposits available like uranium, manganese, and iron ore, Gabon's total economy has been greatly diversified. Timber and timber products now account for 54% of Gabon's total export.

The factors which have led to the development of timber industry in Gabon

1) The presence of many good species including Ebony, Ocoume, and Mahogany.
2) Cheap transport by river ogowe and railway line facilitated contributed high to the fast development of timber industry in Gabon.
3) Capital availability provided by large foreign companies which were given concessions to exploit the forests
4) Availability of skilled labor, which is also provided by the foreign companies that were granted concession as well as unskilled labor from the local areas.
5)Constant market for timber produced especially in Gabon. This has been due to high demand for timber in the continent and the world at large.
6) The government support for timber production.

Economic importance of forestry in Gabon;

1) Forests especially in Gabon contribute sufficient revenue to the economy so as to give her a favorable balance of trade.

2) Local employment especially in Gabon has been generated.

3)It has led to the diversification of the economy in Congo especially Gabon. It has encouraged the development of mining industry based on iron ore and agriculture where cash crops like cocoa, coffee, rice and ground nuts are grown.

4) Oil mining also has started after mobilizing resources from the exports products.

5) International relations have been improved between the countries which export trade especially Gabon.

6) It has facilitated the fast growth of some towns and ports like port Owendo.

7) Some manufacturing industries have developed as a result of capital generated by the forestry industry.

Problems facing timber industry in Gabon;

1) There is large-scale deforestation caused by the clearing of vegetation by the man so as to establish settlement and areas for cultivation. The shifting cultivation has contributed greatly

to deforestation. Also, excessive cutting for timber production has led to exhaustion of forest reserves in the eastern part such that timber industry has moved further inland to the untouched areas.

2) Poor labor supply since most people concentrate on mining activities, which are more paying than forestry.

3) There is also small home market for the forest products.

4) The area situated far away from Ogowe faces the problem of inadequate transport

5) There is also the problem of the absence of pure tree stands in the forestry area.

6) Stiff competition from other major producers like Canada.

7) Disappearance of valuable species due to excessive cutting and the use of fires.

8) Problems of transport since the area receive heavy rains throughout the year leading to water logging.

9) Fluctuation of price in the world market which has favored timber products from the temperate areas than the timber from equatorial and tropical regions.

10) Dense forest which tends to be impenetrable leading to timber extraction and transportation.

11) Poor local market as a result of low industrial base.

12) Forest exploiters also face the problem of rugged landscape posing problems in having across to other interior areas as well as developing Infrastructure like roads and railways.

13) Frequent wars that take place in Congo basin disrupt timber extraction. There is labor unrest due to fear of wars and much capital being used in timber extraction.

14) Competition from other economic sectors like agriculture and iron mining which have been encouraged by the government for the sake of diversifying the economy of the country.

15) Lack of education and low technology has also led to mismanagement and depletion of the forest resources in Gabon.

TIMBER INDUSTRY IN BRAZIL

Brazil is the only major commercial timber producer of any significance in Latin America. The dense forest is found in the amazon basin (Amazonia), which contains a vast variety of hardwoods. There are small quantities of mahogany, rosewood and balsam wood. But despite this vast tropical forest in the Amazonia, the greatest development of lumbering (timber industry) has developed in the Parana pine forests found in the south.

The development of timber industry in the Parana pine forest in the south has been attributed to the following factors:

1. Parana pines are found relatively near the main industrial area of south Brazil, as well as Paraguay and Northern Argentina.

2.There has been some improvement in transport in the south, which have facilitated accessibility and ferrying of forest resources.

3.Availability of cheap labor for lumbering.

4. Predominance of Parana pine (araucaria pine) which is highly demanded. This tree species yields softwood, which is easily worked for timber.

There are now over 3000 saw-mills in southern Brazil. In Brazil timber ranks the second to meat in terms of export. The country accounts 2% of world coniferous production and 10% of broadleaved production. It also produces quebracho wood, whose bark is used for extracting

tannin. The extraction of tannin enhances the use of forests in Brazil even though not for timber. Tannin is used in the manufacturing of leather.

Problems hindering the development of timber industry in the Amazon basin (Amazonia) in Brazil

1) Deforestation that has led to the destruction of a large part of the forest due to the shifting cultivation, ranches, establishment of settlement fuel and mining. The clearing of the forest is being supported by the government in order to solve the problem of high population in Brazil. Deforestation has accelerated the problem of leaching and soil erosion, which leads to the decline in fertility and reduction of arable land.

2) Diseases like malaria attack people and cause death leading to the problem of labor shortage. Labor shortage is also complicated by the sparse population in the region, rural urban migration and infant mortality rates have contributed to the problem.

3) Poor living conditions of the lumbers as well as poor supplies of power and water.

4) There is poor accessibility due to poor transport in the region. The region has poor transport network although the government has begun the construction of highways in the amazon basin. Also, heavy rains associated with frequent floods aggravate the problem of accessibility to the forest. The Amazon's river flow across too much vegetation undergrowth and this has also hindered the effective use of water as means of transporting logs.

5) The Amazonia is inhabited by the wild and dangerous animals like snakes making exploitation difficult.

6) Low capital due to poverty has made it difficult for people especially shifting cultivators and lumberers to invest in more advanced methods of land use and forest exploitation.

7) The Amazon basin is also suffering basic services like of health, education, clean water and electricity.

Generally the amazon basin is greatly threatened by the high demand for fuel wood since there are no coal deposits or well developed oils reserves. Another problem is the population explosion, which is still taking place.

TIMBER INDUSTRY IN TANZANIA

Potential

Over ½ of the area is miombo woodland and very small area is under the forest. Most of the species are hard wood such as Mninga (pterocarpus angolensis), Mvule (pericorpsis angolensis), acacia, grevillea, mpera mwitu, mkarambati, mtunda etc. softwood species are pencil cedar, pines, pinus, podo, black wattle, cypress and eucalyptus. Miombo woodlands occupy the central and western parts of Tanzania like Tabora where the Tabora misitu production mill is located Mangrove forest is also found along the coastal parts of Tanzania where there is salty water.

Uses of timber in Tanzania;

Timber and its products are used for making furniture, building, fuel, ornaments (like ebony) honey collection and beewax extraction, making medicine (the neem and baobab trees), making tannin like the mangrove trees.

In Tanzania timber production is based on the policy of self reliance in sawn timber and at the same time sustains a small but efficient export trade in high quality timber. It holds a substantial trade in logs and charcoal with the Persian Gulf countries.

There are research centers for forestry products in Tabora and songea. More researches are being done in other parts of the country like morogoro at the Sokoine University of Agriculture.

FOREST PLANTATION

There over 74,304 hectares of forest plantations in Tanzania, which have been established in order to provide either hardwood or softwood or both. Examples of forest plantations in Tanzania include those, which provide softwood only are buhindi, matogoro, rubare and rubya; those which provide hard wood only include kwamkoro, lunguza, loliondo and mtibwa; and those which provide both hardwood and soft wood are rondo, ruvu, kawatere, kiwira, meru, north and west Kilimanjaro, sao hill (mufindi), shume, magamba, ukaguru and usa.

DEVELOPMENT OF TIMBER INDUSTRIES

Timber industry in Tanzania is largely located in the rural areas where individuals and some groups run the industry. The government also runs the timber industry but to a small extent. The of many trees, development of transport system like the central railway line and the TAZARA railway line , demand for hardwood products like furniture, demand for paper, labor availability, food supply etc. have been some factors which influenced the development of timber industry in Tanzania.

Nonetheless, timber industry in Tanzania is not well developed compared to countries like Sweden due to the following factors.

1) Most of the species are hardwood while there is a very great demand for softwood in the world.

2) Poor transport network is another hindrance. Most of the roads are impossible during the rainy season and the railway lines are not enough since they pass in areas which are far from the timber producing zones.

3) Low capital to be invested in the development of the industry is a big problem. Most of the capital is borrowed from other countries, which are economically developed.

4) Poor local market because most of the people in the country are poor and most of them have very low per capita income.

5) Much concentration on cash crop and food crop production as well as mining has made the timber industry keep on dwindling.

6) Low level of technology leading to poor quality products which do not compete in the world market.

7) Deforestation or depletion of the forest is another limitation. Most of species have been destroyed and are still being destroyed because of fires, over cutting for timber production. Cutting for curing tobacco like in Tabora, Mpanda, Ruvuma, and chunya, overgrazing etc

Fires have become a common problem in mufindi and the mbeya range forest. Some of the forest areas have been cleared for settlement following the explosion of population. Generally Tanzania loses between 30,000 and 40,000 hectares of forest land every year and tree planting efforts add only about 20,000 hectares. This is less than 10% of the area supposed to be planted with trees every year in order to balance demand and supply. Most is cut for fuel.

8) Food supply is another problem. The central parts of Tanzania where hard timber is being produced experience some problem of food. The food available is usually expensive leading to inefficiency.

9) Labor shortage as a result of massive exodus of young and energetic people from the rural areas to urban areas in search of jobs in the offices and industries.

10) The tropical condition of Tanzania does not favor the establishment of many plantations for softwood species. These species are confined in the highland areas only.

Effects done in Tanzania to promote the forestry and timber industry in Tanzania.

1) Conserving the forest through planting more trees. Different reforestation and afforestation programs have been established in Tanzania in which trees are being planted. Some areas have been declared as reserved in which cutting of trees is strictly prohibited, e.g. amani nature reserve in Tanga. Fires are being controlled by involving the local communities especially in Iringa and Arusha- Babati. Special education is being offered in schools, through mass media and campaigns focusing on the necessity of conserving the forest. The

government has also been encouraging the planting of trees for example in the year 200, president Mkapa and her honorable former minister of natural resources and tourism Mrs. Zakia Menghji demonstrated the planting of trees so as to encourage such efforts throughout the country. The national wide tree planting campaign began vehemently under president Mkapa in April 1999. The millennium tree which was landed by president Mkapa is known as sclerocarya birrea (mung'ongo) or the marula tree which is a good supplier of fuel wood, animal fodder, timber, edible fruits, carving material s, bee forage, medicinal product, and local brew as well as making the famous anarula wine.

2) Forest research centers have been established to conduct more research on the forest and forest products this was under the national forestry research master plan, which was prepared in 1991-1992 which aimed at promoting forest research activities through cost sharing mechanisms. There is silvicultural research center established in Lushoto.

3)Forestry training has started and there special training centers like Tengeru in Arusha and the Sokoine university of agriculture recruitment of qualified and competent staff for local governments is being emphasized and the in service training is being promoted.

TIMBER INDUSTRIES.

Most of the timber industries are located in the forest to cut costs of transport since the logs are used are bulky and heavy. Some like furniture and paper industries can be located far away from the forests and especially near the markets. Their raw materials have reduced bulkiness after sawing and pulping have taken place.

Examples of timber industries in Tanzania include the following.

Furniture and fixtures industries

There are so many industries of this category in Tanzania. They are still small in scale some are run by individuals in their home steads while others are run by organized groups of people like the one in keko and in manzese at Dare s salaam.

Pulp and paper plants;

They were established in dare s salaam (kibo paper mill) and mufindi pulp and paper mill in Iringa. But the paper industry but the paper industry is small and is not running properly because of the following factors such as Poor management, poor capital availability and the industry requires a lot of capital, poor water supply due to drought conditions which have constantly been hitting Tanzania., destruction of trees as a result of fires that ravage the plantations especially the sao hills plantation in mufindi, poor power supply from the available power stations especially the mtera dam, poor skills for producing good quality paper, and poor local markets since people prefer paper that is manufactured abroad. The mufindi pulp and paper industry was established at the cost which is Over Tshs. 250 million. The pulp produced is used for making a variety of paper-wrapping, newsprint, cartons, writing etc.

The establishment of Mufindi pulp & paper plant was stimulated by

1) The governments need to be self sufficient in the supply of paper, etc.

2) High demand for paper and books after the great rise in school enrollment.

3) The presence of the forest plantation of sao hill that could supply the raw materials.

- Plywood factories located in Mwanza and Tanga

- Tanning industries like the one in Kilimnjaro (moshi)

Importance of timber industries in Tanzania

Timber industry is important for.

1) Providing employment.

2) Importation of timber is unnecessary thus saving foreign currency.

3) Environmental awareness has increased in the nation thus promoting forest conservation.

4) Stimulated the development of transport into forests so as to exploit the products easily, such as the road in southern highlands where the forest with softwood covers 33,200kms.

5) Promotion of living standards of people through the process of making furniture

6) It has also promoted the conducive learning environment in schools in the country through the supply of paper construction and furniture.

7) Timber products especially traditional carvings have become one of the tourist's attractions in the country. Some tourist admires and buys the carvings.

8) It has also stimulated the market for food crops since the workers in the timber industry need a lot of food so that they can be able to work effectively

9) The industry has also contributed the generation of government revenue through selling some of the products locally and exporting some of them abroad. For example Tanzania sustains a small but efficient export trade in high quality timber. It holds a substantial trade in charcoal and logs with the Persian Gulf countries.

Negative impacts of timber industries in Tanzania

The timber industry has several negative impacts including:

1) Encouraging deforestation since tree planting speed is lower than the rate of destruction and even the rate of recovery is very slow.

2) It has contributed to environmental pollution especially the tanning industry, which is the major contributor in water pollution.

3) High capital involved in the establishment of the timber industry leads to the abandonment of other important projects.

4) It leads to the destruction of animals and birds habitation.

THE FUTURE OF THE TIMBER INDUSTRY IN TANZANIA

The future of the timber industry in Tanzania depends on the proper management of the existing forest and woodland areas, the current tree planting and caring efforts, the degree of awareness among the people on forest conservation, population growth rate, financial position and the commitment as well as the cooperation between the people and the government.

Problems facing forestry world wide;

1) The forests have been felled indiscriminately and wastefully.
2) Man has, intentionally or accidentally started fires that destroy the forest.
3) Lightning has started fires in the forest or damaged the trees.
4) Increasing world population causes a demand for forest products and hence encourages excessive exploitation.
5) Economic activities such as agriculture are putting pressure on the existing land.
6) Political unrest in most parts of the world has caused random felling of trees.
7) Diseases and pest attack the trees leading to a large- scale destruction.
8) Where the industries have been set up near the forests, tree leaves have been stunted and destroyed.

Solutions towards these problems;

Today the government and nongovernmental and international bodies have attempted to offer solutions to problems facing forestry through different ways like:

1) Introducing afforestation and reforestation programs and this under high tune in Tanzania where the national tree planting campaign has been launched and is being insisted by the government officials.

2) Spraying of forests with pesticides and fungicide so as to combat the problem of diseases and pests.

3) Removing the infected trees in order that they cannot affect the others.

4) There has been improvement of fire fighting technique and equipment.

5) Training personnel in forest management.

6) Clearing around forest as a means to guide against fires.

7) Legislation on non- interference with forest areas.

8) Mass education through different media on the importance of trees and necessity of conserving them.

9) Reclaiming land from swamps and arid areas so as to ease the pressure on forest zones.

10) Conducting research on characteristics of trees to establish the suitable species that can be grown in specific areas.

11)Ensuring maximum utilization of the trees that have been cut.

REGIONAL FOCAL STUDIES - 5.7 ENVIRONMENTAL FRIENDLY TOURISM

Tourism can be regarded as the movement of people away from home to other places of interests for leisure, or pressure or studies etc. It involves visiting places of interest like wildlife conservation areas, historical sites, museums, beaches etc .

Scope of Tourism

Tourism can be regarded as socio cultural and economic activity.

1. **As social cultural enterprise:** Tourism involves traveling for the purpose of resting and relaxation, pressure, curiosity or study tour. A person can travel far to the other place in order to study other cultural aspects which are different from his or her own country. Some people travel so as to view spectacular features like mountains, lakes, and wide variety of animals for pressure. Some travel far for adventures exercise like mountain climbing on the Mount Kilimanjaro. It also provides employment opportunities to the local people in the country.

2. **As an economic enterprise**: Tourism leads to the earnings of foreign currency through the visitors who come. It also involves the expansion of the market for the local products. Some tourists travels far with their goods and some travel to look for the market areas for their goods.

The money obtained from the tourist industry can be invested in other economic projects for the development of the country concerned. For example tourism in Switzerland has boosted a lot of the economy of the country and it has contributed to the large scale industrial development of the country.

Hence tourism is an industry or enterprise which can be used to promote culture, widen the market for local goods, expanding education and creating employment as well as generating capital to be invested in other economic sectors whose performance has been dwindling.

Types of tourism;

1.Domestic tourism which involves people traveling to places within the country for example from Dar es salaam to Mikumi or from Tabora to Serengeti National Park.

2.International tourism which involves people moving from home countries to other countries for leisure or studies.

Factors that Encourages the development of Tourism in the country

I. Physical factors:

1. Pleasant climatic conditions especially sunny conditions attract tourists from colder countries during winter.

2. Attractive landscape (scenery) due to physical features like mountains, crates, lakes, coastal beaches, canyons and deserts

II. Social – cultural factors:

3. Presence of historical and architectural sites for example cities, churches, mosques, temples, palaces and pyramids.

4. Presence of recreational resorts, swimming places etc.

5. Good social services like shopping centers, medication, good food, water supply, and well trained staff etc.

6. Presence of natural parks like Serengeti, Yellowstone, Yosemite etc

7. Local skills like the Makonde carvings in Tanzania as well as the dressing style and traditional dances among the Maasai and the Sukuma.

III. Economic Factors:

8. Availability of capital to be invested in the tourist industry.

9. Advancement in transport and communication e.g air transport, road, railway, and water as well as internet services. These facilitate accessibility of different places of interest in the community.

IV. Political Factors

10.Peace in the country encourages the development in the country since the tourists like visiting the country where there is peace like Tanzania in East Africa. They normally avoid the areas with political problems like civil wars.

11.Also the government policy can encourage the development of the tourist industry by financing or giving favorable conditions, which are not restrictive.

Importance of Tourism

1. It provides employment to the people in hotels, guiding section, game parks and traveling agents.
2. It provides foreign currency to the country, which is being visited.
3. It can facilitate rapid improvement in technology related to the tourist industry.
4. It provides opportunity for recreation or enjoyment.
5. It leads to the introduction of new culture.
6. Strengthening the international relationship.
7. It enables the marginal land to be used for economic development rather than staying idle. For example national parks occupy the areas which were unproductive.
8. It promotes international respectability of a country. For instance today Switzerland is well known for flourishing tourist industry and it is known as "playground of Europe"

Why tourism has increased nowadays?

1. People have accumulated greater wealth and are of higher standard of living such that they can afford traveling (Greater affluence in the societies).
2. There has been a great need for studying other cultures in other countries.

3. The start of long holidays with pay.

4. Development of better transport facile is particularly in air words, it can be said that accessibility and mobility have improved including the increase in car ownership and affordable charter air flights at overseas.

5. Cheaper transport services especially air transport.

6. The development of attractive national parks in different parts of the world.

7. Increasing number of active people.

8. Greater awareness of locations facilities and opportunities through education advertising and the media.

Trend of Tourism at a Global Level

The world tourism by an estimated 7.4 per cent in 2000 its highest growth rate in nearly a decade and almost double the increase of 1999 but Africa was left out the boom, increasing its international arrivals by just 1.5 per cent the world Tourism Organization (WTO) said units preliminary estimate of global travel. While Kenya, Zambia, Mauritius, Morocco, Tunisia and Algeria achieved strong growth. South Africa and Zimbabwe tow of the Africa biggest destination stagnated or suffered the WTO said. International tourist arrival in South Africa grew just by 1 per cent in 2000 to over six million tourists. The worst performance was Zimbabwe which saw a 60 per cent decline of tourist arrivals to just 840,000 visitors. The decline in South Africa has been due to the contribution of the reports of crimes against visitor and floods in Mozambique and in Zimbabwe has been due to the recent land conflict against the foreign farmers it the country.

German tourists continued to be the world second top travelers after the Americans and an estimated 48.4 million people (around 754 per cent of population) went on a holiday in 2000 and their spending rose to DM 96.0 billion. Spain retained her positing as the most favorite holiday destination abroad, followed by Italy, Australia, France, turkey and Greece.

Major problems which are currently scampering the smooth development of tourism in the world include:

1. The world looming terrorism associated with bombardment of economically strategic centers like the world Trade Center in the USA that took place on 11th September in 2001. Terrorism has scared many international tourists leading to the desolation of tourism development in the world. Many people fear traveling with aeroplanes lest they encounter the problems of hijacking like what happened in the USA. Visa procurement procedures are also associated with a lot of restriction as a result of terrorism

2. The ongoing crimes against the visitors in different corners of the world have contributed to the decline in tourism in some countries.

3. Environment problems or hazards like floods in Mozambique and stormy winds contribute to the dwindling trend of tourism in the world. In other places like Turkey, Indian Japan and California there are problem of earthquakes since there are located along the zones of convergence.

4. The current political conflicts in different countries coupled in what wars like it eh Democratic Republic of Congo, Middle east (Palestine and Israel) etc are a hitch or snag to tourist development.

5. Poor transport and communication network in the third world countries is another hurdle in the tourist development. There are poor roads in many countries such that visitors do not get greater chance of having a glimpse (view) of different attractive aspects in the interior of the countries like the southern circuit of Tanzania.

Negative Effects of Tourism

1. Tourism leads to environment degradation like deforestation an erosion; pollution like water pollution and air pollution.

2. It leads to the spread of diseases like AIDS etc.

3. Tourism needs high capital and hence if there is low capital it cannot develop easily. This discourages the development of other economic sectors.

4. Tourism can accelerate terrorism in the tourist country. The terrorist can come to the country as normal visitors

5. It can also lead to the deterioration (destruction) of culture in the countries which are visited.

6. It leads to the occurrence of conflicts in the country due to cultural destruction.

Solution to the Problems;

1. The visitors should be taught the culture of the natives in the country where they are visiting so that they cannot interfere with the people cultural sects like dressing etc.

2. Reducing the number of visitors who visit the country so as to conserve the environment.

3. New areas should be opened up to reduce congestion in the existing tourist centers.

4. The government and international organization should be active enough in supporting and governing the tourist activities in the country concerned.

5. There should be involvement of the local community in order that the local people can benefit and help I conserving the tourist centers (tourist attraction) like wildlife conservation areas etc.

6. There should be integration of tourist activities with the promotion of the environmental condition through the eco –tourism approach.

ECO-TOURISM (GREEN TOURISM);

It is the terminology which demoted ecological (Eco) aspects combined with tourism activities. Eco-tourism or green tourism can be defined as an integrated approach that involved carrying out tourist activities with minimum negative impacts of the natural environment. This means that when tourist activities take place should involve the promotion of environmental conservation.

In Principal

1. Eco-tourism is based on undisturbed natural environments and encourages undertaking of these activities in a non damaging manner.

2. Eco-tourism enhances the conservation attitude among the people.

3. Eco-tourism should strive to improve local communities economically and socially, at the same time conserving the natural environment. It means that it should be geared towards poverty alleviation in the local communities.

4. I should promote positive interaction between the tourist themselves the local community because the benefits of the conservation areas are for all people.

5. It should promote awareness among the local people through education so that they can be able to know the importune and strategies of conserving the natural environment for tourist activities.

6. Eco-tourism should also emphasize the proper planning and monitoring of the tourist activities and conservation aspects.

Hence Eco-tourism is a wider concept, which involves several insures like traveling business, economics, attitude and behaviors environmental its management and other resources as well as other human activates.

Importance of Eco-tourism to the Local community;

1. It leads to the empowerment of the local community since they themselves design, organize the control activities on the conservation areas. Hence local people participation in the conservation of nature is promoted When people participate they get motivated an become more willing to take part in the conservation process.

2. It promotes the living standard and respectability of the people. The living standards are promoted through income generation as some people are employed and wages from the conservation areas.

3. The cultural aspect and the environment of the local community are preserved.

4. The relationship between the local community, the visitors and the conservation is promoted and hence the community lives in peace.

5. It helps In the control of diseases like AIDS since the participation of the local community leads to the strikes control of human behavior in the tourist area.

6. Eco-tourism promotes environmental awareness among the local people. Through this people can know the potentials of their environment.

7. The local community gets new technology through the visitors who came to their conservation areas, Same special training centers on where people can benefit through getting education and experience.

8. It also helps in the reaction of water pollution as a result of the watershed management.

9. The market for locally produced goods like the Makonde carving of Tanzania can be improved.

10. It stimulates the development of transport and communication system in the local community. In general eco tourism in Tanzania can help in fighting against poverty (poverty alleviation).

CASE STUDIES

TOURISM IN KENYA

Factor for fast development of tourism in Kenya

1. It is magnificently endowed with a lot of fauna and flora which are one of attractions in the country.

2. It also has very attractive scenery, climate and beaches. There are mountains like Mount Kenya and lakes, which attract the visitor.

3. The nearness to the coast has also facilitate easy movement of visitors to the country.

4. Kenya tourist industry in managed more efficiently than any other east Africa country.

5. There is strong government support on tourism.

6. Relative political stability that has been prevailing in the country.

7. Kenya has advertised its industries so widely in the world. There are promotion centers in England, Zambia Switzerland Germany and USA

8. Industrial base and agricultural prosperity like tea plantation have encouraged the development of tourism in Kenya

9. The knowledge of English speaking countries to come to the country since they can easily understand each other

10. Development of transport system like road and airways

Attractions (Honey pots) in Kenya

1. There are several national parks like Tsavo, Meru , Nairobi Amboseli, Mountain Kenya Mount Elgon, Lake Nakuru, Marine national parks (Malindi, Watamu and Kisite/Mpunguti) Historical and archeological national parks, sibiloi oldonyo sabuk and saiwa national Park.

2. There are game reserves like shimba hills Maasai Mara, Marsabit, Buffalo spring etc

These are having a wide variety of animal, plant and birds, which attract visitors into the country

1. Coastal attractions include fishing grounds, beaches, hotels, swimming areas, cliffs, caves, spits, bars etc.

2. Attractive scenery made of Great Rift valley, Mount Kenya lakes and rivers, etc.

3. Development schemes like Galole and Mwea- tebere irrigation schemes, large scale tea plantations in Kericho and other areas

4. Antiquities and historical sites like the fort Jesus in Mombasa Gedi Ruins in Malindi and other found at Kilaguni and voi


SUDAN
ETHIOPIA
Lodwar
Lake Rudolf
Moyale
Marsabit
UGANDA
Wajir
SOMALIA
GREAT RIFT VALLEY
KENYA
Eldoret
Mount Kenya
Meru
Kisumu
Nakuru
Garissa
HIGHLANDS
NAIROBI
Machakos
Lamu
Malindi
INDIAN OCEAN
TANZANIA
Mombasa
0 100 200 km
0 100 200 mi

TOURISM IN TANZANIA

Tanzania with its unique features, is one of the famous countries in the world of tourism. Its tourist industry has a bright future because of the following reasons;

- The government has shown a greater interest in promoting this industry for example the ministry of Natural Resources and Tourism has been so much active in promoting this economic sector. The departments into chemistry have their own policies.
- There are promotion offices in different countries for advertising tourism in Tanzania. For example promotion offices are in Germany (Frankfurt), Sweden (Stockholm), North America, New York and England (London). There has been promotions campaigns going like the one launched at the 36^{th}) International Tourism exchange (ITB) in Berlin, March 2001 to make other nations know that Tanzania is among the attractive destination in the world.
- It created the tourist industry new promotion logo that is Tanzania the land of Kilimanjaro and Zanzibar and about 50 tour operators, hoteliers, lodge keepers and the

tourist Board presented the nation as an ideal holiday destination offering wide range of possibilities for the discerning visitors from abroad. A main thrust of the campaign was to attract more up market tourist by offering a wide variety of visual options. They promoted various soft adventure programmers such as white water rafting, trekking and canoeing as well as different opportunities for sport. Various possibilities for cultural tourism in Zanzibar and on the mainland, conference tourism and incentive travel were among the new offers presented at the five die ITB which concluded on March 7, 2001.

Then Tanzania's minister for Natural Resources and tourism Mrs. Zakia Hamdani Menghji said "even though beach tourism and safari will continue to be the backbone of Tanzania tourism industry, we are trying to develop more niche products and special interest in tourism". "This is part of Tanzania's ongoing efforts to develop an economy friendly and environmentally sustainable development of tourism which will preserve the country tourism resources and enhance the well being of the host population".

1.There is a wide variety of tourist attraction (honey pots) this ranges from game reserves, national parks, coastal beaches historical sites coral reefs cultural aspects like language and dressings and the carving, spectacular features like the Kilimanjaro mountain lake Tanganyika.

2. New areas are being established into the southern circuit lake region and coastal areas as well as in the islands of mafia and Zanzibar.

3. The east African cooperation will act as a dynamo in the promotion of tourism like many other east African countries. The cooperation will intensify security measure will enhance visitors mobility in the region and advertisement of tourism sector visa procurement procedures will be implied.

4. The government stability that has made the country maintain some degree of peace will continue attracting the visitors into the country with conflicts like the Democratic Republic of Congo, Rwanda and Burundi, Tanzania is struggling to maintain security so as it can become a safer destination.

5. It is trying to use information Technology in the tourist industry so that the activities should keep on running more effectively and monitoring the tourist activities in the country.

6. Local people are being involved and this will promote the status of tourism. Since there will be more participation and peace in the conservation areas. For example there are various community Based wildlife conservation projects, which have been started in different parts of Tanzania like the Serengeti Regional conservation strategy (SRCS) and the Amani Nature Reserve (ANR) in Tanga that was established in 1997.

7. Apart from attracting more tourists especially from Germany, the country is seeking more German investment in further developing of tourism infrastructure. Germany has been supporting management and conservation of some other national parks within the frame work of

German Development and investment company (DEG) is actively involved in Tanzania hotel and tourism sector and help to build up several hotels, lodges and tourist facilities.

Hence, the number of tourists has been increasing year after for example in 1997 tourists visiting Tanzania increased from 326,188 in 1996 to 360,000. This earned more than USD 393.4 million. Also in 1999 the number of visitors increased to 627,325 earning 733.2 million USD. The increase was a result of efforts made by the government and private tour operators to advertise Tanzania tourist potentials in the recent past. (Source BOT journal 1997).

Tourist Attractions (Honey posts) in Tanzania;

1. Attractive landscape characterized by the presence of mountains like Kilimanjaro which is snow capped, active volcanic mountain oldonyo lengai (the mountain of god where visitor struggle to the steep slopes of the mountain) large lakes like Tanganyika and Victoria the remarkable Rift valley and the Indian Ocean with its attractive beaches. Lake Tanganyika is the deepest rift valley lake in Africa and the longest natural fresh water in the world.

2. The presence of two of the world largest game sanctuaries, the Serengeti & Ngorongoro ecosystem and the sellouts game reserve. The former supports the greatest concentration of wildlife of earth. The shared plains support about one million wild beasts about 260,000 zebras and thousands of gazelles.

3. Large attractive network of National parks and game reserves covering about 25% of the land area. There are National parks like Serengeti lake Manyara, Tarangire, Arusha, Kilimanjaro Mikumi, Ruaha, Katavi, Gombe, Mahale, Rubondo Island, udzungwa and saadani. Also there are game reserves eleven of which are selous, rungwe, Kizigo, Moyowosi / kigosi, Maswa, Ibanda, Biharamulo/ Bugiri, Gurumeti/ Ikorongo, Usangu, Pande close to Dar es Salaam ugalla, and Mkomazi.

4. There are pre historic sites like olduvai (oldupai) George in the Serengeti Plain where visitors get important information of the past. This is a river canyon cut 100 meters deep through the volcanic soils of the Serengeti plains. There is a museum at the Olduvai Gorge where visitors get different information of the past.

5. Archeological sites like Isimila, which is 21 km south of Iringa and 800m off the Iringa – Mbeya highway. At isimila there were discovered faunal remains, stone tools like knives, flake scrapers etc. But this site is not so attractive to tourists because it has not been promoted into an attractive destination. Hence the government has to make sure that the site is promoted.

6. Shifting sand across the Ngorongoro plains is another tourism attraction. The sand shifts at 17 meters per year.

7. There are coastal attractions like Mangrove plants, fishing, grounds coral reefs, beaches, hotels, islands like mafia island and water for swimming.

8. Conducive climate into the mountains (cool) warm coastal climate good for swimming etc.

9. The national language Kiswahili and the visitors and the local people.

10. Tanzanian attractive traditional rafts like Makonde wood carvings, the paintings at kondoa irangi and the cultural aspect like the Maasai dressing are magnets to tourists.

11. Improved accommodation in the hotels and restaurants as well as lodges.

12. Peaceful political atmosphere in the country attract tourists.

13. Improvement in Transport and communication like air, road and water transports.

NATIONAL RESERVES AND GAME RESERVES IN TANZANIA

Tourist Zone in Tanzania can be categorized into the **frequently visited** and the **less frequently visited areas**.

The most frequently visited areas include:

1. The Northern Circuit which includes Serengeti with its lodges like Seronera and Lobo, Ngorongoro conservation area with the Ngorongoro wildlife lodge situated to the rim of the crater, Lake Manyara the Arusha or Momela National park. The northern circuit is served by the Kilimanjaro international Airport (KIA) at Sanya juu between Moshi and Arusha.

2. The southern to eastern circuit which include coastal beaches with white sands, worm water, kunduchi beach, white sands and Bahari beach hotels. There are ancient towns mosques and the palaces of the coast especially Zanzibar. The Mikumi national Park fishing this circuit is served by the Dar es salaam international and Morogoro, Iringa road like Ally Hassani Mwinyi road to Bagamoyo and Morogoro - Iringa road.

3. Other areas visited in the western zone include Lake Rukwa, Tanganyika, katavi, National Park, Gombe etc and in the lake zone include the Lake Victoria, Rubondo national park etc.

Advantages of Tourism in Tanzania and Kenya;

1. It has led to the creation of employment opportunities. It has led to the creation of employment opportunities

2. It has contributed to the generation of the government revenue. For example in 1997 Tanzania earned more than USD 393.4 million from 36000 tourists and in 1999 it earned 733.2 million USD from 627, 325 visitors.

3. It has promoted the living standard of the local people in the respective countries.

4. It has facilitated the fast development of science and technology as a result of the influence of the visitors who came to East Africa.

5. There has been promotion in the standard of hotels and lodges in the tourist centers.

6. The countries have become well known worldwide through the visitors who come and leave the country with information back home.

7. The market for the locally produced goods has been promoted.

8. Tourism has encourage positive attitude towards environmental conservation since people have realized the potential values of the natural environment.

9. It has strengthened international relation with many other countries like Germany, France, Sweden, Finland, Canada, Japan, Norway Britain etc.

THE WILDLIFE POLICY OF TANZANIA

The Ministry of Natural Resources and Tourism in its vision of the wildlife sector clearly stated as to involve all stake holders in wildlife conservation and sustainable utilization as well as in fair and equitable sharing of benefits among the challenges the sectors has to address are;

1. To promote involvement of local communities participation in wildlife conservation in and outside protected areas network.

2. To integrate wildlife conservation with rural development. There are moves to create wildlife management Areas (WMAS) to be managed by rural communities. This has two objectives, which are;

- To promote conservation of wildlife and its habitats outside the areas (National parks, Game reserves and Ngorongoro conservation area) by establishing wildlife management areas.
- To transfer the management of wildlife management areas and ensure that they get tangible benefits.
  (a) The policy also outlines strategies for integrating wildlife conservation and rural development especially sharing benefit.

The Policy for National Parks in Tanzania

1. The policy states the purpose of the National parks in Tanzania as to ensure optimum levels of revenue and benefits accrue to the national economy, the parks, and communities without impairing park resources the issues pointed out in the policy pertaining to local communities are;
   (a) To facilitate coordination and shared benefits with local communities.
   (b) To provide material, services, and facilities for public information and education needed by target groups, among them are selected groups from local communities.

2. The policy also specifies that law enforcement staff should cooperate with local communities around the national parks and the public in general to win confidence and support the people in the fight against illegal activities within and without the park boundaries that may have impact on the park resources.

3. Smoking: No one should smoke while on the game drive and camp, the cigarettes should be disposed carefully to avoid wild that can damage animals and vegetation

4. Feeding: Never feed animals at your hotel or in the wild. It can upset their diet and lead to unnecessary dependence on people.

5. Liter one should take the litter with him/her as animals can become ill or even die should they digest it.

6. Hunting: No one is allowed to hunt in the national park without special permission to do so.

7. People movements: All people should in their vehicle within 200 meters from any game animal. It is prohibited to get out of the car in the national parks except in the designated places.

8. Camping is permitted only at sites or authorized by the conservator or staff.

9. Maintaining Biodiversity: No one should pick out or destroy vegetation or remove any object of biological interest, including eggs, feathers, bones and trophies.

10. Fire control: No one should light or cause fire to be lit. After camping be sure to extinguish you fire carefully

11. All visitors entering the national park must be accompanied by a licensed guide or an official guide

Limitations of Tourist Development in East Africa;

1. Low capital availability especially Tanzania whose economy is very low.

2. Problems of transport and communication which is still not well developed in some areas where the roads are impassable in the wet season.

3. Tourism is a seasonal activity in East Africa unlike Switzerland where it takes place all the year round.

4. Population encroachment on the existing tourist potentials like national parks, game reserves and sanctuaries. This has been due to high population growth rates on the margins of these gazette areas.

5. Low managerial or poor managerial skill cause problem in the general management of that tourist center.

6. There is a problem of political instabilities especially in Uganda as well as terrorism that involved the bombing of American Embassies in Tanzania and Kenya in 1998. This scared American tourists from visiting east Africa. The wars accelerate the breakdown of the established infrastructure and discourage investment in the tourist industries.

7. There has been low advertisement because of low capital, poor communication system as a result of low technology etc.

8. Poor quality of services as compared to other country has been discouraging tourism.

9. Poorly organized hunting in the game reserves affected tourism .

The Loliondo Care in Tanzania;

Loliondo is a good example of the Game Controlled Area where hunting has been taking place. This has been giving the hunting rights to some hunting companies. In 1992, the Ngorongoro District council on behalf of six villages (ololosokwan, soitsambu, oloiperi, olorien/ magauduru, loosoito and Arash) signed with a hunting company In which the latter was given exclusive hunting rights in the loliondo game controlled areas. The local people have not been benefiting greatly from the hunting process in the area and this has led to the upsurge of a lot of complaints.

The number of animals has decreased because of hunting making the area less attractive to tourists, It is alleged that the villagers were even not informed or the terms of the contract such that they cannot effectively and efficiently participate In the conservation if the area. They still depend on the goodwill of the company for their development but the goodwill seems not to becoming forth since the new contract was signed into year 2000. Hence there is need for the hunting to be stopped in Loliondo & other Game controlled areas in order to conserve the animals and attract tourists who can bring in same foreign currency that can be benefit the local people especially the Masai.

What has to be done so as to improve tourism in East Africa?

1. To re – equip or rehabilitate the existing lodges, and hotels so that they can be of good standard.

2. There should be more efforts in advertising the tourist industry of East Africa.

3. There should be comprehensive training given to these who engage themselves in the tourist industry. For example the government should train game wardens who will be in position to defend the national parks and game reserves against the danger of poaching.

4. More new areas should be opened like coastal areas and lakes already Tanzania has started developing the coastal areas and lakes to open up new areas under the ministry of tourism and natural resources. The efforts are also focusing on opening up the southern areas, the coastal areas and the interior of Tanzania.

5. Massive campaigns should be launched to local people so that they can learn how to appreciate the importance of the gazette areas and even participate in the conservation processes.

6. The central government should encourage the development of private tour operators so as to assist in the promotion of the industry. They can be given loans to invest in transport at the minimal interest.

7. There should be control of population so as to avoid people encroachment into the conservation area.

8. Anti poaching unit should be established in East Africa so as to protect the animals.

9. Peace and harmony has to be maintained in the east African countries and this scan be facilitate through close cooperation fetch east African countries.

The prospects of Tourism in East Africa

The future of tourism in East Africa is promising this is based on the following reasons;

1. The revival of the African Community will promote the tourism industry in therein. There are efforts wages towards intensifying security, improving transport and communication etc in east Africa.

2. Same news areas are being opened up especially in the interior and along the coast as well on the islands. These will attract more tourists.

3. There are efforts done in re-equipping the rehabilitation of the existing lodges for example Mwea in Ruwenzori National park and Para in Kabalega National park, and building of new hotels like the Holiday inn and the royal palm in Dar es salaam improvement of the old hotels and building of new ones will lead to the improvement of accommodation in these countries and attract more visitors.

4. These have been launched strong campaigns to advertise tourism in East Africa and as well as outside the region.

5. The presence of many attract features in East Africa both natural and man made there are spectacular mountains, which are ice capped like the Kilimanjaro and the Kenya Mountains presence of beaches and the wildlife conservation areas with a variety of animals etc

6. The east Africa climate is attractive to the outsiders especially those who came from cold countries in the temperate regions when the winters are severe in Europe or north America the people from those places decide to visited east Africa due to its warm climate.

7.The east Africa countries have realized that tourism is another economic sector that helps in solving the problem of unemployment hence the government are strongly struggling to promote this sectors.

8. There different programmers for environmental conservation which will also keep the region very attractive and healthy so that more and more visitors will be attracted.

9. There has been development in transport and communication east Africa. For example there are airports, telecommunication services and of recent there has been fast development in the use of cellular phones. This will also encourage tourism to a greater extent as a result of effective and efficient information flow

10.There is stronger involvement of the local people and the private sector. This will lead to the faster tourist development than the way it could be run by the government only.

Nonetheless, the achievement in the positive development of tourism in east Africa will depend on fast development of transport and communication network, maintenance of peace, strong cooperation, improvement in accommodation, improvement In Technology through training, environment conservation and the continued vehement advertisement by the east African countries.

TOURISM IN NAMIBIA

Introduction

Namibia is a newly independent country but the tourist sectors have grown very fast within a short time. Incidentally, tourism is the third large contributor to the Gross Domestic Product after mining and agriculture. The number of visitors to Namibia has been increased year after year. For example in 1993 over 368,000 visitors came to Namibia 560,000 in 1996, 615,000 in 1997 and over 800,000 are projected for the year 2002. The overall growth of the tourism sector is target at 10 12 percent per year.

Factors that have contributed to the tourist Growth in Namibia;

1. Strong policy on promoting tourist industry. The policy focuses on bringing a definite change by promoting culture based tourism. The policy emphasizes the adoption of eco tourism approach. The draft plan on tourism. Which was adopted in 1994, has made a lot of changes. The plant gives room for the private sector and the local community to participate In the tourism development. The draft plant has established an action plan, which is aimed at enhancing the changes.

2. Well – developed infrastructure has facilitated easy accessibility different places in Namibia.

3. Advertisement that has been done by the government and the private sector. There are promotion offices Johannesburg. Cape Town, German, Spain New Yuck, United Kingdom and other offices were planned to be opened in Nairobi and Dar es Salaam.

4. There are attractions which included:
   (a) Climate endowed with beautiful sunshine.
   (b) Abundant wildlife in the game reserves. Like the etosha and Mamili national parks, caprivi, daan and viljoen game parks.
   (c) The presence of attractive grand canyon like the fish river canyon with hot spring resort at Ai – Ais
   (d) The Namibia Desert landscape. It also offers a high possibility for stargazing for the astronomers.
   (e) There are beautiful rivers.
   (f) Diverse cultural attractions like the tradition crafts which include wood carving from the kavango and caprivi owambo and Himba baskets as well as Bushman egg shell jeweler embroidery work, carpets woven from karakul wool beading, metal forging

and a presence of many cultural groups with their respective traditional dances and music.

(g) Variation in the geological and geomorphologic structures has been another attraction to be visitors in Namibia. The Dam viljoen Game Park has a gravel surface and rolling hills which facilitate accessibility and provide the ideal condition for game viewing especially at sunset.

(h) There are sand dunes of spectacular nature in the desert these also attract visitor.

(i) The capital town of windsock is another attraction. This is a business hub and has an international conference venue.

5. The influence of SADS in the promotion of tourism among the member's countries. In attaining this goal it has created the Regional Tourism organization of the southern countries (RETOSA).

6. The establishment of Namibia stock exchange (NSX) that has attracted foreign investors has been another contributing factor in the tourist development.

7. The hard work made by both the public sector and private sector the private sector has invested substantially in the development of infrastructure.

8. The influence of the of other activities has facilitation the development of tourism in Namibia.

9. The aim from European countries has also enhanced the tourist development process into the country.

10. Namibia has a favorable investment potential created by Namibia free market economy and the government commitment to promoting free enterprise.

Importance of Tourism in Namibia;

1. It has stimulated the further development of infrastructure.

2. It has contributed to the employment creation in the country.

3. It has also contributed to Gross Domestic Product. It is the third contributor to GDP after mining and agriculture.

4. Social services have improved in the Country especially with the introduction of the community based tourism.

5. It has promoted the move towards environmental conservation in the country with the aim of maintaining the country beauty.

6. It has helped in the preservation and boosting of the country cultural values and norms.

7. Tourism has earned Namibia an international repute.

8. It has led to the promotion of the people life in general.

Problems Facing the Development of Tourism in Namibia

1. Namibia is not yet well marketed since has just attained its independence. It got its independence on 21st March, 1990 and the head of state being president Sam Daniel shafiishuna Nujoma.

2. At the beginning more focus was put on mining agriculture and fishing than tourism.

3. The costs of maintaining the quality of tourism are high.

4. It is facing stiff challenge or competition from outside, Hence it has a long way to go.

5. Lack of service culture and inability to gauge the strength of the market.

6. There has been slow implementation of the tourist policy since 1994.

7. The country is young hence its economy is still young. It has not let to the generation of enough capital to be invested in high quality tourist enterprise.

8. Economic crisis took place in the Far East and Europe in 1994 had negative effects on the tourist development. This I s because other sector that could generate capital like mining were affected.

The efforts being done to Promote Tourism to Higher standards

1. Maintaining peace in the country.

2. Decentralization of the tourist operation in order to encourage more private investors and the local people to participate in the tourist development. It has formed the tourist board to deal with tourist affairs. The government has decided to reduce its involvement and remain just as policy makers.

3. Educating the local people so that they can get involved productively in the environmental conservation.

4. It has formulated the legislation on waste management and pollution control so as to promote the quality of the environmental which tourism will take place.

5.There are plans to provide readily available labor, inexpensive electricity easily accessible markets in the neighboring countries and well developed and expanding road network.

6. There are plans to provide readily available labor, inexpensive electricity, easily accessible markets in the neighboring country and well developed and expanding road network.

7.The future of tourism industry in Namibia depends on political stability and relative peace and tranquility in the country. Also the preservation of all natural attractions especially the skeleton coast is utmost important.

Tourist Resorts in Namibia

1. Cape cross seal Reserve, Is known of 23 colonies of cape fur seals which breed along the coast of South Africa and Namibia.

2. Caprivi Game Park, which is wedged between Angola and Botswana. It extends from the Okavango River in the west to the Kwando river in the east.

3. Doan viljoen Park, which is a weekend retreat for wind hookers as well as relaxing stopover for tourism.

4. Etosha National Park which is a shallow depression having various games.

5. Etosha National Park which is a shallow depression having various games.

6. Fish River canyon which has hot springs resort.

7. Gross Barmen hot springs Resort is build on the site of one of the earliest mission stations in Namibia.

8. Hardap Recreation Resort and Game reserve which is situated around the hard pan dam (the largest dam in Namibia).

9. Khaudum Game Park which a wide variety of game species.

10. Mahango game reserve which as a reverie forest, a broad flood plain, magnificent baobabs, large herds of elephants and red lunch.

11.Mamili, mudumu and namib- naukluft national parks.

12.Sandwich harbor, skeleton coast park, von bach dam recreation resorts.

TOURISM IN SWITZERLAND

Switzerland is the famous country in the world due to its tourist development. It is also referred to as the playground of the world since tourism takes place all the year round and may tourists visit Switzerland because of its attractions. There are also different games and sports that are of interest to the tourists.

Factors Influencing the Development of Swiss Tourist Industry physical Factors

1. Ideal climate which allows the activities to take place both in winter and summer.

2. Beautiful scenery made by the Alps. Mountains which have u-shaped valleys, pyramidal peaks and snow cover. There are also water bodies like lake Geneva which adds to the beauty of the scenery.

3. Its central location in Europe has also led to high accessibility of the country from different directions in Europe and other countries like America etc.

Human Factor

1. The transport system has been improved for example the railway network has been electrified. The transport cost is low and the movements are fast. Switzerland has modern tracks and modern locomotives and this has encouraged tourism.

2. Availability of H.E.P due to the exploitation of numerous rivers and hanging valley waterfalls.

3. Good hotel management so as to meet tourist demand.

4. Capital availability that was invested in the tourist industry, Capital was accumulated from the Swiss foreign trade

5. Availability of skilled labor. This has led to the efficient running of the tourist industry.

6. Hospitality of the Swiss people has been another attraction to the tourists.

7. Its policy of neutrality has made peace dwell in the country and hence tourists have been encouraged to visit the country

8. It has international institutions like banks and conference centers used by different national because of its peace.

Importance of Tourism in Switzerland

1. It is the major employer in the country. During the peak season it employs more than 120,000 people. This is six or seven times as much as Tanzanian tourist employment.

2. It has contributed to the earning of foreign currency in the country. Hence capital is accumulated from tourist industry in a great amount.

3. It has stimulated the development of science and technology for example electrification of the railway system.

4. Steep slopes of the mountain have led to problems of transport to different parts of Switzerland. The alps occupy about 60% of the total area giving small room for the diversification of the tourist industry.

5. Environmental pollution due to the coming visitors.

Tourist Areas in Switzerland

Summer tourist centers where tourists view snow capped peaks, clear blue sky, lakes cascading waterfalls, sunbathing, and swimming. The centers include; The swiss plateau towns of Lausanne, Geneva, Berna and Zurich. Also around the lake shore of Lucerne and in Ticino where there are towns of Locarno and lugano. The visitors come from June to August. Winter areas, which are visited from November to March, offer the following aspects. Abundant snow on the slopes and glacial lakes for viewing and practicing ice skating and skiing (or tobogganing). The main resorts are confined to the slopes of Alps mountains and are called alpine centres which include; St Moritz, murren, Grindelwald, Kandersteg, Gstaad and Lauterbrunnen

Swiss resort centers

TOURISM IN THE USA

The USA has a very advanced tourist industry. There are several factor which have let to the advancement of tourist industry in the USA.

These include:

1. The strong government support on the development of the industry the government has formulated the policy, which provides favorable conditions for investment.

2. The availability of capital due to the advanced economy of the country. The USA is the leading country in terms of economic development in the world hence it has been easy for the country to invest in tourism.

3.Well – established transport and communication network in the country. Internet communications has made easy for arrangements to be done in advance. The roads are good and efficient.

4. There are many tourist attractions (honey pot) like National parks e.g. Yellowstone, Grand canyon and Yosemite Volcanic eruptions like the old faithful geyser, good lake like great lakes and towns like Los Angels, San Francisco etc.

5. Strong political stability due to the advanced defuse section in the country.

6. Variable climatic conditions in USA such that there are areas with warm conditions and other areas with cool conditions hence this makes people become eager to travel.

7. Good social services in the lodges, restaurants and hotels have stimulated the last development of tourism in the USA

Tourist Attractions (Honey ports) in the USA

1. There are lakes, which are used for swimming, fishing and viewing like the great salt Lake and Crater Lake National park.

2. There are spectacular gorges created in the desert areas of California like the grand canyon etc.

3. There are national parks with a variety of animals like the Yosemite Yellowstone, Red wood national park, Zion national park, e.t.c in which the species like Bear, elk, and buffaloes exist.

4. Spectacular volcanic features like old faithful geysers and hot spring as well as crater lakes. There other impressive feature like the Grand Canyon, which was formed as result of water erosion in the desert. It attracts many people from different parts of the world.

5. Various centers for sports and game like swimming centers, skiing centers, fishing centers and surfing centers. There is an excellent system of campsite picnic. Motoring facilities give effective access especially to the huge parks and forest.

6. There are monuments like the Dinosaur National Monument.

7. The countries economy is another attraction to the tourist into the country.

8. American English language and other social aspects have been a great attraction to different tourist. Some go to America so as to learn the American way of living. Speaking dressing and general interaction

9. There are attractive towns like San Francisco which is the most beautiful city having hills streets coastal setting colorful world temple exotic shops and restaurant Los Angels which is famous for movie industry located in Hollywood, Beverly hills' at Anaheim and Disney land.

10. There are good and attractive beaches like aquaria an circus beaches in Florida, Miami coca and palm beach etc maim Beach has attractive hates nightclubs private beaches and public beaches an excellent golf courts. Palm Beach is the vocation and has the arty museum. Cocoa beach as an excellent outdoor exhibit of US air force space missiles. Daytona Beach with automobiles races. Florida is referred to as a sunshine play ground because of plenty of sunshine and many visitors from the north come when its winter in the north especially in Canada.

11. There are well made roads and air transport facilities, which facilitate accessibility in different parts of the tourist areas.

CASE STUDIES IN THE USA

Tourism in California

It's developed because of good desert climate and forest. The climate allows outdoor sports like skiing and surfing there are beautiful towns allows outdoor sports like skiing and surfing there are beautiful towns like San Francisco and Los angels there are movie industries, Long beaches, the presence of the long British liner Green Mary (the ship which has became one of the attraction by having good hotels) good roads, good hotels and art museums, national parks like Yosemite etc.

Everglades National Park

Is a National Park, which is a swamp with a variety of plant and animal communities includes creatures like alligators, crocodiles, Manatees and aquatic birds rarely seen elsewhere. The park was established by the government in 1947 so as to protect these creatures. The problems of the park are drought, soil pollution, fires and conflicts with handcraft industry which leads to cutting of trees leading to deforestation.

Yellowstone National Park (Wyoming)

It was the world first National park and probably the best known it was set up by the US government in 1872 so as to protect the area. It is rich in attraction slice geysers (e.g old faithful) host spring, canyons, lava flows and wild life like bears, elk and buffalo today there are comfortable lodges hates and tourist villages. There are well made roads that have promoted

effective accessibility . The park has been facing problems like congestion due to pressure due to a big number of visitors pollution and depletion of vegetation and rising local house prices.

Problems facing Tourism in the USA

1. Problem of water supply, which affect the arid areas of California and other parts. This has been due to the general change in climate. But water conservation measures are being instituted so as to ensure proper use of water. For example people are being encouraged to construct toilets, which do not use a lot of water.

2. Terrorism is another problem affecting tourism in USA. For example the destruction that took place o the 11th September the tourists who want to vitas USA I this incident the hijacked planes crashed into the world trade center towers and the pentagon building leading to loss of lives and destruction o properties.

3. Population pressure in the tourist centers has led to land degradation. But strict rule and regulations are being put in place so as to ensure that the tourist centers are not greatly destroyed. Some of the measures include restricting the tourists from getting into the national parks with their own (privet) cars.

4. Frequent fires, which affect the national parks, have been a problem. The fire can be as a result of natural causes like thunderstorms, volcanic eruption or by a man.

5. Tourism is getting a great challenge from other countries, which are actively involved, in the development of tourism in their own countries like South Africa, Tanzania, and Switzerland etc. This means that the number of tourists might decrease because of the other caters in other countries.

6. Some visitors are attacked by animals like buffaloes when they are viewing them.

7. Other animals like Elk are shy and hence they attend to run away when the visitors are viewing them. So taking photographs becomes cumbersome.

8. Noise pollution because of the cars causes distress to animals.

9. Water pollution in the lakes and reviver in another problem faint tourism in USA.

10. Air pollution that causes the occurrence of smog and acid rains.

Some of solution at the problem;

1. Limiting the number of cars getting into the parks and establishing free shuttle bus system.
2. Limiting the number of people into the park.
3. Strict restriction on smoking to avoid causing fire unnecessarily.
4. Improvement in the communication system like introduction of arrangements for the visit to the parks.

TOURISM IN MAURITIUS

Mauritius is an island located in the Indian Ocean 20^0S 57^0 E on the eastern part of Madagascar Island. It is a very small country with an area of 1865 sq km. The Island is predominantly volcanic but erosion has reduced it to more uplands. Most of the body uplands consist of well preserved craters aligned from the north east to the south east and forming the main water shed some 610 meters high. Lave flows from these uplands have weathers to form fertile soils now used for sugarcane cultivation.

Tourism is one of the economic activities and it has growth recently Because of tourism Mauritius is also called most of the foreigner as a Beach of holiday destination or a place of exotic distant beach centers. The island is entirely a beach of holiday destination and about 90% of 95% of tourist accommodation is along the beach.

Trend of Tourism

Since 1984 tourism has been increasing as the number of visitors has been increasing and European tourists account for 60% of all tourists in the country Mau R. 3.9 million in foreign exchange. In 1993 the number of visitors rose to 375,000 bringing in Mau R. 5.3 million in foreign exchange. More and more tourist resorts are being created and the services are bringing improved. Accommodation has been improved and the average of night stays in bungalows, Gust houses and private rented rooms has been doubled. In general from 1992 to 1993 tourism increased by 10% and it has been increasing

Factors which have stimulated the Development of the tourist Industry in Mauritius

1. The attractive climate especially to Europeans who come from cold areas and enjoy the warm conditions in the Island. It is warm because of being located within the tropical areas (20^o S) where it receives a lot of sunshine

2. Heavy investment from different part of the country facilitated the development of tourism in Mauritius. For example most of the investors in tourism are Mauritian, South African, French, British and Germans.

3. Rapid growth of transport and communication system has made tourism grow fast. For example currently the air line has been established between Tanzania, Mauritius and Comoro Islands. This has contributed to the boosting of tourism in Mauritius. More and more visitors are having access to the beautiful Island and its beaches. There are travel agencies who organize voyages to Mauritius (Tour operator and Agent voyage)etc

4. The government involvement in tourism has also stimulated the development of tourist industry. The government has created a greater room for foreign investment n the hotel industry, leading to the increase in the number of hotels in the country. The rates are of low charges but still are profitable; the government has also been so instrumental in the formulation

of policies on tourism. The policies are aimed at maintaining he is land up to market profile reducing the impacts caused by tourists through eco tourism approach emphasizing high spending tourism so as to craze the income margin emphasizing the use of the vertical space by contracting high rise buildings emphasizing in building of hotels with limited number of rooms at least 200 rooms establishing efficient communication system like the telephone, transport system like road network and electricity to capacity building more new hotels and preparing well qualified personnel who can run the industry very effectively and efficiently.

5. The presence of attraction (honey - posts) like
   (a) Beautiful beaches like the one found at le more and coral reefs
   (b) Interesting parks like the casela Bird park the crocodile souillac Le val nature park etc which have different animals and birds.
   (c) Trading centers at port Louis which is a chief commerce center.
   (d) There are also excellent harbors and an airport at port Louis which provide vital facilities and services for carriers between Africa Sri – lanka and Australia.
   (e) Sport center like Big game fishing at Grand bar Deer hunting and fishing in le domain du chasers south of the island in the heart of the deep forest, swimming sports like the seaside at Le more mountaineering or rocks climbing in the volcanic uplands and other sports like golf, deep sea fishing table tennis etc.
   (f) Museums like Naval museum Robert Edward Hart Museum, postal museum, eureka etc.
   (g) Interesting volcanic features like the trout – aux- Cerf crater. The ancient volcano crater towering the town and the surrounding and the water falls like the orchestra falls as well as the gorges like Black River Gorges.
   (h) Attractive construction old and modern ones like at port louse and the numerous colonial houses at cure pipe.
   (i) Factories like the tea factor of about 850 hectares of cane land.
   (j) Factories like the tea factors of bois cheri and sugar mill at the domain le pailles.

   (k) Attractive gardens like vanilla green houses and the Botanical garden of pamplemousses which is famous for its giant water lilies and numerous variety of trees and plans

6. Advertisement of Mauritius tourism. Tourism in Mauritius is highly advertised and there are promotion center in Tanzania, Kenya, South Africa and Europe. The use of Internet in the promotion has affected a substantial positive influence in the development tourism in Mauritius. Mauritius Tourism Promotion Authority (MTPA) has played a great role in the advertisement of tourism in Mauritius

7. The country political stability has encouraged more and more visitors to come. There is a strong defense force

8. It has strong amicable relationship with other countries like Britain, France, India and South Africa. These countries give Mauritius financial and technical assistance. More assistance comes from the world Bank and IMF

9. There is a good banking system and other financial institution has also contributed greatly in the development of tourism in Mauritius. Example of the Bank. Other financial institutions include Mauritius Housing corporation, The national currency of Mauritius is Rupee (Mau R)

10. Its location makes it very accessible from different parts of the world since there are not substantial physical barriers to air transport

11. Strong determination to develop a quality tourist industry rather than appealing to the mass market. The quality of tourism has become one of the magnets attracting tourist into the country Tourists are sanative to the quality of the environment and services if they are not of good standard visitors stop coming g leading to a great loss

12. Power availability has been another stimulant. There has been established hydroelectric power center called champagne, built in 1985. The country is also making use of waste products of sugar biogases, which is less damaging to the environment

Tourist Resorts in Mauritius

1. **Trou aux Biches** – Renowned as the best beach resort in Mauritius for its safe bathing and miles of fine silver sand, Trout aux Biches offers the best in secure beach – from accommodation standards, availability of water sports activities and its proximity to all tourist attractions. Trout aux Biches is an also famous for its under water life and beautiful corals and divers believe it is the best coast to go diving owing to its fabulous beauty and colorful underwater life.

2. **Mont choisy** – Stretching from Trout aux Birches village Hotel to Mont choosy beach, the longest and most popular public beach in Mauritius, is the residential beach hotel area commonly called Mont Choisy. Its white bad of powder sand, more than a mile long curves along its turquoise by and the inviting shade of the casuarinas trees. Villas and apartments chosen stretch from Trout aux Birches the beginning of the public beach providing resident with access to several beach areas. These villas and bungalows are close enough to Grand Bay the popular tourist resort to the accessible by car or public transport within 5 minutes but far enough to enjoy peace o mind and privacy south by most visitors.

3. **Pointe aux Canonniers** – Stretching from the well known cheesy beach to Grand Bay is point aux canonries well known by regular visitors to Club Med. While sea bathing is not fabulous owing to shallow water beyond club med the inviting month cheesy by is only a few minutes' walk away with its turquoise logon and gentle waves lapping the shore. The club Med allows non – resident tourists to take advantage of its restaurants, bar and evening shows against modest fees (very useful for evening entertainment) and if you prefer the bustle of Grand Bay and its numerous restaurants, duty free shops and its festive atmosphere it is less than a kilometer away

4. **Grand Bay & Pereybere** – The hub of tourist activities in Mauritius Alive all day and all night long with an incredible array of restaurants, bars and night – clubs as well a fashion and specialist shops stretching along its yacht studded turquoise bay. Grand bay is tourist show – case where big game fishing outer islands sailing this under – water walking and other

attraction are there for your enjoyment , They have chosen a wide variety of accommodation, rot eh most luxurious A + properties to the medium prices and further on after pereybere public beach a few lower prices ones.

5. **Calodyne/Grand Gaube** – In the north east not for from cap Malheureux, this small fishing village is a quiet resort with a couple of hotels and a few private bungalows. At calodyne, some 2kms before reaching the village of grand Gauge, they have chased a comfortable bungalow/hotel complex and added a couple of delightful beach bungalows in Grand Gaube a stone throw from the fish landing station where fresh fish and lobsters can be bought beach complex of 6 duplex houses around a lovely swimming pool.

6. **Poste Lafayette/Roches Noires** – Poste Lafayette is a lovely and peaceful resort the reveals the authentic and un spoilt Mauritius perfectly convenient for a peaceful stay and unforgettable souvenirs Being on the east coast, whilst the other popular resorts in the west and north west suffer from the heat during the summer months (November to March) poster Lafayette remains cool and enjoys a pleasant climate. Not heather hand, during the winter moths it is windier than t the west coast, They have chosen for visitors two sea windier than the west coast. They have chosen for visitors two seas from establishments which they believe offer the best all round amenities and comfort, namely La Colombiere and Coral Beach and recently added a beach villa to the portfolio. Roches Noires is the exclusive residential beach resort par excellence. Only a few kilometers form poste. Lafayette, it conceals several luxury beach houses sometimes behind high walls. They have chosen for visitors four of these lovely residences conveniently located around a tennis court and a well tended garden with tropical flowers

7. **Trou d'Eau Douce** – We have included a small hotel on the beautiful beach practically opposite the well known "ile auc Cerfs" the most favorite excursion destination for everyone visiting Mauritius. Silver Beach Hotel provides excellent value next to 5 star hotels on this stretch of the coast.

8. **Point d'Esny/Blue Bay** - Righ opposite I'ile aux Aigrettes is Pointe deny, a quiet resort between Mahebourg and Blue By Rather windy in winter, it is glorious during the summer month when swimming into helicon and lazing in the warm sun are at dithery best. They have chosen for tourists a very comfortable bungalow sleeping 8 guests right not eh beach at point D espy while I Blue Bay they have chosen a small apartments and comfortable studies right not eh beach. To continue their drive for finding food value smaller hates around the coast to complement her catering villas they have recently added the Blue Lagoon Hotel to our portfolio. These two resort are the closest to the international air port.

9. **Souillac** – On the southernmost tip of Mauritius, the awesome beauty of giant waves crashing on the souillac rugged coastline at Gris-Gris and its wild vegetation give a strange air of Brittany of this otherwise quiet and restful resort favored by those who seek refuge from the madding crowd. A modern bungalow with swimming pool built on the cliff edge at Gris – Gris is our highly recommend holiday home.

10. **Le Morne** – Going west how along the most beautiful part of the coast of Mauritius, through Baie du cap and spectacular Makonde we arrive at Le morne with its several famous hotels

where we have chosen a small complex of 8 studios bordering on the Hotel Parades (5 star) golf course. Unfortunately, we understand that the current refurbishment of this little complex may be followed by change in ownership. Right at the entrance of the hotel and close to all its amenities the complex is within a private zone enjoying 24 hour security.

11. **Riviere Noire/Tamarine** – Now going north along the west coast, some 15 minutes drive away, we reach Rivier Noire which is quite popular with those looking for exhilarating surfing emotions whilst holidaying at a slower pace. It is a peaceful resort famous for its big game fishing clubs, organizers of international fishing events. They have chosen a 4 bedroom bungalow on the beach as well as small complex of 6 apartment's office the slope of the La Tourlle Mountain in Tamarin. That new complex should really appeal to those seeking restful atmosphere to enjoy tranquility whiles savoring the idealic view across the bay. A hotel renowned for its sports activities has also been chosen to complete the picture.

12. **Flic en Flac** – Still on the west coast, south of port oust is the resort of flic en flac a seaside village quite popular with tourists close to all amenities such as bans restaurant bar and night clubs it is less than 1 km from casinos and beach hotels. Flic en fac beaches more than a mile long and most popular with swimmers the whole year rood it should also be noted that flic en flac is a diver's paradise hewer under water caves and wrecks make their delight. Other than the usual sea from apartments and of beach villas they have included accommodation offered by the Klondike hotel, le pearled beach hotel and manias Hotel and recent added four really luxury villas in the most beautiful setting of le tamer complex with its huge swimming pool as canter piece in the most idling garden imaginable, and this year have increased your choice to include several apartments next door to le Tammie at Le Dater, a sister complex to Le Tamer, built ant furnished to the same high standard.

13. **Luxury beach houses** – Frame canonries point to Cap Malheureux in the extreme north, are dozens of beach villas kept in printing condition for their own private use by third wealthy owners. These houses are very rarely rented out and except for a couple of properties practically never during the high seasons. Easter, the month of August and the Christmas/New Year period. They have succeeded in obtaining some of these houses for our clients and for obvious reasons they can only list brief details of each to wet visitors appetite, and they only send relevant complementary details upon request. However view this property Ref 4 epics a lovely mansion with 4 double bedrooms, all en suite and air conditioned, to appreciate the high quality o these properties

Impacts of Tourism in Mauritius

Positive Impacts include:

1. Provision of employment to the people of Mauritius and even from outside, Tourism employs more than 11,000 people.
2. It has greatly encouraged the development of transport and communication systems like roads, airways telephone and internet services.
3. It has led to the rise of individual people and national income since the visitors bring foreign currency.

4.There has been promotion of educational, medical and power supply services. Some of the institution based on tourism have been established in the bid to improve the standard of tourism in the country.
5.Environmental awareness has been promoted into country and the government is struggling to improve the environment so that it can before beautiful and attract more and more people.
6. It has earned the country an international repute by being referred to as Exotic Distant Beach or Beach of Holiday Destination.
7. It has greatly contributed to the diversification of the economy of the country. The country economy has been almost monoculture dominated by sugarcane production for over a century and a half

Negative Impacts of Tourism

Socially

1. Tourism has led to the destruction of local culture since the tourists come with their own cultural behavior and impose them onto the local people. The local people can change the mode of dressing hairstyles life styles etc.

2. Tourism has led to exploitation of the employees since they are paid low wages, which are not commensurate to a lot of activities they do.

3. Tourism influences the language of the place by introducing new and abusive works

4. It facilitates the spread of diseases causing deaths. For example through sexual relationships HIV/AIDS spreads very fast during tourism. Hence Mauritius is now open to that danger since visitor who visit the countries are not all safe, some are accelerated drug trafficking to the Island by visitor from other countries especially south Africa

Environmentally

1. With the fast development of tourist centers there is an increasing problem of water and beach pollution along the coast. For example disposal of garbage, sewage etc
2. The coral reefs are begin damaged due to water pollution and breaking them for ornaments
3. Pollution has led to the coast and coral rock. Now the polluters are being fined and environmental education is being inseminated to the people especially along the coast and around other honey pots
4. Construction along the coast has led to the destruction of the forest since people have been clearing to establish tourist resorts and hotels. Deforestation has resulted in the loss o biodiversity like animals and birds due to the destruction of the habitat

Economically

1. It will lead to the decline of agriculture since most people will go to the tourist centers to seek jobs

2. The loans the country is getting from the world Bank, IMF and other financial organizations will make the country run to debt crisis

Problems Facing Tourism in Mauritius

1. The services in the hotels are not such much up to standard since the personnel were not well trained and the government has begun training people.

2. There are a lot of expenses in running the tourist activities and the government insistence of lowering the prices in the hotels has brought even bigger problems,

3. Environmental degradation due to the development of tourist activities and denudation of the volcanic features by running water. This has been due to poor environmental concern. In response to this the government established the Ministry of environmental protection Act, which requires an Environmental impact Assessment for new projects, which are to be established. The government has also encouraged the reduction in the use of coral sand to basaltic sand. Marine parks are being zoned to protect coral and marine life. The sewerage master plan has been developed to prevent untreated sewage into the ocean.

4. Too many tourists flooding into the country due to low costs and hence the number of people becoming unmanageable

5. Emergency of informal and Bungalows will lead to poor standards of services. The government has to control and formalize the establishment of these hotels so as to operate up to standard.

6. There has been tension between France and Mauritius over Trammeling Island, which Mauritius wants to take from eh finch control. The island is 550 km NW of Mauritius and France has a meteorological observation station established there. Hence France is not ready to hand it to Mauritius. This tension can have adverse impacts on tourism once it culminates into a bigger conflict .

TOURISM IN SOUTH AFRICA

Tourism has become another important economic sector in the country it has been expanding s the number of visitors has been increasing time after time. In 1990 there were 1,029,093 visitors while in 1991 there were 1, 709,554 visitors, The change was 66.12% In 1995 there were 4944,430 visitors and in 1999 there were 6,253,000 visitor the change being 9.1% African were 4,18,8880 while visitors from overseas were 5,732,039 in 1999 the Africa visitors were 4,734,000 while visitors from overseas

The government has a vehement plan to make south Africa one of the competitive tourist countries in the world. South African tourism is the national tourism agency responsible for the international marketing of South Africa as a preferred tourist destination. It has the aim of making tourism the leading economic sector and so promotes sustainable economic and social empowerment of all South Africa.

Factors that Led to the Development of Tourism in South Africa;

1. Presence of a variety of attraction.

2. Museums like the Municipal museum (King George VI art Gallery in port Elizabeth which displays British, South African and Asia art, National Museum of Bloemfontein, South African National Gallery Michael Collection in Cape Town and Museum Africa in Johannesburg which shown the lives of people under apartheid.

3. There are libraries like Johannesburg public Library, southern African Library in cape Town, University libraries (the University of wit water rand, Stellen bosch library and university of cape Town) and the state Library in Pretoria.

4. Good hotels and restaurants with charming personnel like wild Board Traditional restaurant that offers traditional South African food some restaurant have internet that offers traditional South African food. Some restaurant have internet cafes.

5. Musical theaters like those at Grahams town and port Elizabeth that present the contemporary dances.

6. Sports center crickets yards golf yards outdoor sport centers like swimming pools sight viewing centers rugby tennis hunting and fishing centers.

7. There are parks and game reserves. National parks are like the pilnesberg National parks, which is on the old extinct volcanic crater and well stocked with game and bird species pilnesberg is one of three extensive craters in the world Kwazulu Natal parks and the Kruger national park, which is one of the world's largest game reserves. Game reserves like Borakalalalo Nature reserve (has a beautiful forest) Madinkwe game reserve (with a variety of vegetation an dame) Mafeking game reserve (with Buffalo).

8. Attractive relief features like raters, Drakensberg and beaches.

9. Historical sites like the archeological site at Taung Heirtage site where the Tang child skull was discovered by Professor Raymond Dart in 1924 and the Battle fields especially in the area of the Zulu Kingdom such as the Kwazulu Natal battle fields.

10. There are attractive towns like Pretoria and Johannesburg with museums, restaurants, hotels monuments and the African cultural village, which has an enormous informal sector of vendors artists traditional healers and craftsmen . In Soweto to visitors meet the people who are the backbone of the nation, Music and arts festival occur all the year round, etc

11. Knowledgeable friendly and accredited local guide that gives a captivating company to the visitors.

12. Different activities like fishing mining and agriculture like sheep farming and viticulture and hunting.

13. Attractive environment in some place like Mafeking, which is free of Malaria.

14. Involvement of the local community in the wild life conservation management of hunting resource protection etc The trial authorities have been involve leading to smooth running of the tourist activities in the country. For example the Ga Rasai Communities near Borakalalo are fully responsible for their areas involvement of the communities has manifested great success by increasing local people income. The Bakgatha tribe, for example receives 10% of the annual gate fees taken in Pilanesberge.

15. The end of sanctions in 1994 made South Africa get a wide market outside after participating in different exhibitions, which began in 1995 in Johannesburg.

16. Good coordination under the South Africa Tourism agency, which is governed by South Africa Tourism Board. The board has integrated both tourist matters and environmental aspects so as to enhance eco tourism (sustainable tourism) The south Africa. Tourism Board is trying to ensure that tourism is marketed visitors are dispersed to different areas of interest, there is environmental awareness, researches are conducted, there is highly responsible leadership etc

17. The government involvement is another factor that has stimulated the development of tourism. For example President Thabo Mbeki has promoted tourism through his vision of Africa Renaissance. The theme of Africa Renaissance has been adopted and adapted to a theme of Tourism Renaissance, This government has also established the policy on tourism, which has been encouraging the development of quality tourism, promoting the environmental condition involvement of the local community, etc

18. Advertisement: South Africa Tourism is highly advertised. There are promotion offices in London Frankfurt, New Your, Amsterdam Paris, Zurich, Vienna, Harare, Tokyo and Sydney. South Africa participates in major travel show, campaigning and holding educational work sessions.

19. There are good health and medical services although they are paid for.

20. Advanced transport and communication is another stimulant factor South Africa has a denser transport network compared to other courtiers. These is an efficient system of electrified railway line competition in air lines has led to the reduction in fare.

21. The fall in the value of Rand attracted more tourist to come especially in 1996.

Contribution of Tourism in the Development of South Africa;

1. It has led to the creation of employment opportunities for both local people and those from other countries. Employment opportunities have been increasing year after year for example in 1994 here were 470,000 people employed in the tourist sector in 1997 the number rose to 665,000 employees, and this rose to 774,824 in 1999.In the year.

2. It has also contributed to the generation of revenue. The revenue has been increasing, for example in 1944 the revenue from tourism was R7 billion, in 1995 was R9 billion. It rose to R20 billion in 1997. In 1998 the tourist revenue was R20 billion in 1997. In 1998 the tourist revenue was R24 billion which rose to R31 billion in 1999.

3. The market for local commodities has expanded. The tourists are buying traditional food and other artistic goods in big number.

4. It has also promoted environmental awareness among the people. The local communities are so much involved in the nature organized by the government and the local leaders.

5. Transport and communication systems have been promoted in the country.

6. There has been fast advancement in science and technology as a result of the coming of the tourists. Mist of the tourists visit the country while having a good stock of knowledge and on leaving they live the country with a good stock of knowledge.

7. It has enhanced the promotion of culture in the country especially the rational practices, which are taking place in Soweto. These have a captivating influence to the eyes of the visitors who visit Soweto. There are traditional dances, handicraft goods etc

Soweto: There are traditional dances, handcraft goods etc

Limiting Factors Facing Tourism in South Africa

1. Some places have problems of Bilharzias especially in the Eastern and Northern regions; others are affected by Malaria etc. These pose problems to the visitors.

2. There are problems of crimes, political unrest and other nasty activities. This has made the government to put precautions to the visitors that even south Africa is basically safe, visitors should be cautious not to draw attention to themselves by flaunting expensive things like cameras, jewelry and large amount of cash. Night stroll is also dangerous.

3. Terrorism that has hit the whole world is another limitation. This has made air transport to be feared by many people because of the experience of bomb beasts ad hijack.

4. Water supply is another problem. This is because of the fact the South Africa has little rainfall and the water available is competed for by different economic sectors like miming, industry and agriculture, and the water available is unclean.

5. Air pollution due to open fires for cooking, heating and production of energy from coal fires power station, which provide most of South Africa electricity. Pollutions severe in Mpumalanga province where the atmosphere is stable.

6. The western part of the country is not well accessible due to poor transport and communication. But the government has planned to open it up for economic development. The Orange River scheme has been established so as to develop the western part of the country. The schema has become one of the honey pot to the tourists visiting the country.

7. Power is another problem due to the fluctuation of the volume of river and substantial absence of oil deposits. Much power is needed for running the industry.

8. The problem of AIDS has a great threat to the development of tourism. AIDS has become a great problem in South Africa and this has been contributed by the visitors.

9. There high costs involved in educating people on the need to conserve the natural environment with a focus on promoting tourism in the country.

10. The coastal strip of South Africa is too narrow and this has been a greater limitation to the development tourist resorts along the coastal area.

11. There is a problem of over population in the Bantustans, which have led to intensive settlement, fuel cutting and overgrazing and bush encroachment. These problems are common in the Eastern Cape and were sun natal. Problems caused by tourism involve environmental degradation especially deforestation, and pollution spread of diseases like HIV/AIDS, the rural depopulation due to rural – urban migration, increase in social problems like crimes prostitution, or housing drug trafficking: Destruction of some cultural values etc.

The Lessons to Learn from South African tourism

1. Involving the local people leads to smooth running at the programmers like nature conservation which is very important for attracting tourists. Hence, Tanzania has to make sure that the local people are highly involved so that they can feel committed and benefit from the sector. Such efforts have begin in some parts like Tanga.

2. The policies should be clear and encouraging different types of investors to invest in tourism including the local people. The local people should be given a greater priority so as to avoid the problems like those involved in the Loliondo case of 1990

3. Tourism needs strong and extensive advertisement so that people in other parts of the world can know where the country is located and what they can enjoy before they start traveling. Tanzania also has been advertising her tourist industry and has been participating in different exhibitions organized outside and within the country.

4. The personnel involved in the running of the tourist industry should be well experienced, charming and conversant with many languages Is one the tourists came from different parts of the world and they speak different language. Tanzania has already begun training people and different language like French, Germany and English are being taught in many tourist institution

5. Tourism is a good approach towards solving the problems of unemployment and one way of diversifying the country economy.

Despite that the East Africa is well endowed with various and interesting tourist potential is not well developed compared to that of such countries like Switzerland which have limited tourist potential.

1. Population encroachment on the existing tourist potentials e.g. national Parks game reserves and sanctuaries. This is caused mainly by the presence of a high population growth rate on the margins of these gazette areas.

2. There is a sever lack of capital to invest in the industry. This is because the East African countries economies depend on agriculture and yet of recent there has been a problem of price fluctuations on international markets for their agricultural crops.

3. Lack of proper managerial skills required in the managements of a tourist industry. The tourist industry is very sensitive to inefficient management.

4. There is a problem of political instabilities especially in Uganda and of recent terrorism in Tanzania and Kenya that involved the bombing of the Embassies. Political instabilities and terrorism have a number of implication toward the tourist industry, e.g. scaring away foreign visitors, accelerating breakdown in the existing infrastructure e.g. roads hotels health facilities and morals among the youths. Directly everything becomes very expensive within an economy, e.g high transport network. Political instabilities also have a impact o scaring away skilled labor required and there is always corruption of the officials which facilities inefficiency in management political instabilities also create a situation of unnecessary clearances, say at international airports along the highways all these facilitate inconveniences to the visitor.

5. There is low degree of advertisement of the tourism industry potentials to the outside world. This has been facilitate by lack of skilled labor force capital and the capacity to interact with outside world.

GUIDING QUESTIONS

1. Outline the factors that encourage the development of tourist any country

2. Tourism has grown fast now a day give three reasons in short

3. What is the importance of tourism in any country?

4. Show the negative effects of tourism in Tanzania.

5. Identify the actors which have led to the great development of tourist industry in Switzerland.

6. Mention three winter tourist centers and two summer tourist centers in Switzerland.

7. Show the importance of eco tourism to the local community in Tanzania

8. Why should the local people be involved in the tourist activities (Give four reasons).

9. Outline the problems facing tourism in East Africa.

10. Identify the negative effects of population growth on the tourist industry.

11. How does tourism differ from other industries?
    (a) It is an invisible industry, It involves serves and not machines that can be seen
    (b) It is a very sensitive industry to unfavorable political social and environmental change
    (c) It is largely a leisure industry
    (d) It is so seasons

12. How can Tanzania improve tourist industry? (at least six points).

13. Why do we say that tourism in Tanzania has a bright future? (Give three reasons).

14. Tourism in USA is very advanced, why? (give six major reasons).

15. Outline five problems facing tourist industry in USA.

16. Show six rules and regulation (Guidelines) provided

17. Draw the map of Tanzania to show the location of the game reserves and national park in Tanzania.

18. Mentionable the tourist attractions (honey pots) in USA.

19. How can the conflicts in the national parks be solved?
    (a) By demarcating the conservation areas and the residential areas.
    (b) By involving the local people in the nature conservation area and hence they can be responsible in helping on the conservation of the national parks.
    (c) The local people should be approached as equal partners and not as people of low standard in the community
    (d) The benefits obtained from the national parks should be shared with the local community.
    (e) New routes should be established and the national parks should be fenced if possible.

(f) There should be comprehensive training of the local people so that they can learn to appreciate potentials of the national parked and their significance in the general economic progress of the country and the local people.
(g) There should be clearly stated policies on tourist governing tourist activities.

5.10 RIVER BASIN DEVELOPMENT

River Development projects are the schemes which are development for different purposes. They are called multipurpose schemes because they are aimed at meeting many goals like flood control, Water supply in the industries, irrigation schemes, Settlement etc. Example of river development projects, In Africa Volta River projects in Ghana at Akasombo dam, Orange River projects in South Africa, Gezira irrigation scheme in Sudan at Sonar dam, Aswan High in Egypt located on the Nile Mwea Tebere and Galole irrigation schemes in Kenya Rufiji Basin development, Kilombero basin development and Kagera development river basin development schema. Out of Africa are the Tennessee valley projects, Indus in Pakistan and Ganges project in India Amazon Basin development scheme in Brazil.

Processes in the River Basin Development include;
1. Construction of the dams for retaining water.
2. Dredging of the river. This refers to the removal of silt or mud from the river.
3. Straightening and widening of the river channel so that it can accommodate more water.
4. Clearing of vegetation where economic activities are going to take place.
5. Planting of trees of the sides of the river so as to prevent soil erosion and check the movement of the surface run off so as to reduce or prevent flooding.
6. Creating some canals and installing the pipes that can help in irrigation.

Economic Importance (Benefits) of the River Development project benefit;
1. They help in the control of floods where they are established.
2. They lead to the improvement of navigation in the respective rivers especially when the dams are constructed.
3. Lead to the development of the fishing industry especially after the construction of the dam.
4. Water is provided for the domestic use and industrial purposes.
5. Water also is provided for the irrigation schemes hence leading to the expansion of farms and increased agricultural production.
6. They are used as research center for studying ecosystems and their importance to human being.
7. River projects encourage environmental conservation like the control of soil erosion by planting trees.
8. They are used as research centers for studying ecosystems and their importance to human being.
9. River development project have encouraged the development of towns in many places e.g in Germany most of the towns like cologne, Bonn and Frankfurt are found along the rivers. Hence they can help in solving the problem of overpopulation.
10. Employment is usually created in river basin development projects.
11. They are center for hydroelectric power generation.
12. Silt removed from the river during dredging adds fertility to the soil and hence promotes

farming.
13. They lead to the development of timber industry e.g. in Canada and Sweden the river are used for transporting downstream to the saw mills.

Setbacks (Hindrances or Limitations) Facing the river Basin Development Projects;

1. Unreliable rainfall and excessive evaporation lead to the drying of the river and other water bodies. Hence economic activities can't take place easily due to dryness.
2.Accumulation of silt in the dam leads to the reduction of the volume of water.
3.Water pollution especially by the industries discourages the utilization water from the river basins for economic development.
4.Lack of capital for establishing and maintaining the river basin projects.
5.Lack of or technological equipment and labor for managing the river basin projects.
6.Soil exhaustion due to intensive farming.
7.The outbreak of diseases like Malaria and cholera.
8.There is a problem of displacing the people to other areas.
9.Soil erosion can also face the established project and cause damage.

Disadvantages of River Basin Development Project

These disadvantages are based on the problems, which are caused by scheme itself. They include;
1. The projects lead to the increased debt cries in the developing countries because of borrowing money from the developed countries.
2. The projects can cause soil erosion if they are not well managed.
3. They cause environmental pollution like the increase in salt (Stalinization) in the soil, acidification because of the use for chemicals in agriculture and industrial waste disposal as well as air pollution as a result of introduction of gases like methane and carbon monoxide into the air.
4. The construction of dams leads to the displacement of people. This is disturbance and can cause loss during migration.
5. The projects are expensive to establish hence they consume a lot of capital.
6. They also lead to the outbreak of diseases, which affect people.
7. They can cause overpopulation since many people are attracted to establish their settlement.
8. Occurrence of conflicts between countries that share the river.

CASE STUDIES

TENNESSEE RIVER VALLEY DEVELOPMENT

Tennessee is the tributary of Ohio River in the United States of Africa (USA). The Ohio River in turns the tributary of the Mississippi river. The Tennessee valley receives high rainfall over 1250mm and in the high areas it can be as higher as 2000mm. The valley was characterized wit

fertile soil and hence attracted people to the valley. The people cleared vegetation for cultivation. Formerly the river had an irregular flow and had huge silt load which made navigation difficult. It used to flood. Other problems included the presence rapids and diseases. Because of poor methods of cultivation erosion set in this led to the decline in agriculture. The valley is well known in the world in terms of the successful control of the problem of severe soil erosion.

How the valley was developed;
The U.S.A government organized the development of the valley. It first set up the Tennessee River Authority (TVA) in 1933. The general aim was to sole the economic problems of the people.

Major Aims of the scheme;

1.To control soil erosion and improve the quality of the land that had been degraded by sever soil erosion.
2 .To control the floods.
3.To improve navigation.
4.To develop the Hydroelectric power generation centers.

Steps that Tennessee Valley Authority (TVA) Took in Developing the Valley were;

1. 1. Constructing the dams along the river course. A total of 32 dams were constructed to control floods.
2. Reforestation was done especially on the steep slopes of Appalachian Mountains.
3. Gullies were filled up with brushwood to trap the eroded soil particles especially silt.
4. Modern farming methods were introduced, for example terracing, contour, pouching and crop rotation on the slopes.
5. Planting of grass or cover crops not the slopes so as to reduce surface run –off.

Advantages (Results) of the Project;

1. 1. There has been increase in the water supply for irrigation, domestic use and industrial use.
2. Navigation in the Tennessee River has improved. Commercial freight ships are operating in the river.
3. Hydroelectric power was made available to many people.
4. The floods have highly been controlled.
5. Provision of Hydroelectric power has led to the development of different manufacturing and heavy industries. For example Machinery and Aluminum smelting in Alabama and Atlanta in Georgia. Atomic power station and Aluminum smelting at Alcoa.
6. It has stimulated the development of mining industry, forestry etc.
7. The project has created job opportunities for more than 50,000 people.
8. Tourism developed after the river development. Many public parks (around) 100 and camping areas have been established.

9. Erosion was highly controlled.
10. There has been disease control. For example, formerly Malaria.
11. Increase on the size of the arable land due to soil control.
12. There has been development of fishing industry due to the contraction of dams.

Problems that Limit the Development of Such schemes in the country;

1. Political suspicion and terrorism.

2. Such schemes are very expensive to establish and run.

3. There is low government commitment toward developing such schemes in the country.

4. There is high rate of people migration urban areas expecting to get employment hence the scheme suffers the problem of labor supply.

ST. LAWRENCE IN USA

Is the river which drains the great lakes, flowing at ways into the Atlantic Ocean. It passes through the most densely populated part of Canada and highly industrialize portion of the USA. It serves as a waterway for ships for about 3,218km and produced much hydroelectric power at Niagara and Cornwall. St. Lawrence lowlands are good for agriculture because of fertile soil. The climate is also conducive for a variety of crops. It has a long growing season, adequate and well distributed rainfall. But the river has many rapids and water falls.

These problems were solved by constructing some canals to bypass the rapids and falls such canals are ERIE and Well and) Dredging and the dams were constructed so as to regulate the river flow. The aim was to make St. Lawrence the seaway. But the idea was opposed by the Railway companies in US and it took long time to achieve this aim. After signing the agreement (Canadian – American agreement 1950) St Lawrence Seaway was opened in 1959

Advantages;
1. It has provided a good channel useful for the bulk transport of wheat, iron ore and coal.

2. It has also encouraged the supply of power due to the transport of fuel and development of HEP stations after the construction of dams.

3. It has stimulated the growth of industry especially timber since the forest is found in the river areas around the basin. St. Lawrence forest provides raw material for the timber industry and the river provides transport for timber materials.

4. Agriculture has also developed involving mixed farming and dairying. This has been due to the good climate with long growing seasoning summer, enough rainfall and good soil. The crops grown are wheat, maize tobacco, potatoes, vegetables like lettuce, and fruits like apple.

The major limitation of navigation in the St. Lawrence river basin has been winter condition. When water gets frozen efficiency of the river is lowered. But the problem is reduced through systematic reporting of ice flows, which give a computer picture of the condition in the river flows which give a computer picture of the conditions in the river especially at the estuary. Helicopters are also used in monitoring the conditions of the river.

N.B following many drawbacks St. Lawrence has not been great financial success winter being the major hindrance.

Problem Due to the River Basin Development;

1. Conflict with the railway companies arose since the river basin development was seen as the challenge to the railway system in the country.

2. Industrial problems occurred such as decline of other industries due to emergence of the new one. Mining exhaustion made some of the people migrate and some became unemployed.

3. Encroachment on the rural areas swallowing up valuable agricultural land.

4. Occurrence of population leading to the outbreak of diseases and stench small wafting from the dumping places in the river basin.

5. The influx of the backs into the area has led to the occurrence of ghetto life.

6. Encouragement office the mining and timber industries especially coal mining has led to land degradation. This has been associated with the cretin many pits, deforestation and erosion.

7.There are new laws made to ensure the restoration of the mined areas but still the problem is likely to provable due to more demand of coal caused by the global energy crisis**.**

THE RHINE RIVER BASIN IN EUROPE

The river Rhine flows through Switzerland sets Germany and Netherlands and forms the border of France. It flows into the Atlantic Ocean and German has most of the Rhinos Course. It is the most important river in Europe.

C Characteristics of the River;

1. It has low seasonal fluctuation, it seldom floods and rarely freezes.
2. It has high volume due to many tributaries like Moseley etc.
3. It flows through highly industrialized areas.
4. The soil in the river basin is fertile.
5. It is navigable as far as Basel which is 950km upstream and 230m above this level.
6. Little seasonal fluctuation and dare occasions of flooding the freeing.
7. Freedom of movement along most of the Rhine course encouraged the improvement of navigation condition along its tributaries namely Main, Moseley, Neckar and Rhur.
8. High water volume for easy movement of the vessels.
9. The river has been improve by being straightened by dredged.
10. Its idea position and flowing through the industrial heat of Germany makes it most intensively use for commercial water way it is used for moving a lot of bulky goods and raw material.

A series of canal have been constructed to enable barged with capacities exceeding 1000 tones to Link River in the Rhine water way system. The canals are Rhine – Rhone canal, Main – Danube canal, Albert Canal Dortmund Ems canal and Mitt eland canal.

Importance of the Rhine River to Europe;

1. It has stimulated the development of HEP generation center which supply power to the industries, mining centers and homesteads.

2. It has provide on the outlet to the Atlantic Ocean from the interior of western Europe.

3. It has led to the development of industrial sector. Many industries especially in West Germany are located near the river Rhine industrial development has also been due to the cheap and large sale transportation of the raw materials. Industrial towns sired by the Rhine river waterway include Ludwigshafen, Strasbourg Stuttgart, b\Basel Antwerp Lyon a Mainz.

4. It supplies water for agricultural like market, gardening and airy farming domestic and industrial use. Hence, it has also encourages market gardening since water is used for irrigation in the gardens.

5. Navigation in the river basin has stimulated the development of trade, it has become an axis on which trade highs in the whole of the European Common Market.

6. It has become of the tourist attractions. Some tourists come and see the successful use of the river water for the development of the countries. Tourists are interested in seeing how the use of water form Rhine River is well organized such that there haven't been economically developed countries.

7.It has also stimulated the growth of towns since people have settled close to the river due to water availability.

Problem

1. Spread of diseases because of water pollution caused by the river basin development.
2. The area is facing the problem of land degradation since it is densely populated. But the governments are very keen introduced encouraging people to stop reproducing in a big number.
3. Aging of people will lead to inefficient use of the river and its resource.

RIVER BASINS IN CHINA

China river basins have been the back born to the development of the country. The river include Hwang Ho, Yang tse Kiang and Si Kiang Hwang Ho and Yang tse Kiang originate from the Tibetan plateau and poor their water in the China Sea. These rivers have basins which offer fertile soil goods for agriculture. Planned agriculture was carried out in these river basins.

How the River Basins were developed into a more Productive state;

1. The government launched some comprehensive national schemes for the control of great river that is Hwang Ho, Yang tse Kiang and SI Kiang. The river control project were initiated to achieve reclamation, creating of navigation water way.

2. Several dams were contracted across the river channels as to hold back excess water during the rimy season and minimize floods. The dams were multi page, that is for encouraging navigation, providing water for domestic and industrial use, and encouraging fresh water fishing the country.

3. Apart from constructing dams, canals was constructed to connect all the great rivers. This made transport cheap and efficient.

4. Forestation programs were introduced in the river basins so as to control soil erosion. The forest could provide a variety of products for economic and social use.

5. There was the use of fertilizers and manure for reclaiming the land. Also deep pouching was applied across the slope.

All these were initiated during the twelve year plan launched by the government of china. In the development of the river basins people also have largely been involved in making decision and implementation those decisions**.**

Achievements as a Result of River Basin Development in China;

1. More arable land was reclaimed and used for agriculture and settlements.

2. Industrial development took place in the river basins such as metal Engineering, chemical

prosing, cement industries etc Industrial centers in the yang tse kiang basins are hunan, chungking, Kweiyang and Kumning, e.t.c.

3. Simulating of the developed towns like Tientsin, Shangria, chungking etc.

4. Stimulation of the mining sector due to transport development copy of water. Minerals like coal iron or etc are being mined.

5. There is greater soppy of HEP powered due to the contraction of dams across the river channel.

6. Floods have been minimized to great extent in the river especially after the construction of dams and planning of trees.

Problems caused by the scheme;
1.The development of the river development schemes has led to the growth of high population causing stress on the land and its resources. But nowadays the government of China has been fighting against population growth by imposing very strict policy on population control loads to avoid some environment problems.

2. Water pollution due to domestic refuse and industrial waster being dumped in the river basin. Some of the wastes are toxic.

3. Greater use land due to expansion of agriculture and industries development acceleration and river floods**.**

Problems facing the scheme;

- Disease and pests which agent the cops animals and people.
- Frequent floods and storms affect the river basin and the activities carried out.
- Land fragmentation as a result of high population with poses pressure on the land.

The Orange River Basin Development
The Orange River and tributaries: The Harts, the veal, the Modder and the Caledon rise from the Drakensberg and flows westwards in the Atlantic Ocean. The river crosses or drains Lesotho Botswana South West Africa and the Republic of South Africa. It is the largest river in South Africa with a flow of water equal to all other rivers (in South Africa) combined.

T Features of the River;
1. carries a lot of silt due to unstable soil in South Africa.

2. It tends to flood in the rainy season.

3. It has got high water fluctuation due to high evaporation. This is due to the fact that it flows

through the desolate desert. Sometimes the river dries up. Hence the river flows to the drier parts of the country in the west.

The combination of aridity and poor water supply has made the western parts of the country lag backwards in terms of development compared to the eastern part of country. But the Orange River basin has got high economic potential for supporting the increasing population in South Africa. It has high potential due to the following facts;
1.The valley is wide and hence can allow large scale agriculture activities to take place.
2.The river basin has a flat land surface good for establishing irrigation schemes and applying mechanization.
3.The soil is fertile to support a variety of crops needed for the country.

The Orange River Basin scheme

The project started in 1962 with the following objectives;
1.To make full side of the irrigation and hydroelectric power potential of the river and provide a sound basis for agricultural and industrial.

2.Controlling floods, which have been hindering the development of the river basin.

3.Achieving soil stabilization by planting trees.
The total cost of the project was estimate as US 900 million the scheme was estimated to enable a further 280,000 land to irrigate.

The Process of Developing the River Basin;
1.Building of the dams like the P.K leroux Dam Hendri Verwoers Dam (completed in June 1971) Mortuary, Kalk fontein and welbedacht etc. The dams were aimed at providing water for irrigation cosmetic use, industrial activities and fishing.

2.Contraction of canals like van der kloof from P.k leroux dam to de aar, Riet, Brak Angers and carnavongeles valley where irrigation could take place, Other canals leading to the great fish river where there is fertile soil but poor water supply.

3. Channels and tunnels where also constructed with the purpose of leading water to the drier parts for irrigation.

Achievements of the Orange River Scheme;
1.There has been an increase in the area for irrigation in order that more production can be realized. There has been an increase in crop production by 25% and crops grown are sheet, maize, hay groundnuts, cotton and vegetation. The dangers of drought conditions over a large area of the interior have minimize.

2.There has been a wide control of floods to reduce the damage caused by water.

3.Reduction in silting through soil stabilization.

4.Water supply has been stabilized due to the creating of dams. The existing schemes are supplied with water leading to greater crop production. The current water supply systems have been relieved.

5.Stimulation of both primary and secondary industries. For example textile industries have developed due to the improvement of sheep farming.

6.More areas for settlement have been established where people are living. The area has attracted population from the east reduction of over population.

7.The project has contributed to the reduction of the imbalance between the west and the east.

8.Cheap power from the contracted dams has aide mining and communication development in the South Africa region

Problems caused by the scheme;
1. It made the government incur a lot of costs in establishing. The estimated cost was US 900 million. Hence other important economic activities could be ignored for sometime.

2. The construction of dams led to the acceleration of coastal erosion.

3. Development of the scheme led to water pollution and hence the occurrence of diseases.

Problems facing the scheme;
1. Labor shortage since most of young people go to the mining areas manufacturing industries sand tourist area. The ongoing tension in South Africa due to the profound imprints of apartheid system also causes the problem of labor availability.

2. Diseases, which affect the crops, animals and people affect the production and efficiency in the scheme.

3. There is a problem of soil erosion and silting because of unstable soil.

4. There is water available is under high competition involving the agricultural sector, mining and industry.

5. Volume fluctuation in the river is another problem. This is due to the fact that South received little rainfall and arid is common feature in the western part of the country.

THE KAGERA RIVER BASIN DEVELOPMENT PROJECT

Historical Background

The development of the project was formerly organized by the government of Tanzania, Rwanda and Burundi in 1977 Uganda joined in 1981. The project was to be established with the main aim of starting a massive Hydro electric power schema, centered on the dam at the established at Rusumo fails in the Kagera River. At first Tanzania proposed building dam of 1395 meters high capable of generating at least 128 megawatts of HEP needed for a large scale industrialization and electrification of the lake region. The four countries convened a summit in Bujumbura in May 1981 and agreed to hold the dam of 1325 meters high at Rusumo falls so as to produce 80 megawatts of hydroelectric power.

Characteristics of the Kagera River Basin;
1.It has reliable water flow since it is located in the area that gets high rainfall (Highland).
2.It has a wide variety of plant and animals.
3.The soil is fertile, and hence good for agricultural development.
4.There are same mineral deposits like iron hence the development of the river can speed up mineral extraction.

Requirements for establishing the scheme;
1.Capital for investment on the equipment was needed.

2.Training of people is also necessary so as to equip them with necessary to be utilized in the river basin development.

3.Rwanda and Burundi needed other areas for agriculture. Rwanda has to lose about 8200 hectares and get another land to resettle about 10500 ramifies. Burundi has to lose 3200 hectares and find another land for restyling 1600 families. These brought some hesitation with these countries since losing their landing order to develop the project under joint venture. So there has been a loan argument about this and about the compensation to be paid out of the international funding.

4.There should be surveys to find new farmland for the people dispossessed of the land.

5.Arranging some claims and squabble of families for favored new sites set by the government.

6.Ensuring that building materials are available.

7.Common agreement among the country concerned since the project could affect each a of them.

Advantages expected from the Kagera River Basin Development project;
1.The production of HEP for the member countries and even the neighboring countries.
2.Employment of the people.
3.Development of transport and communication systems in the region.
4.Greater cooperation among the member countries and hence paving the way for the development of trade and peace.
5.Development of agriculture and the mining industry.

6.Diffusion of agriculture and the mining industry.
7.Expansion improvement of market for the crops produced in the region.
8.The development of tourist industry.
9.Improvement of the life standard of the people by electrifying the waste lake Victoria.
10. Development of search activities especially on biodiversity.

Problems encountered in the Development;

1.Hesitation by Rwanda and Burundi who will lose the part of their land for the giving room for development of the scheme.
2.The researches and preliminary plans are taking too long.
3.This will lead to the decline of other small projects because of the government concentrating more on that project.
4.Expenses will be high since the process needs high capital and the government do not have enough capital.
5.Low technology among the local people and these need intensive training.
6.Four of the serious congestion after one project is completed in another bottleneck to the fast development of the country.
7.The ongoing civil was in Rwanda and Burundi. These keep people resoles and insecure causes retardation in the development of the project.
8.Labor supply is a problem because of migration of people from that region to other areas like Dar es salaam and the mining centers in Arusha and shinyanga.

THE RUFIJI RIVER BASIN DEVELOPMENT – TANZANIA

The Rufiji River in Tanzania portrays a good example of the areas which has high economic potential but not fully exploited and is under populated because its resources can support more population.

Characteristics of the Rufiji River Basin;

1.It has the largest river (the Rufiji) in the country and starts from the southern interior highlands of Tanzania emptying its contents in the Indian Ocean.
2.It has features like waterfalls, meanders, alluvial fans, and ox bow lakes.
3.The river basins also characterized with a variety of animal vegetation like the mangrove and grass as well as bird.
4.It has different resource including water oil natural gas wildlife (flora and fauna) and good arable land.
5.It has conductive climatic conditions receiving enough rainfall, high temperature that allows a variety of crops to be grown.
6.It tends of flood in the rain season giving transport problems and destruction of property in the farm.

Activities Going on in the Rufiji Basin;

1.Fishing is taking place at a small scale under the local inhabitants. The government once proposed to start prawns farming project but encountered a staunch resistance from the environment.
2.There is cultivation of rye, sugarcane, coconuts, vegetables etc large scale irrigation scheme is

taking place in the Kilombero River basin apart of the Rufiji basin.
3.Tourism is taking group in the sell outs game Reserve contributing to the earning of the foreign currency in the country.
4.Hunting of the wild game by the local people.
5.Lumbering also takes place involving the local people and the other businessmen from other regions like Dar es salaam.
6.There are researches and mineral exploration going in the area.

Why the Rufiji Basin has a High Economic potential in the country?
1.It has a large fertile land which has not been fully utilized for agriculture. If fully utilized for cultivation it can lead to high production of crops boosting up the economy of the country.

2.It has many attractive aspect like variety of vegetation, the delta, ox bow lakes, meanders, alluvial, fans, animals, fish and boards
These can attract more tourists making the Rufiji Basin another great tourist destination.

3.It has potential resources for power production like the waterfalls oil and gas deposits which are either not fully exploited or lying idle.

4.Enough rain and good temperature that can support a variety of crops like rice, sugarcane beans maize etc

5.There are people who can provide labor for transforming the basin into productive area.

Factors that limit the Development of the Rufiji Basin in Tanzania
1.Poor capital availability to be invested in the development of the basin.
2.Low level of technology is another hindrance. The local people are using poor tools because of low technology.
3.There is shortage of labor caused by the rural urban migration most young and energetic people are running from the Rufiji basin to towns like Dare es salaam.
4.Remoteness associated with poor transport and communication system.
5.Poor market availability especially the local market. The local people have low purchasing power due to poverty.
6.The government priorities are focused more on other area than river basin development.
7.There are frequent floods which affect the crops it harms and other people property.
8.There are frequent floods, which affect the crops in the farms and other people property.

W What should be done?
1.The local people technology should be improved so as to facilitate effective exploitation resources in the basin.
2.Seeking financial assistance from different diners for the sake of getting capital to the invested basin development.
3.Restricting rural urban migration so that people can stay in rural areas and produce. Migration can be reduced by heavily investing into the region there by establishing some projects.
4.Transport and communication systems should be improved so as to facilitate the movement of people information and different products.

5.Intensifying environment conservation processes for the sake of fostering the status of the local attraction in basin and draw the attention of many visitors in the areas.
6.Water conservation processes should take for the sake of promoting the supply of water for domestic use industrial use and irrigation.

Threats to the Rufiji Basin Development

The Rufiji basin is threatened by some problems like water pollution deforestation. Diseases land degradation resource exhaustion and conflicts. The causes of these threats are tourism fishing agriculture lumbering, fuel, wood extraction, mining and settlement.

KILOMBERO IRRIGATION SCHEME (TANZANIA)

Kilombero irrigation scheme is located along the river kilombero a (tributary of river Rufiji in southern Tanzania, R. Kilombero) is close to the Great Ruaha River. Its water is pumped to supply overhead sprinkler irrigation.

Organization of the scheme

It has large estates or plantation of sugar and there are factories at Msolwa and Ruembe. Small scale farmers were allowed into the areas so as to ensure suffice\client supply of sugar cane for the factored. These farmers are called out growers. They were given 6000 hectares of land to cultivate and same agricultural facilities as well as extension services were made, available, three settlement villages were established and were located about 20km south of the Company sugar Estates. During the early stages of this schema (1960) European expatriates were involved and late local Tanzanian was tainted for running the project.

Aim of the scheme

1.To open up the remote and no prosperous area of southern Tanzania.
2.To improve the crop (sugar cane) yields, about 2800 hectares were put under irrigation where sugarcane has been being grown as the main crop on the estates by the state owned company and out. Other crops grown in the valley are rice, beans maize and vegetables with the help of irrigation. Fishing also is taking place.

Factors that Facilitated the Development of the scheme

1.The need to develop the rural areas of southern parts of Tanzania.
2.The available large land in the river basin with retile soil.
3.Reliable water supply from the river for irrigation and other uses.
4.People high need for sugar made it necessary for developing the scheme.
5.Availability of transport services for example the establishment of the TAZARA railway lines the development of the schema.

Advantages of the Scheme

1.There has been flood control and the river is helping man instead of working against him.

2.The scheme has stimulated the development and maintenance of the railways lines and roads.
3.Sugar production increased compared to the order time when the supplies were so scarce and expensive.
4.There has been less dependency on the imported sugar and thus saving foreign currency for Tanzania.
5. It opened up the remote areas like Msolwa and Ifakara by encouraging the construction of roads and railways to serve and link up the schema with coast.
6.It has led to the creation of employment opportunities.
7.It has promoted the life standard of the people (out growers) through assisting them by giving them felsites training.
8.The development and organizing the market for their crops for example new towns like Kidatu, Makambako and Mikumi which offer social services to the people.
9.The company provides the expert advice to the farmers on how to plant, weed and protect crops. This means that it has encourages the development of technology among the local people.
10.It has promoted the market for HEP from kidatu.
11.Timber and fishing industry have developed as a result of the utilization of the valley.

Problems facing the scheme;

1. Poor labor supply due to rural – urban migration.
2. Diseases like cholera and malaria affect the farmer and hence failed to help effectively in development of the scheme.
3. The climatic problems like drought have been affecting water availability. Sometimes the volume of water in the rivers decreases
4. There are transport problem prevailing since the roads and bridge are not well constructed. Hence during wet season the areas in not well accessible.

Prospects of the Project

The government has a great intention of developing the valley so that it can be more productive than it is today. In achieving the goal the following will have to be done;

1. Constructing more dams for retaining water all the year round.
2. Maintaining the roads and modifying them to a better standard.
3. Training the local people on other activities than sugar product only so that the valley can be for diversified economic activities like fishing, timber production, wild life conservation and mining.

Importance of rivers, dams and lakes;

1. River help in the generation of HEP like at kihansi on the kilombero River Mtera and Kidatu on the Great Ruaha and Nyumba ya Mungu on the Pangani River and the Kariba dam, etc.
2. They promote transport and communication in the country.
3. They supply water for irrigation, domestic uses and industrial activities.
4. They modify the environment like introducing moisture to the atmosphere, which later leads to the formation of rainfall.
5. They attract settlement due to the supply of water and good soil.
6.The features like water falls in the rivers attract tourism.
7.River act as boundaries such as Ruvuma between Tanzania and Mozambique's and Kagera

between Tanzania and Rwanda as well as Uganda.
8.They promote the fishing industry.

Problems of rivers dams and lakes;
1.Fluctuation of the river volume due to the excessive evaporation.

River Basin Development

1. There are problems of cataracts, rapids and waterfalls, which bring problems in navigation.
2. The invasion of vegetation in these water lead to problems in fishing and navigation.
3. Some of the rivers have short courses such that these rivers cannot contain enough water for economic uses.
4. Also some river directions are such that they drain water away from the place which need that water for irrigation and hence end up emptying water in the ocean.
5. These water bodies lead to the spread of disease like e.g. bilharzias.
6. Some cause conflicts especially when the rivers are shared by many countries like Nile, Ruvuma and the Kagera
7. Flooding of the rivers loads to destruction of property soil erosion and the spread of diseases.

REVISION QUESTIONS

1. What are the advantages of the river basin development schemes?
2. Mention five disadvantages of the river basin development schemes in Africa.
3. Mention six River Basin Development schemes in Africa.
4. What is the basic requirement for developing the River Basin Development scheme?
5. Mention the factors that facilitated the development of Punjab Agricultural Scheme in the Indus River basin.
6. Outline the factors that hinder the development of the River basin Schemes in Tanzania.
7. Mention the problems caused by the River development Schemes in any country you have discussed.
8. Identify the advantages of the following river basin development schemes.
   (a) The Kagera River Basin International Development Scheme.
   (b) The Kilombero River Basin Development Scheme.
9. Show five achievements the Tennessee Valley Authority (TVA) attained in development of the Tennessee Valley.
10. Explain four benefits the small holder farmers get from the Kilombero River Basin Development Scheme.

5.8 MANUFACTURING INDUSTRY

Economic activities are so varied. The term industry is used to cover a wide range of economic activities, which may involve making, supplying or delivering goods and services to a number of people.

Types of Economic Activities (Industries)

Primary Industries (Activities)

The simplest form of industries concerned with extraction of raw materials to be supplied to the other industries. Examples are Farming, Forestry, Fishing and Mining.

Secondary Industries (Activities)

These include both manufacturing and processing industries. In this category the raw materials are assembled or manufactured into finished goods. They are divided into two groups.

1. **Heavy Industries**

These are the industries, which produce heavy goods like metal goods, heavy chemical, locomotives and shipbuilding.

2. **Light Industries**

These are the industries, which produce light goods, example are like Textiles, making of electrical equipment, plastic goods, cosmetics, electronic gadgets, and toilet articles.

They involve re-processing of the partially manufactured goods to make more complex products like watches, radios, computers, books, clothes etc.

(i) Food processing, car assembly, manufacturing and building are secondary industries.

Tertiary Industries (Activities);

They are not a part of manufacturing at all but the industries whose jobs involve providing goods and services for the public. Examples are transport, trade, tourism, and entertainment, catering (hotel services) medicine (doctors).

Quaternary Industries (Activities);

These include people who provide specialist information and expertise to all the above sectors i.e. primary industry, secondary and tertiary industries. Example is research, design engineering (designers), and computer programming grown in summer in the region. In the wheat zone cotton, maize, potatoes, sugar beet, soya beans, peanuts, flax and tobacco are also grown. Nonetheless, Garden vegetables are grown all over the country.

In the North and Northwest Grasslands Pastoral farming is dominant. Sheep, goats, cattle, horses and camels are reared. This area is too dry for arable farming since the amount of rainfall is usually below 500mm. In most parts of humid China, pigs and poultry are principal animals raised.

The Western Part;

Is also too dry but there is farming around the oases (oases farming).

Manufacturing Industry;

Manufacturing industry refers to the industry which involve processing and changing the materials in order to make new products of greater value to man. Manufacturing industries are also refers as secondary industries. Manufacturing industries are divided into processing and fabrication industries.

Processing industries: are the ones, which deal with preparing the raw materials for fabrication for example coffee, pulping, decorticators, cashew nut hollered, etc.

Fabricating industries: are the ones that deal with making new products from the processed raw materials. For example textile industries, etc.

Manufacturing industries can also be classified as heavy industries and light industries. **Heavy industries** are the industries, which involve the production of bulky and heavy products like iron and steel industry, car assembly and ship building.
Light industries are the industries, which involve the production of light and complex product, for example; the manufacture of plastics, textile, cosmetics and paper.

Factors Influencing the Location of Industries;

There are several factors, which combine to influence the location of industries. These include;

1. **Raw material availability**. Where raw materials are available, industries develop fast. Some raw materials can be obtained locally, while some can be obtained through importation. In West Germany for example Iron and Steel industry developed in the iron mining areas since iron is a major resource for that industry. But some industries can be located along the coast where the raw materials are imported from other countries. E.g. Japans has its industries located along the coast since most of its raw materials are imported from other countries. Japan does not have enough mineral resources has it imports from outside.
2. **Fuel and power availability**. Some industries are located where there are source of fuel and power. For example coal deposits in U.K and China have led to the location of iron and steel industries in coalfields.

3.**Human resources**. This is connected to labor supply both skilled and unskilled, also determine the location of industries. For example, electronics industries are located in the areas where there is skilled labor. Also, the industries which need high labor like cement industries, are located is areas with dense population.

4. **Availability of Capital**. This is needed for investment in machinery. Importation of raw materials etc.

5. **Market availability** also encourages the development of industries in certain country. Where the market is poor the industrial development also becomes poor. Availability of transport and communication. Some industries are located near the transport systems like the railway line because of being bulky.

6.**Government policies** play a great role in the location of industries.

The government can encourage the location of certain industry in certain place for the sake of balancing the economic development in certain area and provision of jobs.

7.**Government stability** can encourage the development of industries in certain country due to peace and harmony. People feel safe in investing in that country unlike where there are political problems like wars.

8.**Industrial inertia and historical factors**. Industrial inertia is the tendency of old industries to remain in the same area without shifting to the new area despite unfavorable condition. These old industries continue attracting the new industries because of well established transport system and assured supply of labor as well as social services supply.

Significance of Manufacturing to the World Economy;

1. **It provides employment** to the fast growing population in the world, especially the tropical countries.
2. **Industries lead to the diversification of the economy** of the country and reduce the reliance on one type of product.
3. **It contributes to the earring of foreign currency in the country**. For example Japan earns a lot of foreign currency because of exporting the manufactured products.
4. **It leads to self sufficiency**. This means that the country reduce its reliance on imported goods. Hence, its economy becomes stable.
5. **It stimulates the development of transport and communication** like road, railway lines, ports etc.
6. **It leads to the improvement of other economic activities** like trade, tourism, agriculture etc.
7. **It reduces expenses on imports.**

8. **It encourage the improvement of social service.**

Effects of Manufacturing Industries on the Environment;

The effects caused by industries can be either negative or positive. Positive effects involve the use of the margin land, which was once useless.

Negative Effects on the Environment Include:

1.**Gaseous Pollutant**: These include green house gases like Carbon dioxide, carbon monoxide, nitrogen oxide, etc, which pollute the air. These pollutants, on polluting the air, lead to the formation of acid rainfall and global warming. Acid rainfall leads to the addition of acid in the soil, which in turn causes the death of plants and microorganisms as well as the destruction of building by removing the paints on the walls. It takes place most in German due to high level of industrial emission. Global warming is the general rise of temperature at a large scale.

Global warming is due to the green house effect caused by these gases, which trap and retain the energy from the sun in the lower atmospheric level. It lead to melting of ice and increase of the sea level, death of some animals and decline in agricultural production and hence there can occur shortage of food, increase of diseases due to the change in climate. Malaria can increase as a result of the rise in temperature because mosquitoes multiply greatly when there is high temperature.

2. **Particulate (dust) matters and other solid matters which emanate from the industries get into the air, water bodies or soil and cause contamination.** These can lead to the increase of acid or toxicity in places where they are dumped.

3. **Liquid matters**: These involved hot water and chemical from industries. Hot water leads to thermal pollution of water bodies which later can kill the aquatic organism because of the sharp rise in temperature.

General effects of industries pollutants on the health of industrial employees and communities living around:

1. Water pollutants cause disease like cancer, typhoid and diarrhea.
2. Air pollution can lead to respiratory disease like bronchitis to employees and people around.
3. Soil pollution can cause decline in agricultural production and hence starvation can take place to people.
4. People are also affected by noise and sometimes can lead to problems in the blood circulation.

Ways of Reducing Pollutants;

1. The industries should be located far away from the residential areas.
2. Recycling the wastes for example the metal materials should be recycled so as to produce other materials.
3. The combustion system in the engines should be fitted with efficient facilities so that the amount of green house can be reduced if not solved totally.
4. To avoid noise pollution. The part of the machines should be lubricated and the materials used should be like bronze, which do not produce noise.
5. There should be concerted efforts by the government, non - governmental organization and some committed individuals in combating environmental pollution.
6. There should be strong policies governing the industrial operations and ensuring that people who invest in industrial development are given proper education on how to handle the waste product properly like recycling.
7. The industrial wastes should be treated to render them harmless to the health of the people.
8. Alternative energy source which are environmentally friendly like solar energy, natural gas, wing power, etc.
9. There should be other activities developed so as to avoid over degeneracy on manufacturing industries only especially in Japan etc.

CASE STUDIES

SHIP BUILDING IN JAPAN

Ship building in Japan expanded fast after the Second Would War (WW II).

The main reasons for that expansion have been;

1. Japan's enormous increase in external trade, which led to the increase in demand for merchant ships.
2. Japan's large engineering industry has stimulated the development of ship building.
3. Absence of the old established shipbuilding industry made it easy to introduce modernization. Normally old industries tend to create problems in introducing new technology.
4. A large skilled labour force. Technology is well advanced and efficient hence has stimulated the fast development of the industry.
5. Strong determination to become successful in industrial and trade activities in Japan.
6. Introduction of prefabricated shipbuilding.

7. The development of fishing industry in Japan and worldwide has stimulated the development of shipbuilding industry
8. Forestry industry in Japan has contributed a lot since the forest materials are used as one of the components in the shipbuilding.
9. Ready market worldwide especially the rich countries.
10. The government policy has supported the industrial development in Japan.
11. Reliable supply of power like HEP power and Nuclear energy.
12. The need to import the raw materials has stimulated the development of the shipbuilding industry. This is because the country lacks raw material so it imports most of raw material and shipbuilding industry could help in cutting down some coasts of transport.

Problems of ship building industry

1. The industry is threatened by frequent earthquakes because the country lies within the weak zone of the earth crust.
2. Stiff challenge from other countries like China and South Korea, which are also developing their own shipbuilding industries. This reduces the market.
3. The industry also faces opposition from the environmentalists and is bland to be of the source of pollution in the world. Coastal area has been polluted and this affects people and animals.

AUTOMOBILE INDUSTRY IN GERMANY

Automobile industry is concerned with the production of different types of cars. It is basically the assembly industry. The industry developed at the end of 19^{th} C. early development began in Europe such as in West Germany.

Factors that contributed to the Development of Automobile Industries in West Germany;

1. Availability of raw materials like iron, which is important for the manufacture of the cars.
2. Effective and efficient transport and communication system, which helped in the ferrying of raw material and manufactured cars.
3. The use of advanced technology in the process of investing and manufacturing the cars.
4. Availability of high capital, which was needed in investing in the car production.
5. The presence of metallurgical industries the provision of accessory materials need in the car assembly.

6. High market for the car in West Germany is another factor that facilitated the development of the automobile industry.
7. Availability of power from the Rhine rise and coal, power was needed for processing iron ore to get iron and steel which are needed in the manufacturing of spare for the car assembly.

Location of automobile industries in Germany

Frankfurt producing Opel, Cologne producing Ford, Stuttgart producing Benz, Wolfsburg producing Volkswagen and other industries are located in Berlin and Dusseldorf.

Advantages of Automobile Industries;

1. It has promoted trade in Germany as well as at an international level. This is because the cars are being sold both inside Germany and outside Germany.
2. It has enhanced the mobility of goods as well as the fast spread of science and technology. Transport and communication have been promoted.
3. It has also led the creation of employment opportunities in the country helping in solving the problems of unemployment.
4. It has stimulated the development of other sectors like manufacturing industries, mining sectors, and agriculture.
5. The industry has also facilitated the rate of information flow (The diffusion of science and technology).

Negative Impacts of the Industry;

1.It contributes to air pollution through the emission of fumes or exhaust gases into the atmosphere. Air pollution has in turn led to the problem of acidic rainfall, soil pollution, skin diseases and smog.

2. The cars led to the destruction of vegetation which in turn causes soil erosion etc.
3. There has been the increased number of accident due to many cars which are produced. Road accidents are as a result of among other things reckless driving accident car veering off the road and tire bursting.
4. It has led to great debt crises in the poor countries because these countries cannot buy many cars due to poor financial position.
5. Noise pollution is another problem.

Solution to the Problems;

1.There are efforts to produce cars, which are fitted with some facilities which cause combustion to take place effectively and reduce the amount of greenhouse gases produced.

2.Widening the road, tar marking, straightening them and effectively training the driver are reducing car accident. Traffic lights and speed limited are also installed to control the movement of the cars. Also there are special signs and symbols put along the roads to educate the driver and the pedestrians so as to reduce the chances of having so many accidents.

3.To reduce noise some new material are being introduced like bronze and the use of great for lubrication.

Limitations Facing the Automobile Industry in Germany;

1. There is strong competition from other countries like South Korea, Japan, Italy, Sweden, USA and Britain.
2. Exhaustion of iron deposits will lead to the rise of expenses since the country will be forced to import most of its raw material for the industry.
3. There are strong campaigns to reduce air pollution hence encouraging the reduction in the production of especially small cars.
4. Poverty in the developing countries limits the market for West Germany.

TEXTILE INDUSTRY IN CHINA

Textile industry is the industry dealing with the manufacture of clothes and can be from wool, cotton, silk, linen, Nylon and rayon. The industry is classified as a light industry and is widely distribute. It is footloose industry since has a wide range of location factors that is it is not only one location factor. It can be located anywhere.

Historical Background

It is the oldest industry that began in Britain, then USA, to China, India, Japan and other countries. China textile industry was dominating before the revolution of 1949. It was concentrated along the east and along the Yang tse Kiang River. It was followed by iron and steel industry in Manchuria. After 1949 there was more development involvement. The location of the industry became more decentralized such that new industries were located inland.

Areas Where Textile Industries are Located (Distribution of Textile Industries);

Beijing in the North of Manchuria, Shanghai in the Yang tse Kiang delta (is the oldest textile region due to contracts by visitors from 1840's), Kunming, Chungking, Lanchow

in the central basin of Yang tse kiang river, Human canton, Hubei etc. all these industries are in the eastern part of the country.

Factors Which Facilitated the Development of Textile Industry;

1. **Nature of the industry**. It is light and hence easy to develop since it is less expensive. The materials can be imported because they are not bulky to bring transport problems.
2. Availability of local raw material in China especially cotton and synthetic fiber. China produces cotton, which goes to the textile industry.
3. Cheap labor provided by the local people since China has the highest population in the world.
4. External contact in 1840's led to the introduction of the textile technology in the country.
5. Iron and steel industry lead to the development of machines that could be used in the manufacturing of textile materials
6. The use of local people ingenuity (Skills) facilitated the development of textile industry. Some local people were already making textile at a local level hence after being mobilized the textile industry developed faster.
7. Varies power supplies from different dams led to the effective running of the machines. There are power centers on the great river like Yang tse Kiang and other centers.
8. The government influence through formulating the policy that encourage the development of industries in the county. The five years plan senesced on the development of industrial base. In 1958 Mao Zedong introduced 'Great Leap forward policy' and the open policy, which was to allow different people to give their skills needed for the industrial development.
9. Cheap transport and communication using the greater rivers and the Grand Canal.
10. Agricultural success was another factor, which have stimulated the development of textile industry. This provides cotton for the industry and food for the workers.
11. Increased research on fabrics and synthetic fibers has lead to further development of the industry
12. Water supply from the river and rainfall has great impact in the growth and development of the textile industry. Water is used for cleaning the raw materials as well as cooling the machines.
13. Reliable domestic market since China has the highest population in the world, which assures a great demand for clothes in the country.

The textile industry has led to the realization of **advantages like** creation of employment, stimulation of agriculture since it has provided market. Development of other industries

development of town like Kunming and Chungking, stimulation of transport and communication improvement of the living standard of the people etc.

The industry faces limitations like stiff competition from other countries like India, rapid population growth will lead to the problems of capital and concentration of food production rather than cotton, problems of floods price fluctuation, excess cotton production low level of industrial structure etc.

Environmental pollution is the problem caused by the industry itself because of dumping waste products in the river and other water bodies, introduction of gases into the atmosphere etc.

TEXTILE INDUSTRY IN TANZANIA

Tanzania has portrayed a negative trend in terms of the development of Textile industries. Most of the textile industries have collapsed such as the friendship textile mill in Dar es Salaam and the existing ones are operating below capacity. The major raw material used in the Tanzania Textile Industry is cotton most of which comes from the Lake Victoria regions that is Mwanza and Shinyanga.

The factors, which have been Hindering the Development of the Textile Industry in Tanzania;

1. High costs of production due to the high prices of the raw materials especially the imported ones like dyes and some machine spare part.
2. Poor market for the textile products within and out. Internally the industry is affected by the competition from the cheaply imported second hand clothes. People find the Tanzania clothes expensive and this is due to the high cost of production. Also the external market is affected negatively because of the poor quality of clothes which cannot compete with those synthetic fibers.
3. Low level of technology (poor skilled labor) which has resulted in the production of low quality products which leads to poor market or limited number of customers.
4. Poor infrastructure like poor roads, poor railway lines etc lead to the poor distribution of the textiles products to different places in the country.
5. Inefficient management characterized by corruption. The industries fund has been running under poor management associated with the misuse of fund.
6. Poor capital availability has been another problem most of the fund has been coming from outside leading to slow pace or failure in the development of the industry.
7. Unreliable power supply associated with frequents black or have been another hindrance hampering the development of the textile industry in Tanzania. Power shortage

has been foreign some of the industries to stop working for sometimes until when the power supply stabilizes again.

Nonetheless, Tanzania is looking into the possibilities of reviving the old industries and maintaining those which are still performing in order to stimulate and fasten the process of industrialization in the country. Tanzania has learnt that, textile industry is easy to establish since it is a light industry and can be located in many places because cotton, which is produced in Tanzania, can be ferried to different places easily because it is not bulky.

Textile industry can help in combating the looming problem of unemployment prevailing in the country. Different people both their living. This in turn can lead to the promotion of the living standard of the people in the country.

LOCOMOTIVE INDUSTRY IN SOUTH AFRICA

South Africa has many industries and some of these are involved in the manufacture of locomotive (Trains). The locomotive industry in South Africa has **developed due to the following factors**:

1.The presence of heavy iron and steel industries as well as engineering industry. These are located in the towns like Johannesburg and Pretoria.

2.Availability of capital used in the process of establishing the industry. Capital was obtained from the mining industry like gold and diamond.

3.The strong need for a reliable and cheap transport system, which could be used in carrying heavy goods from the interior to the port for export or to facilitate the distribution of spare parts and other goods within the country.

4.The government policy that insisted the promotion of the transport system so as to stimulate faster industrial development in the country.

5.The use of advanced technology in the engineering industry.

6.Economic sanction also made the South Africa government think deeply in term promoting the local market through the development of cheap transport system especially the railways network.

7. The country also wanted to cut down costs that were formerly involved in importing some locomotives from countries like Canada.

Advantages of the Locomotive Industry in South Africa

1. It has enhanced the development of cheap transport system in the country. South Africa railway system especially in the Eastern part is well interconnected.

2. It has propelled the development of other manufacturing industries, mining and agriculture.
3. Trade both local and international has been stimulated. The goods are carried from the interior cheaply up to the port where they are exported.
4. People's mobility, interaction and technological diffusion have been promoted in the country.
5. Tourism has been encouraged since the railway transport is relatively cheap and more reliable.

Cars and Aircraft Industries

These are basically assembly industries. Assembly industries are the ones that put together various component parts manufactured by other industries.

The motorcars and Lorries are now mass-produced in USA on assembly line. Assembly needs considerable engineering skills. USA is the largest producer of road vehicles and the industry is located along the shores of Great Lakes such as Detroit, Cleveland, and Buffalo. Another important center is Los Angels, in California. Car assembly need a large area of flat land there must be good communication with the industries, which supply component parts.

Car industry in USA is facing a great challenge from other countries like Japan centering at Chukyo and Yokohama; Germany centering on Nuremberg, Dusseldorf, and Stuttgart; U.K centering on Coventry, Birmingham, Derby, Oxford, and Dagenham.

AIRCRAFT IN THE USA

Aircraft cannot be mass-produced. They are like shipbuilding which has to be built very many to individual schedules. The first successful flight was made by American Wright Brothers in 1903 and later after the WWI more production started. Aeroplanes are usually assembled in the area where road vehicles are made. The USA is the largest producer in the world with industries near Los Angels at Seattle (on the Pacific Coast).

Factors that Facilitated the Development of Aircraft in the USA;

1. Pre-existing technical advancement led to the fast aircraft industrial development.
2. Military demands during the World WarI also encouraged the production of more aircraft.
3. There was a strong need for space exploration.
4. The need for speedy transport especially when there are urgent cases like rescuing people from floods of earthquakes, sending medicine or taking the sick people very far across the continents and international leaders.

5. The need to avoid physical barriers like water bodies, mountains, rift valleys and vegetation so as promotes an international contact.
6. Advanced researches in air transport facilities.
7. Availability of capital.

Advantages of Aircraft Industry

1. It has promote air transport and accessibility of different places.
2. People's mobility has also increased since they can move to different places without physical barriers given there is political stability.
3. It has also helped in the diffusion of new technology in the world.
4. There has been great improvement in the rescuer activities. For example in Bangladesh and Mozambique in 1999 the Helicopters were greatly used in rescuing people who had been hit by floods. In Afghanistan the aeroplanes have been used in proving the bags of food to the refugees of American – Taliban war against terrorism.
5. The planes are comfortable.
6. International trade has expanded.
7. There has been promotion of defense and space exploration.
8. It has stimulated the development of tourism especially in the USA

Limitations Facing the Aircraft Industry;

1. These are financial difficulties following occasional global economic slumps.
2. There is limited freedom on air space.
3. There is limited market especially in the developing countries.
4. Stiff challenge from other countries like Russia, China and South Korea.
5. Terrorism is reducing the market for air transport and hence the industry will be affected greatly. This is due to the fact that most people now fear traveling using the airways.

Car and Aircraft Industries have Greatly Contributed to the Following Problems;

1. Air pollution because of introduction of gases in the atmosphere.
2. Acceleration of accident in the air and on the road claiming the life of the people.
3. Drug trafficking from countries to countries.
4. Spread of disease like AIDS due to contacts global interactions among the people.

5. Acceleration of terrorism and wars in many parts of the world. The weapons are transported from one continent or country to another.

Electronic Equipment Production in South Korea;

South Korea is among the Newly Industrialized Countries (NICs) whose economy has been growing very due to heavy investment in the industrial development. Other NICs are Taiwan, Hong Kong and Singapore etc. the economics of these countries are referred to as "TIGER ECONOMIES" because they have growing very fast.

Electronics equipment production industry is classified as High-tech light industry since it produces light articles like Television, Electronic watches, desktop calculators, radios sophisticated articles like microprocessors, magnetic discs for computers, computer terminals, software, etc.

In South Korea the major center for electronics production is around Taegu in the south where there are more than 150 electronic factories.

Factors for the Development of Electronic Equipment Production in South Korea;

1. Labor supply in the initial stage of industrial development has been reliable and people are hard working and efficient.
2. Technology because of advanced education among the people.
3. The industry is flexible (footloose) in location. It can be located anywhere even if the space is small like in the city center. It does not need very large area.
4. Ready market for the articles produced in South Korea since they are of high quality and of the current in the world.
5. There has been strong government support in the industrial development.
6. Agricultural development supported this industry especially in creating capital for investment.
7. Efficient transport system in the country.

Advantage of the Electronic Industry in South Korea;

1. It has led to the creation of employment to the population of the country.
2. It has stimulated fast information flow especially through Internet service, which uses computers.
3. The use of computer has stimulated efficiency and accuracy processing bulky data in different enterprises or companies etc. labor work has been avoided through automation

of the machine. In some areas there is the use of robots, which can work more than a human being.

4. The economy of the country has risen fast as a result of exporting electronic facilities.
5. It has stimulated the growth of other industries like heavy industries.
6. The export trade expanded leading to increase international relation between South Korea and other countries.
7. It has contributed to the diversification of country's economy.

Problems of the Electronic Industry;

1. The spread of virus computers lead to error in data processing.
2. It does not have high market in the developing countries where technology is very low and many people do not know how to use electronic facilities.
3. It has lead to the rapid growth of urban population due to rural urban migration. This has led to the rise of squatters and congestion as well as the decline of rural areas.
4. It has contributed to retrenchment of employment (trimming down of man power) since most of the work can be done by few computer more efficiently than human beings. E.g. The use of robots in shipbuilding and car assembly.
5. There has been worldwide competition especially from American in manufacturing electronic facilities.

IRON AND STEEL INDUSTRY IN THE USA

Iron and steel industry is very important in the human and economic development process since it has been useful in stimulating the development of rather industries like car assembly, shipbuilding and locomotive industries. In this industry iron is made from iron ore by smelting in the blast furnace. The iron comes out of the furnace and cools to from a pig iron (It is brittle in nature and hence cannot be made into different shapes).

Steel is made (as an alloy) by mixing iron with other metals like chromium, nickel and manganese. Steel can be rolled or made into different shapes to make different things like spoons, bars, pipes, rods, sheets etc.

Factors that Stimulated the Development of Iron and Steel Industry in USA;

1. The availability of iron ore in several parts of USA like in the Pittsburgh area.
2. Availability of water needed for the running of the industry especially in the cooling process and cleaning.
3. Reliable and cheap transport network like waterways and railways lines
4. The supply of labor in the mining of iron ore and the smelting process.

5. Market availability for the iron produced in USA both within the country and outside like Japan.
6. The strong government support in the development of the industry so as to create a strong base for the economic development.
7. Cheap and plentiful power supply from coalfield and HEP stations.
8. The advancement in technology also contributed in the development of the iron and steel industry.

Factors Influencing the Location of Iron and Steel Industry;

Generally steel and iron industry tends to be located near the sources of raw material (iron ore) and sources of power (coalfield) since they tend to be bulky.

The Factors that Influence the Location of the Iron and Steel Industry Includes:

1. **Raw materials**. Iron and steel industry tend to be located near the sources of raw material like coalfield and iron fields to avoid costs of transport since the raw materials are bulky in nature and hence heavy.
2. **Power source.** Since coat is still the main source of power, the location near the coalfield is usually chosen. Other power sources like the hydroelectric power station are chosen for the location.
3. **Water supply center**. Iron and steel industry is also located near the water source since it needs a large amount of water. Hence it cannot be located in the arid areas.
4. **Transport costs**. Cost of transport is also considered in the location of the iron and steel plant. For example the America (Labrador) the coastal location was chosen for water transport.
5. **Flatland.** Large areas of flat, cheap land are required for the establishment of the iron and steel industry. Hilly areas are not chosen since they need leveling.
6. **Political factors.** The country can dictate the location of the industry in certain place so as to stimulate the development of the regions, which are still lagging behind. Also it can encourage the development of the industry in areas, which are safe or less vulnerable to attack from other countries.
7. **Market availability**. The presence of other industries that use iron and steel as their raw materials like the locomotive, shipbuilding, automobiles, and engineering can influence the location such that the iron and steel industry can be located near these other industries which provide market.

Major Iron and Steel Regions in the USA

1. **Pittsburgh Region.** This area influences the location of iron and steel industry because of the presence of iron ore deposits. It was using coal from Pennsylvania Coalfield but when the iron ores exhausted in Pittsburgh area, iron ore was brought from the Mesabi Range, to the west of Lake Superior. Pittsburgh and Youngstown are the main iron and steel center. Most of steel produced is used in the engineering industries of the region.
2. **The Great Lakes Region:** the Iron and steel industry was established in this region because of the presence ports along the southern shore or Lake Arise, where iron ore was transferred from ship to rail wagons. These ports were discovered to be well brought for the development of iron and steel industry. Coal was brought from Pittsburgh where already iron ores were exhausted.

   Detroit, Cleveland and Buffalo are the main centers. Another important iron and steel areas is located along the southern shore of Lake Michigan. The plants here use iron ore from Chicago are the main centers and they produce steel, which is used mainly by the engineering shipbuilding and railway industries.
3. **The Atlantic Coast:** The iron and steel plants of this region use iron ore imported from Labrador, Venezuela and Chile and coal from the Pennsylvania coalfield. The main center is Sparrow's Point and Bethlehem.
4. **The Birmingham region:** This industry uses iron ores, limestone and coal all of which are mined in the region around Birmingham, at the southern end of the Appalachian Mountains. Birmingham is the center of the iron and steel region.

The Changing Location of Iron and Steel Industry in the USA

The iron and steel industry in the USA, just like in Europe (UK) has been changing in terms of location from time to time. For example traditionally the location was determined by the location of iron ore and coal and Pittsburgh because the major area (the iron and steel capital) and coal came from the Appalachian Mountains. But where the iron ore began getting exhausted the location changed. Some new the iron and steel industries were located along the coastal areas where there were ports. Thus, nowadays the location of the iron and steel industry has become more flexible due to the emergence of many determining factors:

1.Discovery of new and more valuable iron and ore deposits in different parts of the country has led to the spread of iron and steel industry. The new discoveries took place after the old deposits got exhausted in the Pittsburgh region.

2.The dependence on the imported iron ore from Labrador in Canada made the shift take place the coastal areas. Hence, the ports are other determinant of the location of iron and steel industry not only in the USA also in Europe (UK) following need to import the raw materials from other countries.

3.The industry has begun using more scrap metal than ore due to the advancement in technology. Hence, it can be located wherever there scrap metal materials are produced in a large amount especially where these are locomotive and car industries already established.

4.There are other sources of energy than coal. Hence iron and steel industry is not necessarily tie to the coalfield but also can be located where there is hydroelectric power, especially along the river course. This site has another advantage of being able to supply water for cheap and steel industry.

5.Development of cheap transport means like the St. Lawrence contributed to the increase in locational flexibility of industry since it became another factor that attracts the location of the iron and steel industry.

Hence the emergence of other determinant factors like discoveries of new deposits other source of power like HEP, development of cheap transport, advancement in technology especially recycling of scrap iron material and political influence especially the government influence has made the location of iron and steel industry more flexible not only in the USA but also in other parts of the world like Europe.

Importance of the Iron and Steel Industry in the USA

1. It has encouraged the development of other industries like Automobiles locomotives shipbuilding agricultural machinery aircraft industries and the rolling stock.
2. It has contributed to the fast development of mechanized agriculture in the country due to the production of farm equipment like tractors and combine harvest.
3. It has also encouraged the development of transport and communication systems. This has been through the manufacture of cars and locomotives as well as stimulation of railways construction.
4. It has created employment opportunities in the country.
5. There has been stimulation in the development of towns like Pittsburgh (the iron and steel capital) Detroit, Youngstown, Birmingham and Chicago.
6. It has also stimulated the increase in the power supply centers for the snake of running the industry.
7. Export of the iron and steel products have been earning the country a lot of foreign currency as a source of the government revenue.

Disadvantages of Steel and Iron Industry;

1. It has contributed to the environmental degradation and pollution.

There is air pollution from gases emanating from the smelting plants due to the burning of coal, water pollution by introducing some metal material in water and other chemicals,

soil erosion due to the clearing of vegetation when establishing the industry and infrastructure as well as noise pollution.

2. It has been facing a lot of limitation like iron or exhaustion strong restriction on the use of coal as the source of energy from the environmentalists, it is also expensive to establish since it needs a lot of capital and finally the stiff challenge from other countries with the same industry like China, Japan, Canada, Germany etc.
3. It is involves bulky and heavy materials, which bring problems in the transportation. Transporting such bulky materials involve a lot of costs.
4. Its stimulation on mechanization has led to unemployment since the machines are now doing the work that was being done by the people.

IRON AND STEEL INDUSTRY IN TANZANIA

Among the East Africa countries Tanzania has the brighter future as far as iron and steel industry is concerned. The bright future is due to the following factors:

1. About 500 million tons of iron deposits have been discovered to exist in Linganga area. In Liganga iron is present in large quantity in the titaniferous magnetite iron ore deposits. The deposits are near the surface and hence it will be easy to work on them. The other area where there are iron ore deposits in Tanzania is Kisaki in Morogoro.
2. There are large deposits of power resources, which include Chetewaka – Mchuchuma area with 300 million tons of Anthracite coal and 20 million tons at Ilima area.
3. The existing high demand for construction materials like iron bars have stimulated the government to think on establishing parts of Tanzania.
4. The existence of the present steel rolling industry in Tanga has led to a strong inspiration for establishing iron and steel rolling industry.
5. There also exists other source of power like HEP especially at the stiegler's gorge. These will provide power for the iron and steel industry.
6. The need to cut down costs incurred in importing the iron material from other countries.

The government through the National, Development Corporation (NDC) thinks of exploiting these deposits for the future. This will take place in phases. In this plan it has thought of involving the private sectors in the development of this industry like the SITA steel rolling industry in Dar es Salaam (Tabata).

Advantages Expected from the Iron and Steel Industry in Tanzania

1. It will create employment opportunities for the population especially in the southern parts of Tanzania.

2. It will lead to local supply of steel material to the steel-rolling industry in Tanga.
3. This will cut down costs of importing steel from and hence will save a lot of government revenue that could be used in importing steel.
4. It will facilitate the construction sector such that stronger buildings and bridges will be set up.
5. It will also facilitate the development of transport and communication in the country.
6. Agriculture will also improve since farm implements will be produced in a greater quantity and will be cheap compared to the imported iron and steel materials.

Factors Limiting the Development of Iron and Steel Industry in Tanzania;

1. Lack of capital since Tanzania economy is very low.
2. Low technology among the Tanzania. This has led to the existence of poor skilled manpower.
3. There are poor transport and communication systems such that the transportation of iron and steel materials will be problematic.
4. Poor internal market is another hindering factor delaying the development of iron and steel industry in Tanzania.
5. Traditionally Tanzania has poor industrial based since it has been depending on agriculture as its economic backbone (Economic Mainstay).

Why was faster development of industries after independence in Tanzania?

There was faster development of industries in Tanzania after independence because of the following reasons:

1. The government found that selling processed products was more economical.
2. There was a strong need by the government to diversify the economy rather than depending on agriculture only. Over dependence on agriculture only was risky as putting all the eggs in one hanging basket such that one's it falls the owners suffers a great loss of having all eggs broken. Hence the economy that depends on one economic aspect has the risky of experiencing a horrendous total collapse.
3. There was a need to provide employment opportunities to the young people most of whom were from different learning institution like universities. Hence these could locally and relatively cheaply, provide skilled labor rather than depending on the foreigners whose labor was expensive.
4. There was also a great need to cut down on imports that were expensive and save the foreign exchange earnings for a more comprehensive national development process. The saved foreign exchange could be used in establishing other important economic project especially those related to industrial development.

5.To facilitate the benefit exploitation of the local resources rather than exporting them to other advanced countries where they are manufactured and then resold to our countries more expensively.

Show the Rationale behind the Development of Steel Rolling Industry in East Africa

1. To build a strong industrial base for the countries in order to have fast economic development.
2. To cut down costs on imported goods made of steel (Import substitution).
3. Tanzania especially a wanted to become self sufficient on steel materials (The aim was promotes self reliance in the process of industrial development).
4. To create employment opportunities in the countries.
5. To diversify the economics of the countries so that their incomes could be stable.

What is the Role of the Steel Rolling Industry in East Africa?

1. It has facilitated the construction process like strong tall buildings, bridges, etc.
2. It has helped in the recycling process leading to proper management of wastes. Some of the worn out metallic materials are sent to the industry to be smelted and roiled into steel bars for other important use.
3. Steel rolling industry has lead to the creation of employment among the people in East Africa.
4. Small Industries. Which use appropriate technology (AT) has emerged, for example Jua Kali. These use some of the materials produced from the steel rolling industries.
5. It creates market to the power produced from different power resource centers. The power is needed for smelting the iron materials before they rolled.
6. It has stimulated improvement in transport and communication network especially as a result of the constructing bridges etc.

Factors that hinder Development of Manufacturing Industries in East Africa are:

1. Low level of technology used in the establishment of the industry.
2. Low level of capital to be invested in the industries.
3. People are so migratory (they keep on moving from place to place and hence they cannot concentrate on production).
4. Civil wars also hinder industrial development in East Africa.
5. Low government support on the industry development. Policies are not giving strong emphasis on the manufacturing industries. The priority is given on processing industries.

6. Poor availability of raw materials. Some of the available resources are of poor quality and some tend to exhaust quickly.
7. Poor transport and communication. Hence, the transportation of manufactured goods and raw material is very costly.
8. Poor labor supply to the industrial places due to low skills or death of young and energetic people due to accidents and diseases like HIV/AIDS.
9. Limited mineral sources and sources of energy. Sometimes the energy supply unreliable.
10. Limited or poor marketing system. The local people have low purchasing power while the international market is highly competitive and most of our products are primary in nature hence do not have strong market command.
11. The present machines are old and hence they cannot facilitate the industrial activities to a great extent.
12. The people themselves do not have strong determination as far as high development is concerned. It is not like in Japan where people are so determined and are hard working.
13. There are poor research activities that take place in the country, and those, which are being carried out, take quite a long time while the demands are cropping so high day after day.
14. Explosive population growth hinders fast development process, because more attention is given on solving population problems like diseases and food supply abandoning the development of industries.
15. Hazards also pose a great problem especially in the location of the manufacturing industries. For example there is a great fear in establishing or locating the industries in Rungwe (Mbeya) because of sporadic earthquakes that pose a great menace of problems to people.
16. Colonial legacy. The colonialists created poor industrial foundation that the countries inherited. Most of the industries were processing industry and most of them were dealing with cash crops. Hence there was no any strong foundation that could encourage the development of heavy in the countries.

Ways of Improving the Industrial Base in East Africa.

1. There should be improvement in transport and communication systems.
2. There should be improvement in science and technology so as to facilitate industrial growth.
3. The government should formulate policies which support industrial development in the country.
4. The local resources should be explored and exploited for industrial use.

5. There should be control of population growth so that the capital can be invested in industrial development rather that supporting the rapid growth of population.
6. People's on production rather than wasting time moving from one place to another.

Tanzania has a great Potential for Industrial Development, justify:

Tanzania has a great potential for industrial development due to the following facts:

1. It has about 500 million tons of iron deposits that have been discovered in Liganga area. In Liganga iron is present in a large quantity in the titaniferous magnetite iron ore deposits. The deposits are near the surface and hence it will be easy to work on them. The other area where are iron ore deposits in Tanzania is Kisaki in Morogoro.
2. There are large deposits of power resources, which include Chetewaka-Mchuchuma area with 300 million tons of Anthracite coal; and 20 million tons at Ilima area. There also exists other sources of power like HEP especially at Kihansi, Nyumba ya Mungu, Mtera etc. these will provide power for heavy industries.
3. The need to cut down costs incurred in importing manufactured goods from other countries.
4. It is assured of labor supply due to high population.

However, the Development will depend on the Following Aspects:

1. Improvement in technology through training of manpower available.
2. Improvement in the transport and communication system for easy movement of goods, people and services.
3. Capital availability for being invested in the establishment of the industry.
4. The state of both external and internal market for the goods that will be produced in the industries.

How Tanzania Can Modernize Her Manufacturing Industry?

1. Improving science and technology through training and educating people. The skilled labor should be utilized in the industrial processes.
2. The energy supply should be improved so that the machines can utilize effectively.
3. The policy should put more emphasis on the modernization of industries especially developing heavy industries should use local resources like iron ore from Liganga and Kisaki. Emphasis on food processing industries should not overshadow the development of heavy industries since these industries lead to fast economic development. They also encourage the development of other industries.

4. Also there should be wider chance given to the private sector to invest in the industrial development rather than leaving the whole burden to the government which is not having enough capital.
5. The quality of products should be improved so that they can get market outside.
6. Modernization will take place fast once there is a strong control of population growth. Population growth creates pressure for land and hence industrial location tends to be problematic.
7. Another way that Tanzania can purse in the modernization of its manufacturing industry in through being a member of international organization. These help in the diffusion of technology and expanding the market for the manufactured goods.
8. There should be improvement in transport and communication in order to facilitate the movement and distribution of manufactured goods to different places air transport.
9. The need to avoid physical harrier like water bodies mountains rift valley and vegetation so as to promote an international contact. There are mountains like the Rockies and Appalachians, which act as barriers to land transport.

5.9 TRANSPORT AND COMMUNICATION

Transport means the movement of goods, people and services from once place to another place. Transport is an important aid to trade.

Importance of Transport;

1. It can make goods available where they are demanded.
2. It facilitates mass production by enhancing supply of raw material movement of goods to the market, and necessary equipment for production.
3. Transport is one of factors, which improves trade relations within economic units.
4. It leads to the intensification of unity among the nations.
5. Leads to the spread of technology since transport facilitates communication between different places.

Types/forms of Transport

There are three main types/forms of transport. These include:

1. Land transport.
   (a) Human portage
   (b) Animal transport
   (c) Road transport

(d) Railway transport

(e) Pipeline

2. Water transport
3. Air transport

1. LAND TRANSPORT

a. Human portage

It is the most common type of transport used by the majority of the people in various parts of the world. This is because most of the parts in the world are remote, severely lacking capital and skills to put in place the modern methods of transport. A person who carries things is called as a porter.

Human portage has an **advantage** of being used where other forms of modern transport cannot be used. For instance in the mountainous or swampy areas.

Disadvantages are that it is extremely slow and laborious to the user. It is therefore, not very development to the country.

b. Animal Transport

It's the form of transport, which involves the use of animal and is not so well developed in many parts of the world it is commonly used in those areas, which are wild and hostile so that other means of transport are hard or difficult to be used. The animals commonly used may include camels, donkeys, horses, cattle; dogs' etc. animal can be used for riding as well as carrying or pulling loads. These animals, which are involved in this type of transport, are referred to as draught animals.

Advantages;

1. Animals are quicker than human being.
2. They carry heavier and larger loads than human being.
3. Animals are capable of being used in adverse (hard or hostile) condition like desert and waterlogged region.
4. It is relatively cheap and more developmental than human portage.

c. Road Transport

Road transport involves the use of vehicles, motorcycles, and so on. It is well developed in various parts of the world. The best example of well-developed road network is in Germany. In Africa; It is South Africa which has the best road network in the eastern part of the country due to mining, industrial development, trade and agriculture. In Tanzania and East Africa at large, road transport is the most important and it will continue to play a vital role in the economic development of the countries.

Advantages of Road Transport;

1. Road transport is flexible. It can be constructed to many places and can serve even individual homesteads.
2. Road transport offers a variety of transport facilitate giving a customer a wider choice of the type of facility to use. For example the facilities can be trucks, taxis buses etc.
3. It is faster and cheaper at shorter distances.
4. It is suitable for delivering perishable goods for short distance e.g. Vegetables, milk fruits and so on.
5. Road transport is easy to construct and run compared to railway transport.
6. Vehicles that run to the road do not need to run on time schedule like trains and planes. But schedule can be involved at a minimal extent with buses.

Disadvantages (Short comings);

1. It handles a specific and limited amount of goods.
2. Usually heavy loaded lorries are too slow to cover up the expected distance.
3. It is too risky especially for delicate goods. This can cause breakage or destruction goods like computers and glass materials causing a great loss.
4. Weather conditions tend to disrupt road transport especially during the rainy season.
5. It is highly susceptible to attacks by highway robbers on the way.
6. Road transport has led to the increase of road accidents leading to the loss lives of many people.
7. Road transport usually because of being too congested (traffic jam) in the urban areas may end up being very expensive and deterrent to the users.
8. Transport facilities have contributed to air and water pollution in the worlds.
9. Construction of roads encourages land degradation.

ROAD TRANSPORT IN GERMANY

Germany especially West Germany has the most advanced road network.

The road network is characterized by modern system of motorways (Highways). The importance of roads in Germany has increased as a result the explosion in car ownership. Germany leads with the total of over 20 million automobiles and for every three people in the country there is one car unlike in India where for every 800 people there is one car. Other factors that have stimulated the development of roads in Germany are fast industrial development, advanced technology in road construction the mining industry and the development of tourism.

Problems which have been caused by the rapid development road network include congestion and road accident as well as air pollution which have led to the occurrence of acidic rain.

One of solution to these problems includes the construction of the wider motorways that run from Germany high-speed freeways with total length of about 11,000km

(68,000mile). The motorways are relatively new form of transport. They tend to radiate from the capital cities. They began being constructed before the constructed before the World War II by Hitler for military reasons; Hitler was responsible for the construction of 3,200km of highways (autobahns). But by that time they were narrow while nowadays have been widened and the network enlarged. These roads are straight and cut directly through a country. They have a good surface and hence they facilitate efficient transportation with reduced chances of the occurrence of accidents.

Characteristics of Roads in Africa

1. Most of them are untracked and are not all water roads. Most of them can be used during the dry season and stop being used in the wet season.
2. They are not evenly distributed. The dense network is in areas which are economically potential, e.g. mining areas towns due to market industrial areas or politically influential like the administrative headquarters or capital cities.
3. Most of road were built during the colonial period and few have been added by the local governments.
4. They connect different nations and region but interconnection between local areas is poor.

d. Railways Transport

This involves the carrying of goods and passengers by train. Today railway transport has become an important means to transporting bulky goods. This has been a result of rapid industrial development in various parts of the world, where bulky raw materials and finished products have to be transported for long distance. Railway transport has also become an important of transport in Western Europe due to traffic congestion of various vehicles, which slows down greatly people's movement.

Advantages of Railway Transport

1. It is suitable and relatively cheaper for transporting bulky commodities or goods over long distances.
2. It is less affected by unpredictable weather condition if is well constructed.
3. Once the railway has been constructed, Its operating costs are very low and hence freight charges are usually lower, over long distance than those charged by the roads for most commodities.
4. More loads and a greater number of people can be transported at a single journey compared to road and air transport systems.

Disadvantages of Railway Transport

1. The railways are expensive to build. A lot of money is required to lay down the lines and all other facilities e.g. stations warehouses etc.
2. It is not flexible like transport. Only areas with railways line are the ones that can be served. Also door to door service cannot be done with the railway transport.

3. It is not suitable for commodities, which are perishable, like milk and vegetables or goods which are urgently needed like medicine newspapers and so on.
4. Rail transport is not mostly efficient and time conserving. Especially in the developing world, train services are too slow and backward.
5. Because of strictly adhering to time schedule, sometimes it may cause some inconveniences and delays.
6. Rail transport is a bit costly in terms of equipment rail setting and train purchasing and maintenance.
7. The gauge of the railway lines vary from one place in some places the gauge range from 1.5 – 1.7 meters while other is as narrow as 1metre. Many parts of Africa have narrow gauges.

Characteristics of Railways Transport in Africa

1. The railway lines are running parallel to each other with little or no interconnection within local areas.
2. Most of them are running from the areas with economic importance to the coastal areas for export. For example – Ghana has a railway line running from Sekondi to the Tarkwa gold mining area, sierra Leone has a railway line which runs from Freetown. To Pendembo which was mainly to serve the oil-palm growing areas, Liberia had a railway line which was built to serve the iron-ore mining area in the interior. It runs from Monrovia to Rome hills. In Tanzania the central line runs from Mwanza (the source of raw materials and minerals, Kigoma and Rukwa the source of labor and minerals.
3. The railway lines are unevenly distributed. Some areas are better served and other is not. Good railway network is found in South Africa in the Eastern part.

   Hence, in many parts of Africa there is a close relationship between railways and the location of mineral or areas of economic importance like mining areas agricultural areas labor reserves, etc.

   Example of railway line is TAZARA railway line running from Dar es Salaam – Tanzania to Kapirimposhi – Zambia and the central line from Dar es Salaam to Mwanza, Kigoma and Mpanda.

RAILWAYS TRANSPORT IN SOUTH AFRICA

South Africa has the most advanced railway network in Africa. This is concentrated in the eastern part of the country due to the presence of mineral deposits. Good agricultural land and presence of many industries. Railway construction began at Cape Town in 1859 and today a large portion of it is electrified. It is estimated that South Africa Railway handle more than a half of the total railway freight in Africa and covers within the territory a distance of more than 21773 km.

Advantage of Railway in South Africa

The railway system has stimulated industrial development, mining industry, development of town like Johannesburg, development of tourism in the country, increased mobility of the people expansion of market both internal and external the railway is used in the

distribution of goods within the country and ferrying goods to the ports for export, it has facilitated the process of administration and information flow in the country.

PIPELINES

These are type of pipes constructed to carry liquid material such a oil.Example of these pipeline is the TAZAMA which is jointly owned by Tanzania and Zambia carries oil from Dares salaam to Ndola in Zambia **OR** Is the transportation of good through a pipe.

Pipelines constitute another form of transport system which has grown in importance since the formation of the customs union in Europe.

Pipelines carry liquids especially oil. In Tanzania TAZAMA is an example of the pipeline which runs from Dar es Salaam oil refinery (TIPPER) to Ndola in Zambia which is 1700km. In Kenya the pipeline managed by Kenya Pipeline Company extends from Oil refinery near Mombasa to Nairobi covering a distance of some 450 km.

Advantages

1. It involves low unit costs and easy to maintain.
2. There is no physical barriers.

3. It has high ability to cover long distances.
4. Where volume and market demand is sufficiently great and stead pipelines are more economical than forms of transportation.
5. There is low rate of risk unlike tankers.
6. It is very reliable.

Factors Limiting the Construction of Pipelines in Africa are:

1. Low or lack of capital to be invested in the construction of the pipelines.
2. High costs of construction are also a limiting factor.
3. Poor cooperation between or among the countries in Africa.
4. Political instability in different countries which lead to the outbreak, conflict like civil wars. These lead to the destruction of the pipelines and consume a lot of money could be invested in the construction of the pipelines.
5. Lack of reliable deposits especially in Tanzania and other East Africa countries.
6. Low technology among the Africans.

Economic Importance of the Pipelines in East Africa

1. They have stimulated industrial development because of stimulating the supply of fuel oil in the countries.Example construction of industries in Mtwara region due to presence of gases pipeline.
2. They have stimulated the development of trade between the countries sharing the pipelines. For example Tanzania has established strong relationship with Zambia because of sharing the TAZAMA pipeline.
3. They have led to the creation of employment in the refineries and the industries developed of the better supply of oil through the pipelines.
4. Also the life standard of the people in the countries has improved due to fuel supply.
5. Pipelines have cut down costs of transportation.

2. WATER TRANSPORT

Considering the geographical location of continents water transport is the most convenient means of handling the movement of goods between continents. This type of transport has been used from earliest times. This type of transport can be divided into two sub-divisions that are inland water transport and ocean transport.

Inland water transport involves the use of river lakes and canals. Ocean water transport involves the use of seas and oceans. The facilities that are involved in water transport are ship, boats, canoes etc.

Advantage of Water Transport

1. Water transport is cheap since there are no costs of constructing waterways unlike railways and roads.
2. Water navigation facilities such as port tugs and lighthouses do not need frequent repairs and maintenance.
3. It carries heavy and bulky goods over a long distance.
4. Usually little time is wasted of traffic control unlike is other forms of transport.
5. Is suitable for the transportation of fragile or breakable goods e.g. glass, since there will be very limited shaking and jolting on the waterways.
6. Usually costs of collection and delivery are minimized especially where the ports of dispatch are in the same waterside.
7. There is limited chance of robbers unlike in the case of highways of either roads or railways.
8. Facilitate the development of industries by enhancing the supply of raw materials.

Disadvantages of Water Transport;

1. Perishable or urgently required goods such as newspaper cannot be transported through this means to final consumer.
2. If there is use of water canals', these are greatly affected by the dry season.
3. Water transport system cannot be constructed anywhere. It is specific in areas with water bodies while roads and railways can be established in many areas.
4. There is a problem of strong winds, which greatly interfere with the shipping schedules.
5. There are dangerous animals like crocodiles and hippopotamus, which affect the lives of the people.

MARINE TRANSPORT IN JAPAN

Marine transport in Japan is highly developed. It has different types of ship like liner for passengers; Cargo liners use for both passengers and general cargo and follow the scheduled routes. Bulk cargo ship for large cargo like oil iron ore wheat grain and have mechanized loading and unloading for example oil tankers which include super tankers there also container ships which use containers for carrying goods and loading is done by fork lift truck; The advantages of containers includes low costs and reduction of breakages, Other ships include Tramp Cargo ships, which carry assorted cargo and they call at any port. These have no specific sailing dates. Finally there is several fishing vessels fitted with refrigerators pilot vessels etc.

The Development of Marine Transport in Japan has been facilitated by the Following Factors:

1. Presence of many indentations along the coast, which have provided the sites for the development of ports in the country. The coast is long totaling some 29,750km (18,490) miles major harbors have developed at the bays like Tokyo pay between Tokyo and Yokohama, Osaka bay at Kobe Osaka metropolis, Tse bay near Nagoya etc.
2. The expansion of the fishing industry has encouraged the development of marine Transport which has been facilitating the shipping of fish products to the country itself or to other country's overseas. The Japanese are highly depending on marine products for their development since they have poor availability of land resource and the physical landscape in the interior has forced people to locate their settlement along the coast.
3. Land reclamation along the coast has created more land for the establishment of harbors.
4. The need to import some raw materials from other countries for the industrial development has facilitated the development of marine transport. Japan has limited mineral deposits hence it has been importing some raw material from other countries for her industries. It imports iron uranium etc for her industrial development. So the marine transport development could provide cheap transport for the imported goods and save some foreign currency.
5. The presence of shipbuilding industry has promoted the development of marine transport in Japan since Japan produces.
6. Advanced technology and the per-existing experience of sailing among the Japanese have made the development of made the development of marine transport.
7. The location of the country (being surrounded by the sea) has made Japan develop the Marine transport.
8. The strong need to expand trade by creating external market has also stimulated the development of marine transport. This happened because of the fast development of manufacturing industry in the country, which led to high production of goods that became more than the local demand.
9. The presence of forests in the country has also provided timber for the construction of ships in the country.
10. The availability of capital that made the government invests in the marine transport.

Contribution of Marine Transport to the Development of the Economy in Japan

1. It has stimulated the further development of the fishing industry in Japan. Both offshore and deep ocean fishing takes place.
2. It has encouraged the development industries since the raw materials are imported easily from other countries.
3. It has led to the expansion of market for the industrial goods produced in the country. The ship is used in transporting the goods to another country at low cost.

4. Marine transport has also expanded the international relationship with other countries.

5.It has also encouraged the intensification of research activities and further diffusion of technology in the country.

6. The major problem facing the marine transport in Japan is the frequent occurrence of earthquake since the country lies in the zone of convergence of tectonic plates. For example in 1995 there occurred a severe earthquake at Kobe that disturbed the coastal areas and this threat still exists.

7. Marine transport has contributed to environmental pollution especially water pollution and land deforestation as well as overfishing.

THE ST. LAWRENCE SEA WAY

This is one of the largest water in the world. It is formed by the great lakes of North America i.e. Lake Superior, Michigan, Erie, Huron and Ontario which are dreamed by the St. Lawrence River. It is shared by both Canada and the USA. The route covers 3,800 kilometers stretching from the mouth of the St. Lawrence River on the Atlantic coast to the port Duluth on the Lake Superior. The 50 kilometer long Wetland canal provides a link between Lakes Ontario and Lake Erie. Lake Huron and Erie are linked by St. Clair and Detroit River whose channels are drained frequently to improve their navigability. Lake Michigan and Huron are at the same level by a strait. The Lake Michigan lines entirely in the USA while other are on the border of the USA and Canada. The Soo Canal or Sault St. Marie Canal bypasses rapids on the St. Mary's River to facilitate navigation between Lakes Huron and Superior.

The construction of the St. Lawrence Seaway Project started in 1954 and ended in 1958. The four years sea way project was jointly set up by the Governments of USA and Canal with following purposes:

1. To remove rock shoal rapids, several Island and fall so as to make the river navigable. These hampered navigation in the river.
2. To check the problem of shallow water in some areas by deepening the river channel.
3. To remove silting caused by the delta deposition between lakes Erie and Huron
4. To remove differences in the lake levels.
5. To enlarge the course of the river so as to accommodate ocean going ship. This involved the widening of some section of the river where it was too narrow.
6. To construct dams so as to generate hydroelectric power and regulate the river flow.

Development of the Sea Way

The work of developing the sea way involved the following

1. The building of locks and dams to remove rapids and materials.
2. Dredging to widen and deepen the river as the need dictated.

3. The building of the canal to join lakes Erie and Ontario. The building of the canal was undertaken while preserving the Niagara Fall, a source of HEP and tourism attraction.

Between 1954 – 1958 the obstacles were removed. A thousand island which formed shallow rocky areas were removed. The rock shoals were removed by blasting. Several dams and locks were built. The numerous rapids, like Lachine and long Sault, were drowned by the water reservoirs formed behind the dams. The removal of these obstacles enable ocean going ships to use the inland water way.

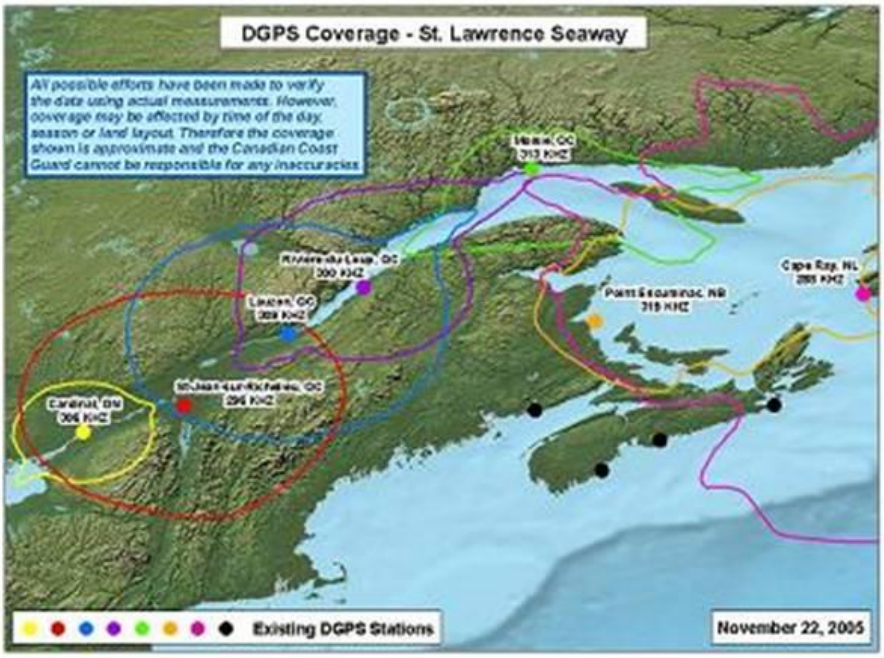
The Work of the Sea Faced Some Problems as Follows:

1. The USA was unwilling to share the costs. Furthermore the USA feared the importance of New York would decline as a result of opening up of the seaway.
2. Land was lost where the river was widened causing displacement of many people who had to be resettled.
3. The December to April winter freeze meant that ice-breakers had to be used on the seaway.

Despite the problems Encountered During the construction of the project, the St. Lawrence Sea way has brought several benefit:

1. There has been a huge increase in the total trade passing through the seaway. The 3,800 kilometer inland water stretch has increased trade between the USA and Canada and the rest the world. Iron ore from Mesabi Range, West of Lake Superior is transported through the route to the Pittsburgh industrial area for use in the iron and steel industry. Other commodities transported along this water way include copper, wheat and timber. The flow of traffic from inland is more than the ones going upstream.
2. It has encouraged the growth of ports like Toronto.
3. There has been development of towns like Quebec and Montreal.
4. There has been growth of agricultural production. Truck farming or market gardening is well developed to serve the urban population.
5. Ease of transport: The removal of various bottlenecks on the route made it possible for the ocean liners to reach the interior parts of North America. The seven locks and the two dams (Iroquois and Cornwall) on St. Lawrence – Sea way ensure the regulation of the flow of water. Furthermore, canal form good links with lakes, thus increasing the volume of cargo, which passes through the route. A total of more than 3,700km of the seaway is open for ocean going ship.
6. HEP is available for the people and the power has stimulated industry growth. Four dams on the St. Lawrence Sea way (Moses Saunders and Beauharnais), Niagara Fall and Sault St. Marie generate electric power, which is used in homes and industries.
7. Costs of transportation especially of the bulky goods (iron, coal, grains) have been greatly reduced.
8. Foreign ships pay toll charges, which go to the government of the USA and Canada.
9. The seaway is the model for cooperation between countries.

10. It has added to the tourism attraction in the countries. St. Lawrence has the world spectacular waterfall, the Niagara Fall. This waterfall attracts a lot of tourism and generates plenty of hydroelectric power from Canada and the USA.
11. It has created employment opportunities in transport and industrial sector of the region. This has been due to the increase in the movement of raw materials and industrial products.



ST LAWRENCE SEA WAY.

3. AIR TRANSPORT

It involved the use of vehicles,bicycle and motorcycle

Air transport is the latest and the faster means of transport in most countries. It is usually confined to urgent cases. The first successful air flight was made by the American Wright brothers in 1903. Great development has taken place since then. Aeroplanes were developed for military purpose during the first war. But nowadays they are used for transporting goods and passengers.

Advantages of Air Transport;

1. It is the fastest means of transport, therefore useful for urgent cases and transportation of perishable goods.
2. It leads to low risk of damage since there is not rough movement and goods do not stay long in transit.
3. It is free of physical barrier (Sea Mountain etc) and hence it is free to go in any direction.
4. It is comfortable and less tiresome especially where one is required to travel greater distances.
5. Operation of air transport are on schedule and this ensure no time wasting.
6. Planes play a major role in providing relief in major disaster areas where other forms of transport are absent or unable to reach. For example during floods, droughts, epidemics and earthquake, rescuer personnel and food can quickly be airlifted to the affected area.
7. Air transport has facilitated tourism in different parts of the world like in Western USA.
8. It has facilitated the transfer of technology from the developed countries to the developing countries.
9. It has also led to the strengthening of international relationship among the countries.

Shortcomings of Air Transport;

1. It can't transport bulky or heavy goods or poorly packed goods.
2. Dangerous commodities such as those which are likely to cause fire (e.g. petrol, paraffin etc) are transported using air means.
3. Usually weather conditions like fog or mist greatly interfere with the schedules compared to other means of transport.
4. Construction of air-field (airport) is usually expensive.
5. Air transport service involves expensive fares such that ordinary people cannot afford.
6. Usually considerable time is wasted in air traffic control over the airfield e.g. cheeping, booking etc.
7. During accidents there is very little chance for survival. Therefore it has contributed to the loss of life of many people in the world.

8. It faces problems of hijacking like what happened in USA on 11 September 2001 where the World Trade Center in New York and the Pentagon building in Washington were horrendously destroyed leading to the loss of many people's lives.
9. The airport are normally built far from towns, therefore time is lost in taking goods to the airport.
10. It contributed to the air pollution as a result of the burning of fuel and emission of greenhouse gases.
11. There is limited freedom of air since many nations claim all the air space over their territory. Foreign planes cannot use this space without permission to obtain flying right is often a long and expensive battle.

AIR TRANSPORT IN THE USA

Air transport is highly developed in the USA and ranks at the top position in the world. The first successful flight was made by American Wright Brothers in 1903 and later after the World War I more production started and air transport expanded fast. The USA is the largest producer of aircraft in the world with industries near Los Angels, at Seattle (on the Pacific Coast). This has contributed to the development of money airports in the country.

Factors that Facilitated the Development of Air Transport in the USA

Physical Factors;

1. The size of the land is so extensive that the government saw the need of establishing the air transport in order to facilitate mobility in the country. For example from New York to Los Angels is over 2500km such a long distance has propelled the development of air transport.
2. The need to avoid physical barriers like water bodies, mountains, rift valleys and vegetation so as to promote an international contact.

   There are mountains like the Rockies and Appalachians which act as barriers to land transport.

1. Pre-existing technical advancement and Military demand during the World War I encouraged the fast aircraft industries development. This has facilitated the rapid development of air transport in the USA.

2.The strong need for space exploitation also has promoted the air transport.

3.The need for speedy transport especially when there are urgent cases like rescoring people from flood of earthquakes, sending medicine or taking the sick people very far across the continents and international leaders, sending perishable goods like milk, fish, vegetables as well as fresh fruit and the growth of package holidays since 1960's associated with the increase in tourism.

4.Advanced researches in air transport facilities.

5.The fast and large-scale agricultural development has led to the need of aircraft in spraying large tracks especially the plantations.

6.Availability of capital to be invested in the establishment of airports and manufacturing of aircraft. This has greatly been possible due to the advanced economic level of the country.

7.High per capital income or high living standards justify the use of air transport. This is due to the fact that, despite being relatively costly, people can afford the air transport.

8.The manufacture of aircraft facilities in the country and the presence of many airports.

Problems facing the Development of Air Transport in East Africa;

1. There are few airfield.
2. Establishing airports is very expensive.
3. Low capital since many people is poor and hence they cannot afford this type of transport.
4. Low capital availability.
5. There are no local industries for producing planes.

COMMUNICATION

Is the exchange of information or message between people. It can also be defined as the process of passing information from one part to another part. Transport and communication are so related since through transportation, information can move from one place to another place. This means that transportation facilitates communication.

There are channels of Communication that is Oral, Written and Visual.

1. **Oral Communication** is the method through which people contact one another through telephone, radio, face to face conversation, and recorded message.
2. **Written communication** involves the transmission of information in written form like letters, parcels, post cards, telegrams, e-mails, telex, fax, etc.

3.**Visual Communication** includes passing information through charts, photographs, films and graphs. Sometime these channels can be combined for example oral and visual can form audio visual communication etc.

The Role or Significance Communication;

1. It has led to the spread or dissemination of ideas and information on various aspects of a human society.
2. It has lessened the isolation of remote places especially telecommunication and radios.
3. It has enhanced the ability to warn of disasters and to organize relief or rescue more rapidly.
4. It has greatly assisted in the promotion of trade by allowing shipping firms to direct their vessels by transmitting news using radio, Television and newspapers.
5. Radio and Television have become important in the entertainment aspect.
6. Communication helps in spreading education and promotion of technology.
7. It has a big role to play in the political matters all over the world. Leaders use different means of communication to speak to their people and mobilized them for the general human and economic development.
8. It has instilled sense of competition since people keep track of events around the globe.
9. It has been used in enhancing gender equality through education and reducing violence in the societies.
10. Communication is used encouraging people on the necessity of facing different challenges.

Disadvantages of Communication;

1. It can lead to disunity or conflict among the people especially when negative information or report on people are passed from one place to another.
2. It is always affected by distortion and fallacies.
3. It is costly especially telephone such that few people in the country like Tanzania can afford.
4. Establishing communication lines needs high capital.
5. The services are supplied unevenly. Some places are better served due to their economic importance than other places.
6. It helps in spreading immoral value in the societies hence encouraging the evil activities like prostitution etc.

Problems Facing Communication in the Developing Countries;

1. There is lack of capital to be invested in the communication industry.
2. Illiteracy in some areas hinders the development of the communication system as the flow of information.
3. There is low technical know-how among the people and poor equipment to carry out research.

4. There is poor transport network which to leads to inefficient information flow because of the reduced people's mobility.
5. Low income among the people is another hindrance facing the development of transport and communication systems.
6. Low volume of trade in some countries discourages the development of transport and communication network.

Solution to the Problems that Face Communication in Kenya;

1. Borrowing from friendly countries and international institutions so as to finance communication networks.
2. Training institutions are being established to provide the necessary personnel, e.g. the school of Journalism, Kenya institute of Mass communication Railway Training School and Post Office Training School.
3. Adult education and low cost education system are being adopted to reduce illiteracy.
4. Diversification of production is being encouraged in order to boost incomes.
5. Emphasis is being laid on small scale industries so as to improve earnings of the people.
6. Import restrictions are being reduced or removed to allow the importation of communication components.
7. Local industries are being encouraged to produce spare to meet the local demand for communication gadgets.

COMMUNICATION IN THE USA

The USA has the most developed communication network in the world. She has Over 70 telephones per hundred people, has the largest number of radios, has high number of television station, has the highest number of newspaper, has an advanced and highly precise satellite network covering the whole world.

Q. Account for such great advancement in communication network in the USA.

These can subdivided into physical, political and human factors.

A. Physical Factors;

1. **Relief:** Distance and relief features like mountains; escarpment plateaus etc affect the cost and possibility of building the lines of communication. Where the land is flat transport and communication develops easily and involves low costs.

2.**Earth's movement** like earthquakes, faulting and volcanic lead to the difficulties in developing transport and communication system. These movement can also destroy the existing transport system develop the transport and communication systems.

3.**Climate** is another factor which determines the development of transport and communication. The areas which experience heavy rains like the Congo area and Amazon lead to poor transport development.

B. Political Factors;

Political factor influence the development of transport and communication in the country. The governments can therefore decide on the development of transport and communication system in their respective countries.

Also the country with peace experiences smooth development in the country but where there is no peace the development becomes slow and the existing means of transport and communication can be destroyed due to the lack of peace in certain country.

C. Economic factors;

Development of transport and communication system takes place fast where there is enough capital. But lack of capital leads to poor development of transport and communication while the areas which are not having enough resources experience poor development of transport and communication.

Importance of Transport and Communication

1. They encourage the development of industries through the supply of raw materials and transportation of manufactured goods to the market or consumers.
2. They create employment in the country. For example some people are employed as drivers, station master etc.
3. They facilitate the spread technology in the country.
4. Enhances the accessibility of places.
5. They lead to the promotion of trade in the world.
6. Transport and communication encourages the development of tourism in the country.

Negative Effects Transport and Communication;

1. Transport leads to accidents especially in the roads, water and air.
2. Transport and communication facilitate terrorism in the world.
3. Construction of transport and communication system leads to the decline of other sectors because of involving high capital investment.
4. Also the construction leads to the destruction of people's properties and displacement of people for the sake of laying the transportation and communication lines across certain area.

Problems Facing Transport and Communication in Africa;

1. Low capital for investing in the development of transport and communication system.

2. Remoteness is another problem. Some places are so remote such that they are not accessible easily.
3. Political conflicts lead to the destruction of transport and communication lines. They can also limit the construction of the communication lines
4. Climatic condition like very heavy rains leading to floods affects the development of transport and communication systems.
5. Land lockedness leads to high costs since landlocked countries have to pass through other countries when exporting or importing their goods. This causes high costs to the transporting from the societies lead to poor communication among the people in the country.
6. Restriction involved in the gathering information from the societies lead to poor communication among the people in the country.
7. Transport and communication facilities are costly hence some people cannot afford the costs.
8. The variation in language between different places is another problem. This leads to poor understanding between the people concerned.
9. Other problems include physical feature like mountains with steep slope and swamps, which limit the construction of the infrastructure and movement of transport facilities.
10. Cost of repair of the old facilities and the transport and communication lines are high.

Future Prospects of Transport and Communication in Tanzania

The success in the development of transport and communication in Tanzania will depend on the following factors:

1. The great government concern in the development of new transport and communication systems like roads, railway lines, telecommunication systems and radio stations. The government has started encouraging the development of this sector in different places. For example there are places where new roads are being constructed and in other places the old roads are being improved especially by widening like the Morogoro road. There is a strong need of switching from single – tract network to double-track network in order to reduce the problems of delays and increase efficiency.

2. Involvement of the local people and the private sector in the development of the transport system and the maintenance of the existing transport systems.

3. Expansion of both internal and external trade. These will necessitate the development or improvement of the transport system in order to enhance the distribution of goods and services.

4. The development of other economic sectors like manufacturing industries, tourism, mining and agriculture.

5. Improvement in the safety standards in the transport systems especially by careful driving, repair of cars etc.

6. Education to the users of the infrastructures so that they can have the sense of responsibility in the proper use of the roads, railways lines, etc.

7. Proper urban planning and settlement schemes in order that there can be enough room for the development of the good roads, railway line, etc.

8. Control on the variation in the types of cars. Once the cars are so variant; they bring the problems of obtaining different types of spare parts to be used in the cars.

REVISION QUESTIONS

1. Define the following terms:

   a) Transport

   b) Communication

2. How does transport differ from communication?

3. Identify different types of transport and explain the advantage of each type.

4. Show the importance of transport and communication in the development of the country.

5. Explain the pattern of railways system in Africa.

6. Identify different types of communication used in Tanzania.

7. What are the advantages of communication to the country like Tanzania?

8. Identify the factors limiting the development of transport and communication in Tanzania.

9. How can Tanzania improve its Transport and communication systems?

10. Show the contribution of pipelines to the economy of Tanzania.

11. Outline the problems facing the pipeline transportation system in Africa.

12. What are the factors affecting the development of transport and communication in any country?

13. Show the role of different communication media (means of communication) in Tanzania.

14. Explain how negative and positive reporting on women affairs can affect their status in the society.

15. Show how positive reporting can lead to the reduction in gender inequality in the society.

5.12 ENVIRONMENTAL ISSUES AND CONSERVATION

The world at large is rife various environmental problems which constitute topical issues that pose a great challenge to both developed and developing countries. These problems are referred to as issues because they are complicated in nature. They have necessitated profound discussions to take place trying to find way of either solving them, or reducing them or copying with them. Examples of environmental problems which affect the world includes environmental pollution, land degradation, environmental hazards like floods, drought, and famine; and severity of these problems have increased nowadays, because of fast technological advancements, population explosion, increase in poverty that lead to poor resources management, political instabilities, etc.

Environmental Pollution;

It's the introduction or addition of any substance or situation that is harmful or not required to the environment or in a place that substance pollutes the environment is referred as the **pollutant**. It is usually a substance that is present at a place wrongly, in wrong amount and at a wrong time.

Pollutants can be categorized into several categories that include gaseous, liquid and solid pollutants.

Pollution can be positive or negative. Positive pollution takes place where pollutants are introduced into the environment leading to problems to mankind, animals and plants. Negative pollution occurs when something valuable or important is removed from the place creating problems to the living organisms for example removal of the upper soil layer by erosion, depletion of vegetation or removal of nutrients from the upper soil layer by leaching process.

The factors that have led to the increase in the rate of the environmental pollution in the world are as explained below;

1. Rapid population growth taking place a global level especially in the third world countries. This leads to the increased rate of production of wastes and problems in managing the wastes.

2. Increases level of poverty in the developing countries make people use cheap energy resources that cause air pollution like charcoal and fire wood.

3. Rapid advance in technology that has led to the development in industries that emit a lot of gases and wastes.

4. Development of transport network that has led to the increase in number of cars that emit a lot of fumes or smoke to the environment.

5. Increase in political conflicts that force people to keep on migrating from place to place and end up polluting the environment as well as the use of weapons like nuclear bombs.

Classification of Environmental Pollution;

Environmental pollution can be classified as Air pollution, Soil pollution, Water pollution and Noise pollution.

AIR POLLUTION

Air is a very important resource in sustaining life without it there can't be life on earth. Is a mixture of gases surrounding the Earth. The gases that constitute air include Nitrogen, Oxygen, Carbon dioxide and other gases. Air is being polluted and this is a very serious problem on earth since the effects of air pollution are spread over the large area and affects everything where that problem occurs. So air pollution is the global problems. Air pollution refers to the introduction of unwanted or harmful substance into the air or the atmosphere. Air pollution tends to vary from place to place.

In urban areas pollution is greater than in rural areas because of industries that emit a lot of smoke and gases. High population affects vegetation in urban areas such that when the wind blows it tends to raise dust leading to pollution of air. Likewise the use of charcoal in towns leads to the production of gases like carbon monoxide that pollutes the urban atmosphere.

In rural areas air is polluted through burning of firewood, burning of the bush that introduces smoke, soot and ashes as well as cultivation and mining that introduce dust and some gases into the air.

Causes of air pollution

Natural causes;

1. Volcanic eruptions – That give out dust, ashes and gases like sulphur, carbon dioxide.

2. Winds- That blow and raise the dust and pollen to certain levels in the atmosphere. Some of the dust has chemicals that are toxic and hence harmful to the living organisms both Flora and Fauna.

3. Temperature inversion – Temperature inversion is the situation in which the temperature increases with altitude. When there is temperature inversion the air impurities are trapped in the lower level of the atmosphere leading to air pollution since the impurities tend to hand in the human premises in large concentrations.

Human causes;

1. Industrial activities- lead to the emission of fumes and gases that pollute the air.

2. Automobiles- also emit fumes and gases just like industries due to the burning of field oil leading to air pollution.

3. The use of charcoal, coal, firewood and fuel oil for different purposes like cooking, lighting, smelting etc lead to the emission of soot, fumes and gases that pollute the air.

4. Construction activities. The construction projects like road construction, setting up buildings etc lead to introduction of dust into the air.

5. Agricultural activities pollute the air through

   (a) Digging in the soil that raises dust into the air

   (b) Spraying some chemical like insecticides that are aimed at killing disease and pests.

   (c) Decomposition of agricultural remains like rice stalks emits greenhouse gases like methane which is harmful to the environment.

6. Mining activities also lead to the introduction of dust and some gases into the atmosphere.

7. Lack of clear and strict policies on air pollution control contributes to the occurrence of air pollution since there is no statement guiding people on how to use resources properly, how to handle wastes and how to combat the existing problem of air pollution.

Effects of air pollution

1. Reduction in amount of solar energy because of being blocked by the layer of dusts fumes hanging in the atmosphere leading to problems in photosynthesis.

2. Transpiration in plants is upset since the smoke and dust settling on the leaved block the stomata.

3. Global warming can occur as a result of trapping of heat energy from the sun by the green house gases. Global warming can lead to death of plants, occurrence of storms and drought due to excessive evaporation, the rise in seal level, etc.

4. Poisonous gases can kill both plants and animals.

5. There can occur depletion of the ozone layer. When the ozone layer is depleted the Ultra Violet rays can reach the surface because different effects like skin diseases etc.

6. Air pollution can reduce clarity of the air especially when there is smog and dust.

7. There can occur acid rain fall when gases like carbon dioxide and sulphur dioxide mix with rain water. Acid rain can latter lead to soil and water pollution.

8. Air pollution creates an irritating smell keeping people in residential areas uncomfortable.

9. There can occur serious diseases affecting respiratory system like bronchitis.

10. Also, air pollution lead to skin and eye itching to human beings.

11. Air pollution leads to food poisoning though contamination of the crops in the farm. For example poisonous dust or radioactive material like lead can settle on vegetables which on being taken by human being because some adverse effects like leukemia, cancer and even death.

Measures towards redacting or mitigating air pollution predicament;

1. Planting tree which absorb gases like carbon dioxide and prevents fast movement of air that leads to the introduction of dust into the atmosphere.

2. Improving the combustion system in the engines so that the fuel can burn completely. When there is complete combustion little amount of gases is emitted from the cars or industries.

3. Reducing number of small cars and introducing mass transit liners (large cars like buses) especially in towns.

4. Finding alternative sources of energy instead of depending on charcoal, firewood and fuel wood. Alternative sources of energy are solar energy, tidal power, geothermal power etc, which are environmentally friendly.

5. The governments should enact strict policies and laws on proper management of resources so that the amount of pollutants can be reduced.

6. Discourage the use of aerosols in the killing of pests and prevention of diseases like malaria. Aerosols introduce CFC's into the air which is so harmful to the ozone layer.

7. Land- filling when dumping the wastes so that when they decompose they cannot lead to the emission of gases like methane into the atmosphere.

SOIL POLLUTION

Soil is an important resource since it supports plant growth, which in turn supports animal life. It plays a great role in the support of agriculture, which is the single major source of food in the world. Like air, soil also gets polluted in different ways but pollution of soil, unlike air pollution, tends to be localized since it tends to concentrate in one area where pollution occurs.

Soil pollution refers to the introduction or addition of any substance in the soil, which is unwanted or harmful to plants, animals and having adverse effects to the soil quality.

Source of soil pollution

Sources of pollution can be categorized into atmosphere, industries, homesteads, mining and agricultural areas.

1. From the atmosphere – The pollutants are introduced into the soil through the acid rain or wind. Acidic rain leads to the increase in the amount of acid in the soil which later destroys the soil structure, corrodes the minerals, and dissolves the nutrients and kills plants and animals. Acid rain is predominant in the industrialized countries like Germany, Eastern part of Canada and Scandinavian countries like Sweden where it has destroyed a lot of vegetation.

2. From the industries – some chemicals, radioactive materials and metals can be introduced into the soil and render the soil unfit for agriculture. Some of the chemical are poisonous in nature; therefore they kill plants and animals.

3. From the homesteads - some wastes like bottles, metallic materials, plastic bags, cans etc which are dumped into the soil pollute the soil.

4. From the farms there are chemicals which include pesticides like DDT, crop remains, fertilizers etc, can get into the soil leading to soil pollution.

Irrigation agriculture encourages the accumulation of salt in the soil (Stalinization) which leads to the increase in alkalinity. The increase in alkalinity can cause the death of plants and some of the animals.

Likewise, agricultural activities can cause negative soil pollution through soil erosion accelerated by the depletion of vegetation.

5. Mining activities – can lead to the introduction of some rock fragments and some mineral like lead into the upper layer of soil. Sometimes mercury is also used in gold mining. Also in some places explosives are used in breaking the rocks. One these substances get into the soil they cause adverse effects on plants and animals.

Effects of soil pollution;

1) Killing of animals and plant (biota) since some chemicals affects the plant and animals cells. Organisms are very crucial in the decomposition of some material in form of humus.

2) Decline in agriculture as a result of poor production caused by poor plant growth. Poor plant growth takes place because of the decline in soil fertility.

3) The decline in agriculture leads to the occurrence of famine, which in turn leads to poor health and death of people.

4) It can lead to water logging or flooding because of poor drainage caused by the soil pollution, which tends to create an impermeable layer of substances in the soil.

5) It makes man incur a lot of costs when trying to fight against the problem of soil pollution, for example liming of soil to reduce acidity of flushing to reduce alkalinity.

6) Change in soil structure as some of the minerals and nutrients are dissolved by acidic materials.

7) Migration of people to other area which have not been affected by soil erosion.

8) Water being polluted through surface run-off and render it unsafe for use.

9) Change in soil color which causes problems in soil classification and determination of land use.

10) Occurrence of diseases in organisms like cancer in human beings.

Measures geared towards curbing the problem of soil pollution

1.Reducing or stopping the use of chemicals in agriculture like DDT dihedron and weed killers.

2.Encourage the use of manure instead of industrial fertilizers.

3.Recycling of wastes rather than dumping them in the soil.

4.Launching afforestation and reforestation programs, which can use up carbon dioxide.

5.Control of population so as to reduce the rate of production of wastes that lead to the pollution of soil. When population is excessively high waste management becomes problematic and this leads to soil pollution, as the wastes are not properly managed.

6.Educating people on how to undertake their activities judiciously.

7.Radioactive materials should be dumped so deep in the ground.

8.Training and encouraging farmers to use proper farming methods like crop rotation, use of organic manure and switch from the traditional system like shifting cultivation.

9.Encouraging the use of alternative sources of energy like solar energy, natural gas, biogas etc which do not pollute the air that can in turn lead to soil pollution through acid rain.

10.Diversification of economic activities can help in combating the problem of soil pollution. For example one can engage in trade or honey extraction rather than depending on agriculture which tends to pollute the air.

11.Formulating strict policies that govern on show to dump the wastes. Fines should be imposed on those who dump the wastes randomly.

12.There should be special areas established for dumping purposes and these should be on area, which will not be used for agriculture or any other useful activities. They should also be away from the water bodies since soil pollution can cause water pollution through surface run-off of water seepage underground.

WATER POLLUTION

Water is a very important resource that supports human life. No water no life. It is used in different ways that is cooking, washing, irrigation, plant growth, cooling the engines, in

construction, transportation, production of electricity, etc. but nowadays water is highly polluted posing great problems to the well being of people, animal life and plant existence.

Water pollution refers to the addition or introduction of unwanted substances in the water which have negative effects to animals, human beings and plants. Water pollution is also referred to as water contamination. Water is said to be contaminated when it contains much wastes or foreign substances that upset the balance between the organisms in water. Polluted water is not fit for human consumption like drinking until it is treated first.

Ways through which water can be polluted;

1. Disposal of untreated sewage (effluent) into the water bodies. The sewage can be from the homesteads, institutions like schools, hotels and hospitals etc.

2. Dumping of wastes from the industries in to the water bodies.

3. These can be in either liquid or solid form. For example hot water and metallic materials can be disposed into the river of the ocean leading to water pollution.

4. Some chemicals and other wastes from the farms can get into the water bodies through the surface run-off or by deliberate dumping by human being leading to water contamination.

5.Oil spills from the leaking oil containers or pipes. This happened in the Indian Ocean when there were some oil spills from TIPPER in Dar es Salaam in 1990s: Oil forms a uniform cover on the surface of water.

6. Some fishermen who use chemicals in fishing tend to cause water pollution.

7. Breaking of the rocks along the coastal areas or near other water bodies using explosives like dynamite which is being used at Kunduchi Beach quarries leads to water pollution. Dynamite can kill fish and plants.

8. Wind also introduces into the water bodies the dust taken from the surrounding areas especially the dry open areas like the deserts.

9. Water pollution can result from volcanic eruptions that take place in the ocean. These spew out some molten materials (Lava) which introduce gases in the water and raise the temperature of the water, Addition of temperature in the water is called **thermal pollution.** Volcanic eruptions are so frequent in the Mid – Atlantic Ocean ridge.

Effects of water pollution

1. Water pollution can lead to the death of plants and animals if the pollutants are poisonous or cause the rise in temperature to extreme levels.

2. Spread of disease like cholera, diarrhea, dysentery and typhoid.

3. Oil spills kill aquatic organisms because it prevents oxygen from penetrating into water. Organisms die because of lack of oxygen (asphyxia).

4. Water pollution leads to the emission of foul smell that causes discomfort to the people around the water body. The foul smell is caused by the decomposition of the organic matter introduced into the water body.

5. Tourism that depends on the presence of the water body especially due to swimming and sport fishing can decline due to water contamination by oil spills, toxic chemicals and solid metallic material.

6. The color of water changes. The water becomes unclear due to the presence of impurities.

7. Multiplication of seaweeds as a result of the increase in nutrients from the wastes in water. The increase in nutrient is called **eutrophication.** The sea weeds like hyacinth in Lake Victoria deprive the fish of its food leading to the decline in the fishing industry.

8. The death of fish leads to the loss of valuable source of protein to human being.

Measures towards water pollution control;

1. Encourage the use of proper fishing methods rather than using chemicals since chemicals end up killing different fish, animal and plant species.

2. The oils containers and pipes should be kept properly and frequently inspected so as to avoid the problem of oil spills.

3. Discourage clearing and settling in the catchment areas since they can contribute to water pollution so as people will be dumping their wastes in the stream sources.

4. Controlling the population growth in order to reduce the amount of wastes produced. Also when people are few it becomes easy to manage the wastes.

5. Using skimmer ships, chalk, and sawdust in removing the firm of oil from the surface of water. These absorb oil. For example chalk absorbs oil and settles with it at the bottom of the water body.

6. Reduction in the use of fertilizers and chemicals in agriculture. Organic agriculture should be encouraged in which manure is used.

7. The government and the NGOs should cooperate in educating people on how to use water, conserving it and where possible they should assist financial in trying to prevent the problem of water pollution.

8. Water should also be kept in clean containers or reservoirs and be covered tightly to avoid contamination.

9. Breaking of rocks using dynamite should be discouraged and hence alternative ways should be applied.

10. Dumping of wastes on the land should involve the land-filling method since random throwing of wastes leads to water pollution that takes place under the influence of surface run-off.

11. If it is necessary to dump in the water bodies then the wastes should be treated first, and separate. The solid wastes should not be disposed in the ocean or any other water bodies.

12. There should be recycling of wastes rather than throwing them into the water bodies. For example the garbage can be given to animals like pigs. Pigs can give dung that can be used as manure in the farms or gardens.

NOISE POLLUTION

Noise is any disorganized loud sound. Sound of a form of energy but when it becomes so loud it causes negative effects (it tends to be harmful). It is another form of environmental pollution since it can damage the body especially the eardrums and the blood system. However, complete absence of sound can be terrifying and probably just as disturbing as noise.

Source of noise

Noise comes from different sources, they include: Factories / work/ workshops low flying air craft's, homesteads like slamming of the doors, moving heavy traffic of cars, roadwork which tends to produce deafening noise, thunderstorm and explosion of bombs.

Measurement of noise:

Amount of energy or level of noise is measured in decibels (dB) using an instrument called sound level meter or "Sound barometer".

Effects of noise

1. Constant exposure to noise levels greater than 80 dB may cause permanent loss of hearing or someone's speech may sound confused.

2. It can interfere with the concentration on mental work in offices or classes leading to numerous errors or disruption of the learning process. Imagine the situation in which students are doing national examination and all of the sudden the bomb explodes near the examination room or construction that involves hammering of nails in the iron sheets is going on. This can contribute to poor performance among students.

3. Constant noise can cause change in blood circulation and even the disruption of the action of the heart (heart failure). This is a great problem to patients suffering from High Blood Pressure (BP).

4. Explosive noise can be so shocking or terrible that some people can end up fainting or even dying.

5. Noise can cause conflicts among the neighbors since, for example among the tenants of the same house or students in the hostels, if one tunes on the radio at the maximum volume this can disturb others and hence there can be conflict among them once it happens that the person concerned does not want to reduce the sound of the radio.

6. Presence of noise at a particular place can discourage developing the institutions like schools and hospitals. For example, the ministry of education in Tanzania discourages people from establishing the learning institutions near the bustling roads where rumbling cars ply at a high degree. In Dar es Salaam, locating a School near the Morogoro road is not advisable since the noise produced by a great number of cars using the road will unavoidably disrupt the learning process.

7. Some explosive sounds especially those produced by the bombs can lead to the formation of cracks in the buildings: This is because some of the sound levels are so high that they lead to the occurrence of earth tremors.

Noise control

(Reduce your levels or you'll reduce your hearing);

Noise pollution is a complex problem to solve. In most instances it is not easy to avoid noise especially in areas with a complex matrix of activities like the bustling cities of Dar es Salaam, Johannesburg and Nairobi. But there are some places where noise like in the

classroom situation or in the hospital premises. But it is important to reduce noise level by doing the following:

1. Sound proofing: This entails the use of materials which have the ability of absorbing the sound and not reflecting it. In the houses materials like carpets, curtains can be used to act as sound absorbers. In the factories noise levels are reduced by supplying ear mutters and sound absorbing screens.

2. Change the materials used in making the car engines. Use the materials which do not produce much noise like bronze gears. Also in roadwork or masonry the plastic material can be used in drilling or hammering.

3. Applying the lubricants in the parts of the machines which involve friction during movement.

4. Avoid shouting unnecessarily in a place where mental work is taking place or reduce the level of voice during conversation.

5. Stopping unnecessary use of explosives and unwise slamming of the doors should be avoided.

GLOBAL CLIMATE CHANGES

The term “climate change” refers to all forms of climatic inconsistency, but because the climatic is never static, the term is more properly used to imply significant long-term abnormal fluctuations in temperature, precipitation, wind system, and all other aspects of the earth’s climate. It is defined by the United Convention on Climate Change as “Change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods’ Climate changes can be abrupt or gradual such that abrupt changes tend to be destructive as the life system and economies have not sufficient time to adapt themselves to the changes. Gradual changes are not a great problem since they allow adaptation in living organisms and economies.

The world has been experiencing changes of climate at different times from its origin. Major climatic changes that have been taking place include extreme cooling or extreme warming of the atmosphere. Extreme cooling of are atmosphere took place during the ice age and the current trend of climate manifest abnormal warming of the atmosphere at a global level, the phenomenon referred to as Global warming. The warming experienced in the twentieth century

began taking place since at least A.D 1400. But from 1880s to date the warming has been taking place alarmingly and catastrophically.

Causes of Catastrophic Climate Changes;

The causes of climate changes are categorized into natural and human (anthropogenic) causes.

Natural causes of climate change;

1) Chance interaction of unrelated events can cause climate change. For example:

   (a) The impacts of asteroids and cosmic radiation from exploding stars called **supernovas.**

   (b) Massive volcanic eruptions that emit greenhouse gases and a lot of dusts in the atmosphere.

   (c) Tectonic Ocean spreading which change the location of the land masses through **Drifting.**

2) Periodic patterns in weather cycles which are caused by various factors as explained using the theories below:

   a) Change in solar energy associated with 11- year sunspot cycles or 22 year solar magnetic cycles might play in the role.

   b) Another theory is that a regular 18.6 year cycle of shifts in the angle at which our moon orbits the earth alters tides and atmospheric circulation in a way that affects climate.

   c) The most supported theory is that of the Serbian scientist called Milutin Milankovitch. He developed a theory called Milankovitch Cycles based on periodic shots in the earth's orbit and tilt. According the Milankovitch cycle's theory the earth's elliptical orbit stretches and shortens in a 100,000 year cycle, while the axis of rotation changes its angle of tilt in a 40,000 years cycle. Furthermore, over a 26,000 – year period, the axis wobbles like an out-of-balance spinning top. These variations change the distribution and intensity of energy reaching the earth's surface and, consequently, global climate. Therefore, climate changes during the ice age were due to Milankovitch cycles and according to this theory the formation and expansion of glaciers worldwide happen after every 100,000 years or so. (Basing on this theory of cycles, do you expect possibility of ice period in the future?).

Human (anthropogenic) causes

Mankind has been accused as being the major culprit in exacerbating or triggering abrupt and catastrophic climate changes at a global level. Currently the world is experiencing Global Warming at an alarming rate such that the temperatures have increased about 0.5^0 C (0.9^0F) over the past hundred years. Globally, the twentieth century has been the warmest since at least A.D 1400. About twelve of the past 19 years were the warmest globally and 1998 was the warmest year since reliable instrument records began 120 years ago. Man contributes to climate changes through the greenhouse effect by emitting greenhouse gases natural gas; the use of air conditioners, refrigerators, and insecticides that release CFCs; large scale rice cultivation and livestock husbandry that lead to the production of methane gas. Climate models suggest that if the current trends continue global means surface temperatures will increase between 1^0C and $4.5.^0$C (2^0 and 8^0F) by A.D. 2100.

Global Warming and Green House Phenomena;

Global Warming is the unusual increase in temperature of the earth's atmosphere, which is caused by the Green house effect. **Green house effect** refers to the situation in which the atmosphere traps and retains heat energy from the sun in the lower levels leading to the rise in temperature. The atmosphere traps the heat with green house gases that hang in it such as carbon dioxide added to the atmosphere through burning of fossil fuel etc: Methane (CH4) released from ruminant animals, decomposing wet rice paddies, coal mines, landfills, and pipe leaks; Chlorofluorocarbons (CFCs) released from refrigerators or insecticides; Nitrous oxide (N_20) from burning organic material and soil gentrification; as well as per fluorocarbons and sulphur hexa fluoride.

These greenhouse gases tend to trap heat from the sun and keep it in the lower levels since the energy radiated from the surface has long wave length, hence cannot penetrate through the gases and get lost into space. Industrial countries like America and Japan release a lot of green house gases and the USA are leading in the production of Carbon dioxide. Carbon dioxide contributes to global warming about 64%, Methane about 19%, CFCs about 11% and nitrous oxide about 6%. In terms of activities, the burning of fossil fuel contributes about 49%, industrial processes contribute about 24%, deforestation contributes about 14% and agriculture about 13%.

Effects of Global Warming and Green House Effects;

1) The rise in temperature has led to melting of ice in various parts of the world. The ice cap on the Kilimanjaro has decreased in size. Also the size of ice sheets on Antarctica has decreased due to melting.

2) The melting of ice has led to the increase of water in the sea and hence the sea level rise. As a result of the sea level rise some coastal areas are flooded; wave action has increased attacking the coast, etc.

3) Global warming has led to the occurrence of strong storms in different parts of the world that kill people and destroy property.

4) Cold areas have become warm such that tropical crops are grown successfully.

5) Disappearance of some animal and plant species due to failure to adapt to the abrupt rise agriculture.

6) Prevalence of drought conditions in various parts of the world affecting food production.

7) Global warming has caused the occurrence of precipitation in other areas, which used to be dry due to the change in hydrological cycle.

8) Problems of floods and drought have led to massive migration of animals as well as human beings.

9) Decline in production has contributed to increase in poverty and prevalence of famine.

10) Increased spread of malaria even in areas, which were malaria – free. For example Rungwe Mountains in Mbeya used to be free of mosquitoes many years ago, but nowadays mosquitoes have infested the mountain areas spreading malaria.

Mitigation Measures against global Warming and Green House Effect;

1) Discouraging the use or burning of material that release harmful greenhouse gases such as fossil fuel, coal etc.

2) Alternative energy sources, which are environmentally friendly, should be encouraged, for example geothermal power, solar energy, wind energy etc.

3) Modification of the combustion system in the machines in order to attain efficient fuel burning and cut off massive release of greenhouse gases especially carbon dioxide.

4) Formulation of international policies and cooperation among different nations in the fight against air pollution.

5) Control of pollution in order to discourage excessive use of fossil and biomass energy.

6) Large scale rice cultivation should be avoided or improved to cut off the release of methane gas.

7) Recycling of wastes should be encouraged rather than burning or dumping on the surface.

8) Encouraging people to walk more than using cars can lead to the reduction of emission of greenhouse gases. Also mass-transit cars should be used more than many small cars.

DESERTIFICATION

Desertification is the process by which the desert fringes are encroaching on potential agricultural land. It can also be defined as the process in which the fertile land is denuded and degraded to initiate a desert- producing cycle that feeds itself and causes long-term changes in soil, climate and biota of the area. In short desertification is simply turning the once fertile and non-desert land into a desert and is largely a human function. The Sahel region in West Africa just south of the Sahara is an example of the area which has undergone desertification to an alarming rate.

The term **desert refers to a types of geographical region (biome) characterized by low levels of moisture, and infrequent and unpredictable precipitation (aridity).** The African countries which have begun to experience desertification include Mali, Niger, Chad, Senegal, Mauritania, and Burkina Faso since they are on the desert fringes. The Sahara desert is extending towards these countries partly because of recurring cycles of drought and also because of man's activities specially overgrazing.

The loss of land through desertification is not only confined to the Sahelian countries but it is also found in other eastern countries of for example, the desert has advanced approximately 100 kilometers inside the country over a period of 20 years, at a rate of about 5 kilometers a year. Desertification is unusually caused by climatic changes and the effect of human (anthropogenic) activities such as over cultivation and over-grazing.

Causes of desertification

Poor use or mismanagement of land leads to desertification. Many people in the developing countries are ignorant and hence unaware of how to use the land properly due to low level of technology. Therefore, through over-cultivation and over-grazing they damage the land.

Also, **deforestation** that is associated with massive destruction of tress lead to desertification. In many places in Africa natural forests have been destroyed. The trees are used for building, making furniture, building ships and boats, making paper and firewood for fuel. In Tanzania for example, lumbering is taking place at an alarming rate in Miombo woodlands of Tabora, Mpanda and Rufiji area. This creates conditions for the onset of the desert conditions. Rural energy crisis has aggravated a serious problem of forest destruction, particularly in Africa and Asia. Wood is still extensively used in many developing countries as a primary source of energy for cooking and heating purposes and for processing agricultural and industrial products. In Kenya, for example, wood and charcoal account for about 70% of all the energy used (Karugga and Kubasu, 1993). Because of high costs of paraffin and gas, majority of people in Africa cannot afford and therefore they have no other alternative than using firewood for fuel. This has left the land exposed to the agents of soil erosion.

Population pressure in some countries has led to clearing of forested areas for cultivation in order to increase food production. As more land is cleared, the problem of erosion is increased rendering the land infertile.

Apart from anthropogenic caused, **natural drought cycles** have been responsible for the advance of the desert in the semi-arid areas. Drought leads to loss of soil moisture and hence death to different plant species.

Effects of desertification;

Desertification has negative effects, which include the followings:

- It leads to **decline in agriculture:** This is because of drought conditions that cause water problems. When there is poor precipitation plant growth is inhibited leading to poor food production. The Sahel region, Somalia and Sudan are good examples of places where agriculture exhibits very poor performance. The decline in agriculture leads to decline in economy (poverty), famine and health deterioration.
- Another negative effect pertains to forced **population migration** both of human beings and animals. People and animals are compelled to move from areas with scarcity of water to areas that experience enough rainfall.

- Desertification leads to the **loss of important species of trees** such as Mninga. The loss of tree species causes the decline in timber industry and hence decline of revenue accruing from timber.
- The desert advance exacerbates soil erosion, which in turn leads to **deforestation and loss of arable land.** Erosion also destroys different structures like buildings, bridges, destroys roads and railway line etc.
- **Water scarcity** makes people travel long distances to search water for domestic uses like cooking, washing, drinking, watering etc.
- **Wildlife conservation areas** can be destroyed and in turn cause slump or decline in tourists industry in the country. This happen when animals dies or migrate away, when lakes and rivers dry up as well as disappearance of various tree species.
- The phenomenon can also cause stormy atmospheric vagaries due to high wind speed that takes place by following the disappearance of trees in a particular place. West African countries, which are in the Sahel region usually, experience storms, called line squalls. These are very destructive and they occur very frequently due to atmospheric disturbances.
- Desertification **makes man incur a lot of costs** in conservation measures which include planting trees, irrigation, educating people on how to conserve the environment and helping people who have been affected by desert conditions. Somalis and Ethiopia are countries where food aid is provided to people most of the time because they are plagued by the problem of poor agricultural production.

Measures to check desertification;

1. Alternative energy sources should be introduced in the developing countries especially in rural areas where the majority live.
2. Alternative energy sources include solar energy, wind power, Biogas and hydroelectric power. These should be supplied at low tariffs in order that the poor people can also afford them.
3. The local people should be educated on how to conserve vegetation. Some programs like afforestation and reforestation should be introduced in order to curb or mitigate the predicament. The forest department in Somalia has been experimenting with acacia, casaurina, pine, and commiphora and date-date palm in an effort to prevent moving sand dunes from reaching the embarked on several projects aimed at combating dune encroachment. These projects include afforestation. Crop-legume rotation in areas where there is no cropping, establishment of grazing co-operatives and soil and conservation measures (ibid).
4. The governments should devise some substantive policies whose objectives are to lay down principles to guide development and control of forests. In Kenya the government has already done so such that the commission on soil conservation has been established and rural afforestation program has been intensifies. Planting of trees

is also emphasized in Tanzania where even the president once participated in the planting of trees and every year there is the National Tree Planting Day celebrated all over the country with the purpose of encouraging or inculcating among the people with the positive spirit towards planting of trees.

5. The governments should also gazette some conservation areas so as to check excessive deforestation. In Tanzania there are such areas like Kazimzumbwi and Amani nature conservation areas.

EL NINO PHENOMENON;

El Nino refers to abnormal conditions or disruption of the ocean atmosphere system in the tropical Pacific having important consequences for the weather around the globe. Among these disruptions are increase rainfall across the southern tier of the US and drought in the west Pacific. El Nino means little boy or Christ child or infant Jesus in Spanish. This name was used because of the tendency of the phenomenon to take place around Christmas. El Nino is also referred to as ENSO which means El Nino – Southern Oscillation. El Nino is not a new phenomenon, it has been taking place for thousands of years and its records date back as far as 1597. It was originally recognized by the Peruvian fishermen off the coast of South America as the appearance of unusually warm water in the east Pacific Ocean occurring near the beginning of the year. El Nino is often called 'warm event'.

CHARACTERISTICS OF EL NINO;

The event is characterized by reversed wind system in the west pacific such that the flow of the wind is from the west towards the east. The warm water in the west is pushed eastwards by the reversed wind across the pacific. Also, there are changes in temperature (warming) in the east pacific, which lead to the weakening of trade winds. The event takes place after every 2 to 7 years though in some unusual cases it can be after one year or after tea years. For example there have been several events in different years that include 1972-1973, 1977-1978,1982-1983, 1986-1987, 1991-1992, 1993-1994, 1997-1998,2002 March 2003. El Nino is usually interrupted by normal weather conditions or by unusually very cold events referred to as La Nina which is sometimes called El Viejo, Anti – El Nino or simply "a cold event" or "cold episode". El Nino that took place between 1997 and 1998 was very strong and devastating. During El Nino the hot spot in the Pacific moves east creating two convection cells. The level of water in the west Pacific (Indonesian coast) collapses and water surges west wards leading to the rise in the level of water in the east Pacific (near South America).

Causes of El Nino /Southern Oscillation (ENSO);

The is no proper explanation for sure about the causes of El Nino phenomenon but the event is associated with a change in the atmospheric circulation called the Southern Oscillation (SO). The reverse in the circulation triggers the westward movement of warm water across the Pacific Ocean. Nonetheless some theories have been established to explain the occurrence of the event.

Theories explaining the occurrence of El Nino event;

The first theory is that the development of high cirrus clouds atop the clouds column over Indonesian coast lands leads to absorption of enough solar radiation causing the cooling of the ocean surface and reverse of trade winds and ocean surface current, so they flow eastward rather than westward.

The second theory is that eastward-flowing of deep currents called bar clinic waves periodically interfere with coastal upwelling warming the sea surface off South America and eliminating the temperature gradient across the Pacific. This leads to the reverse of trade winds and affects of the weather conditions around the world.

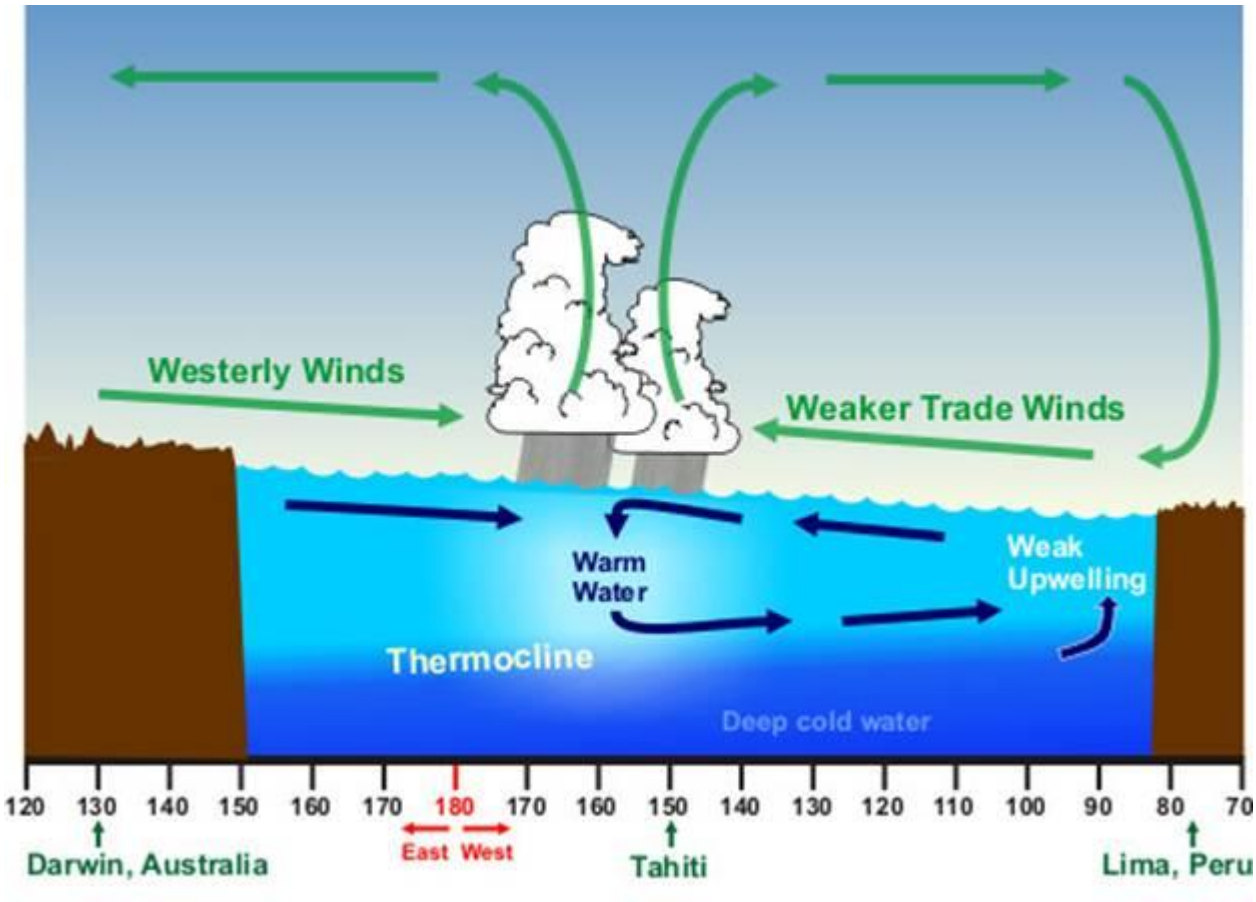
The third theory connects the occurrence of El Nino to the occurrence of major volcanic eruptions within the tropical Pacific Ocean between 10^0S and 250N. These eruptions should have been causing the warming in the eastern part of the pacific causing the reverse of the trade winds and ocean currents.

But further investigations are still under way to see if there is any connection between the two phenomena or are just by coincidence. Hence, the coincidence can be shown as follows:

Eruption	Year	El Nino
Agung (Indonesia)	1963	1965
Mayon (Philippines)	1968	1968
El Chinon (Mexico)	1982	1982-1983
Nevado de Ruiz (Colombia)	1985	1986
Pinatubo (Philippines)	1991	1992-1993

NB: So far the occurrence of El Nino is not related to actions that can be directly attributed to human activity. Even though there is not yet an established relationship between human actions and the development of El Nino, scientists are now conducting studies to establish if there is an increased frequency and intensity of El Nino events which might be related to global warming.

THE OCCURRENCE OF EL NINO:



Effects of El Nino (ENSO);

1) In some parts like South America it causes very heavy rains and floods occur in Ecuador. Floods and landlines that take place result in death and damage of property. Heavy rains also occur in other part like East Africa. Tanzania, for example experienced very severe and destructive El Nino in 1997/1998. The floods destroyed transport system, famine struck in many parts of the country; distribution of goods was curtailed leading to the rise in prices.

2) In other places such as Indonesia, northeastern Brazil and Southeastern Africa drought conditions occur leading to decline in agriculture and problems in power supply. Drought has

been causing wide spread hander in Papua, New Guinea; water shortages have been reported in Java; and in parts of India monsoons have been weaker causing dry condition in northwest India.

3) El Nino affects the fishing industry in South America since the upwelling of cold water, which brings food during the normal conditions stops. When the supply of food is cut off, fish migrate to other places of the ocean in search of food. In the United States, salmon usually found off the coasts of Oregon and Washington is forced to swim into Canadian waters as a result of the unusual warm ocean temperatures.

4) The unusual warm ocean temperatures of the Pacific Ocean lead to the formation of thunderstorms that move eastward with the Pacific warmest water. The thunderstorms disrupt high-altitude jet stream patterns by pumping warm air and humidity over 50,000 feet into the air. The change in the position of jet streams caused by El Nino thunderstorms result in unusual weather patterns around the globe Which show up most clearly during wintertime in temperate latitudes.

5) El Nino also affects the hurricanes such that they tend to take place below normal number of the tropical storms in the Atlantic.

6) Winter storms take place in the Gulf Coast states from Louisiana to Florida, and in central and southern California leading to wetter than normal conditions.

7)Other effects of El Nino include problems in energy distribution, disruption of outdoor recreation, and disruption of manufacturing industries, retail trade, parts of finance and insurance. Financial costs and insurance occur due to damage exacerbated by El Nino.

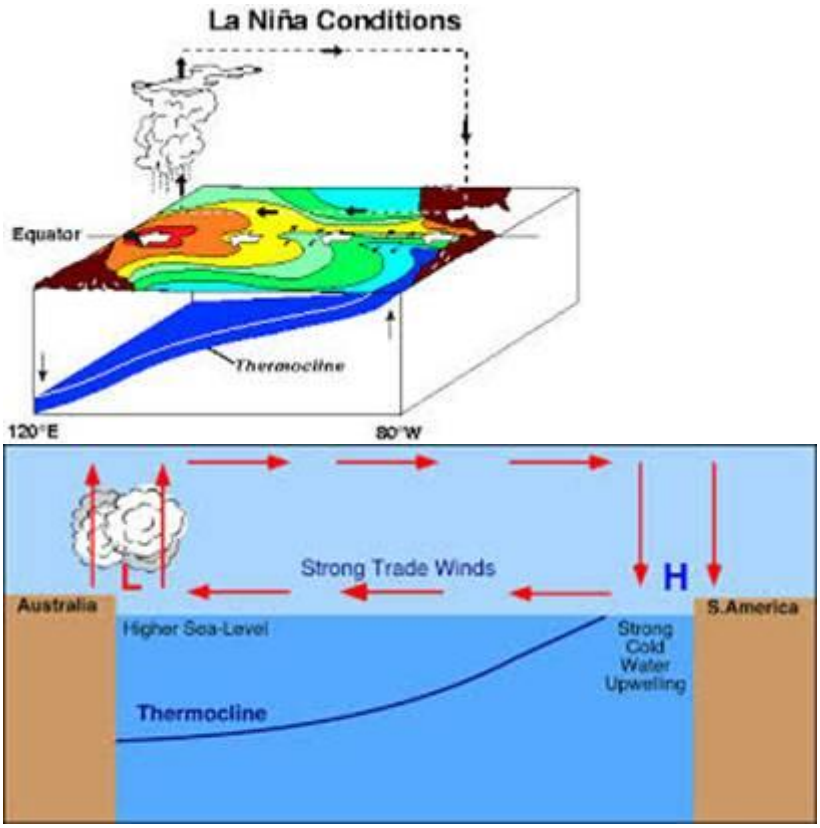
LA NINA

La Nina is also called ‘the little girl’ or El Viejo’ or ‘a cold event’ this is an event characterized by unusual cold ocean temperature in the equatorial or tropical Pacific. It is the opposite of El Nino which is characterized by unusually warm ocean temperature in the equatorial or tropical Pacific. La Nina usually takes place after El Nino and examples of the years which have experienced La Nina are 1987,1988,1995 and June 2003.

The effects of La Nina drought;
-La Nina cause heavy rains and where El Nino causes heavy rains La Nina causes severe drought and very cold conditions.

-It also damages property and leads to death. In the US, winter temperatures are warmer than

normal in the southeast and cooler than normal in the northwest In Indonesia. In Indonesia, very heavy rains take place while South America experiences severe drought rather than very heavy rains.



NB: During the normal condition over the Pacific (Non – E) Nino or non-La Nina) the trade winds are strong and blow towards the west across the tropical Pacific. These winds pile up warm surface water in the west pacific, so that the sea surface is about ½ meters higher at Indonesia than at Ecuador. The sea surface temperature is about 8^0C higher in the west, with cool temperatures off South America, due to upwelling cold water from deeper levels. This cold water is rich nutrients supporting major fisheries. Rainfall is found in rising air over the warmest water and the east Pacific relatively dry.

These involve the occurrence of abnormal conditions that have been taking place in the world. They include Global warming caused by green house effect, Drought condition, desertification, too much rains (EL Nino) leading to floods.

LAND (SOIL) DEGRADATION;

Land (soil) degradation refers to the deterioration of the quality of land (soil) through the loss of fertility, soil pollution, erosion and mass wasting. Degradation rendered soil useless for human developmental activities and unfit for the life of soil biota.

Loss of soil fertility;

This refers to the decline in the soil ability to support plant growth through the failure to provide necessary nutrients for plant growth. Loss of fertility can brought about in a number of ways as explained below:

1) Leaching process: This washes down the necessary nutrients in solution from the topsoil. It makes soil become more acidic and hence toxic. It is common in areas, which are humid and experience heavy rains.

2) Over cultivation: In certain areas caused by the rapid population growth. The crops grown on the same piece of land for a long time lead to depletion of soil nutrients.

3) Monoculture that involved cultivation of one type of crop without crop rotation or inter cropping. Nutrients are used up without replacement and the soil structure can be destroyed rendering the soil unstable.

4) Soil pollution due to excessive use of chemical like pesticides and artificial fertilizers, dumping of harmful wastes in the soil, and acidic rain that make the soil toxic, structure less and hence unproductive.

5) Soil erosion accelerated by poor land management like deforestation, flat cultivation on the slopes, etc.

6) Mass wasting that leads to the loss of the upper layer of soil and its nutrients.

7) Severe loss of soil water through excessive vapor- transpiration especially in arid and semi arid areas.

SOIL EROSION

Soil erosion refers to the wearing away, detachment and removal of soil material from one place to another through the agents like water, wind, ice and gravity.

Types of soil erosion:

Two major types of soil erosion can be distinguished and these include normal geological erosion and accelerated erosion. Is the wide spread type of erosion that occurs wherever there is

natural flow of energy and matter on the earth's surface without human (anthropogenic) influence. It is fortunately very slow and so not normally injurious to the soil cover of the world. More often than not, its rate is either slower or equal to the rate of soil formation hence its effects are rarely noticeable. Erosion under this category is easy to control.

Accelerated erosion;

Is the type of erosion associated with man's activities (man induced or anthropogenic). It is spectacular in nature (very destructive), therefore it has attracted man's attention. Its side effects include physical loss of soil nutrients, leading to severe economic loss arising from the reduced crop yield or total crop failure, and / or wasted efforts and money spent on unsuccessful soil conservation projects.

Factors Affecting or Controlling Accelerated Erosion;

These factors can accelerate or decelerate the rate of erosion; they induced physical and human factors.

Physical factors range from climate, topography, nature of soil and vegetation cover;

1) Climate: Where there is heavy rainfall erosion takes place easily while where there is little rainfall the rate of erosion is also low.

2) Topography: On steep slopes soil erosion tends to be severe while it is slow on gentle slopes.

3) Nature of soil: Erosion tends to be severe where soil is loose and tends to be slow where soil is stable.

4) Vegetation cover: Where there is dense vegetation soil erosion tends to be slow while where the soil is bare and the ground is sloppy soil erosion tends to be sever.

Human factors include management styles and population change.

1. Good soil management like crop rotation and a forestation helps in reducing or checking soil erosion but where there is poor soil management erosion takes place easily.
2. Population increase also leads to over exploitation of resources especially minerals, forest and land through over cultivation. All these lead to soil erosion.
3. Human activities that cause accelerated erosion include poor cultivation like monoculture and flat cultivation, excessive mining construction activities which involved building of houses, construction of roads etc; excessive cutting down of tees for lumbering and fuel; overgrazing and casual burning.

Effects of Soil Erosion

Soil erosion has various effects which include water pollution, loss of soil fertility, migration of people, reduction size of arable and deforestation, destruction of animals habitat accelerating weathering process by exposing the rocks disrupting transport and communication network, destruction of tourists centers and houses, and making man incur costs of repair after destruction has been exacerbated by self erosion.

SOIL MANAGEMENT AND CONSERVATION MEASURES;

Soil management renders to the skillful use or wise utilization and control of quality of soil (land) resource. Soil conservation refers to the process of preserving the soil for proper and sustainable use. Management and conservation of soil involve the following activities, which are carried by human being.

1) Educating people so as to promote land management skills among them. This has to be undertaken by the government in collaboration with NGOs and some individuals.

2) Training and encouraging farmers to use proper farming methods like crop rotation, inter-cropping, and the use of organic manure. Other methods that can be encouraged include strip cropping and contour ploughing.

3) Planting of cover crops, a forestation and reforestation in order to check soil erosion.

4) Reducing or stopping the use of industry chemicals which tend to accumulate in the soil and cause deleterious pollution.

5) Waste products should be recycled rather than dumping in the soil.

6) Animals should be destocked in order to avoid overgrazing that leads to destruction of grass.

7) Encouraging dry farming that involved mulching in order to reduce loss of water through evaporation especially in dry areas.

8) Land lining with brushwood should be used where the oil has been severely eroded producing gullies.

9) Population should be controlled so as to discourage excessive exploitation of resources, which in turn leads to land degradation.

10) Alternative energy resources should be explored and used effectively to avoid the excessive use of forest materials and oil, which causes hazards to the environment.

11) Radioactive materials should be dumped very deeply in the soil to prevent the upper soil layer from being highly affected.

12) Terracing, and construction of stone lines (like in Burkina Faso) and check dams (like in China) should be undertaken so as to control the movement of water and force it to get into the soil rather than flowing over the land.

13) Developing other economic activities rather than depending on agriculture only especially in the developing countries.

14) The government should formulate good policies, which advocate community participation, land tenure and encourage the proper use of land. Where possible people should be given financial support so as to invest unscientific agricultural techniques, which are not precarious to the soil.

Environmental Hazards and Catastrophes, some key terms;

1) Hazards are the event that occurs and when taking place they put the life of living organisms in danger or at risk.

2) Antistrophe refers to a disaster or calamity that entails destruction of properties as well as environmental degradation.

-Catastrophes are caused by hazards and they are assessed in terms of damage or loss which occurs when the destructive events strike at a place.

-Hazardous events include acid rain, drought, floods (e.g. caused by El Nino rains), famine, storms, earthquakes, volcanic eruptions, epidemics, pests, and mass wasting.

Acid Rain;

All natural rain (precipitation) is usually somewhat acidic as a result of solution of gases like carbon dioxide that react with water to form acids. Carbon dioxide forms carbonic acid (H_2C_O3). Clean rainwater has the PH value between 5.5 to 6) PH 7 is neutral. Highly acidic water has the PH value lower than 5. It can be 2.4 -5. But recent research in some places have shown that some rainwater contain more than average amounts of acids. This was first discovered in Scandinavia in the 1950s. Acid rain, therefore, is the rain containing more acids than normal amount.

Formation of acids rain;

- It is formed in the air from sulphur dioxide and nitrogen oxide which are emitted by thermal power stations, industry, motor vehicles, strip mining of coal and burning of coal, sea spraying suing chemicals containing sulphate minerals.

- Developed (industrialized countries) are the major contributors in this problem. These are the USA, Britain, Japan, etc.The countries greatly affected by acid rain include Scandinavia, the UK, Eastern Canada, and Germany in the black forest.

Effects of acid rain;

1) It leads to the increase in acidity in water bodies killing aquatic animals and plants. This is water pollution.

2) It also leads to the increase of acidity in soils reducing the number of plants that can be grown. Some plants die leading to poor agricultural production.

3) It is washed away through the leaching process accelerated by the presence of acids in the soil. In Germany and Eastern Canada forests died because of this phenomenon. The trees die because they become less resistant to drought, frost and diseases. Also their cells are destroyed.

4) As water supplies become acidic they pose a threat to the future health condition. For example the release of extra aluminum has been linked to Alzheimer's disease.

5) Different structures like buildings, monuments and bridges are destroyed as a result of the corrosive action of acid on paints and rocks containing calcium.

6) Erosion of limestone rock leads to the formation of features like sinkholes, do lines and gripes.

7) Sulphuric acid lead to itching and irritation of eyes in human being and animals.

Measures towards combating the problem of acid rain;

1) Spraying the trees to wash off acids and auditing of line to the soils, lakes and rivers to reduce acidity. These have been done in Germany and Scandinavia. But these processes are expensive and not sustainable since they have to be repeated continually.

2) Reducing the emissions of sulphur dioxide and nitrogen oxide by using non-fossil fuel, coal which contains less sulphur, removing sulphur from coal before being used. This is desulphurization and can be done by either washing finely ground coal or treating sulphur with chemicals.

3) Introducing the new boilers in power stations which can burn sulphur dioxide into ash. This can be done by burning coal and limestone together so that sulphur can stick to limestone when burning. This process is referred to as fluidized bed technology.

4) Trapping sulphur dioxide from waste gases and spraying it with water so that it can form sulphuric acid which can later be neutralized by adding lime. This process of removing sulphur dioxide from waste gases after use is referred to as Fuel Gas Desulphurization.

5) Using alternative sources of energy, which do not pollute the air. The country can turn the coal-fired power stations into gas-fired power station or becoming more reliant on nuclear power. Also geothermal power, solar power, water power as well as wind power can be used since these are environmentally sustainable.

6)Using less energy by turning off the lights when not is use since the cables tend to produce nitrogen oxide when the electric current is passing.

7)Use car pools, public transportation or resort to walking so as to reduce the burning of fuel oil that leads to the production of nitrogen oxide.

8) Recycle the wastes to avoid unnecessary decomposition that leads to the production of sulphur gas.

9) Reduce air conditioning and the use of heat since these produce nitrogen oxide.

10) Replacing the old appliances and electronic gadgets with the newer energy efficient products.

11) Adding scrubbers to utility plants so as to reduce the emission of Nitrogen gas.

12) Strict policies should be formulated to restrict the use of energy that leads to emission of sulphur dioxide or to control human activities so that the rate of production of sulphur dioxide and nitrogen oxide can be reduced.

DROUGHT

Drought is a state on an area facing prolonged conditions of dry weather without precipitation or long period of dry weather when there is not enough water. Drought and desertification have something in common in terms of occurrence and effects.

Causes of drought

Natural causes

These entail natural aspects like the wind system dynamics, the shifting of the overhead sun, natural location of some places, Natural fires and earthquakes.

Winds

Wind systems that are dry since they have blown across very narrow water mass stretch cause drought, as they have not picked enough moisture to cause rain formation. The Hartman winds of West Africa are such types of winds which have contributed to the occurrence of drought conditions in many West African countries, particularly the Sahara region.

Some of the winds are dry because they have passed across the cold ocean currents over which they have dropped a lot of moisture and hence reach the surface when they are already dry causing dryness. Dryness in the western part of Southern African countries especially in Kalahari is due to cold dry winds that cross the Benguela ocean currents. In areas where there are descending winds, there is no rain formation since the descending air masses are stable and do not causes rain formation. Rain formation happens where air masses rise, cool leading to condensation and later rain formation.

Shifting of the position of the overhead sun

It is the shifting of the overhead sun takes place, the rainfall regime shifts. If it shifts to the Northern Hemisphere, there occurs dryness in the Southern Hemisphere and when it is in the southern hemisphere dryness occurs in northern hemisphere.

Location of places

Some places are located in the leeward side of the mountains and therefore experience dryness due to the rain-shadow effect. Other places are located very far in the interior such that they end up receiving low amount moisture or no moisture at all.

Natural fires

These are the fire caused by the natural hazards like lightning and volcanic eruptions. These can lead to a large scale destruction of vegetation leaving the land bare. The bare land can then

experience excessive evaporation that leads to loss of moisture and hence the occurrence of drought.

Man induced causes

These entails activities carried out by man such as:

1) Lumbering that leads to deforestation due to excessive cutting of trees.

2) Bad agricultural practices like overgrazing, over cultivation, and shifting cultivation.

3) Establishment of new settlement areas due to the increase in population leads to cutting of trees.

4) Mining activities and construction of dams can also cause deforestation.

5) Industrial activities and cars have an impact on the occurrence of drought. These emit gases that cause global warming and acid rain. These causes death of vegetation leaving the land bare and later the occurrence of drought.

6) Other factors involve poor or lack of population policies, low level of technology and poverty. These have led to poor environmental management that has resulted in the destruction of vegetation and thus the occurrence of drought.

Impacts of drought;

1) It has led to poor supply of water for domestic use, agricultural use and industrial activities.

2) Drought has caused the disappearance of vegetation in many places especially in the Sahel region in Africa.

3) Poor energy supply among the people who depend on firewood as the main source of energy. This has faced people in West Africa.

4) Lack of moisture in the soil has led to death of plants. The land left bare due to the death of vegetation is susceptible to erosion.

5) Excessive evaporation has led to the drying of water bodies especially the seasonal lakes and streams in Central and West Africa.

6) Drought condition has facilitated the desertification process in different parts leading to the reduction of the size of the arable land.

7) Agricultural activities decline due to the death of crops leading to the problems of food availability (famine / starvation).

8) Drought conditions force people to migrate from the affected areas to other areas, which are not affected, and this can cause problems of population pressure, land fragmentation and land conflicts.

9) Industries that depend on agriculture can decline like the textile and food processing industries.

10) Women and children suffer a lot in the following ways:

a. They are forced to go long distance search of water and hence they get tired, deteriorate in terms of health, and face accidents like being bitten by snakes, being raped or being killed.

b. Women and children also don't get time to attend learning institutions since they spend most of the time looking for water and firewood. Performance of girls in school can decline due to lack concentration in school.

c. There can be problems of acceleration of immoral practices since when children and young girls go so much far they can free that they are free of parents attention and decide indulging in misbehavior. Some young girls and boys can use the chance to meet so much far where they are searching for water or firewood and indulge into immoral behavior. This can lead to the spread of HIV/AIDS and unplanned pregnancies among the young girls.

d. Women cannot engage in other activities effectively because of being tired.

11) In some places men are forced to go very far looking for firewood where women cannot reach.

Measures to combat the problem of drought

1) Embarking on a forestation and reforestation programs. The trees add moisture to the atmosphere and hence lead to rainfall formation.

2) The use of proper farming methods which do not deplete vegetation.

3) Control of population should be encouraged so as to avoid the excessive depletion of vegetation.

4) The water conservation centers should be established like dams so as to promote irrigation schemes.

5) Farmers should be given proper education on how to use the resources sustainably to avoid environmental degradation.

6) Strict policies should be instituted so as to restrict the excessive use of trees.

7) There should be introduced the use of alternative energy sources like solar energy, wind energy, geothermal power, water power etc, that are environmentally sustainable.

FLOOD

Flood refers to a period of either high river discharge (when a river overflows its banks because of excess water) or overflow of water along the coast due to extremely high tide and storm waves.

Floods occur as a result of heavy rains that take place in a particular place and they affect so much the lowland areas especially where vegetation has been cleared.

Other floods can occur due to the collapse of reservoirs like dams, emergence of springs, melting of ice and breaking of the water pipes. Also tides caused by the gravitational forces between the earth and the sun or between the earth and the moon as well as the strong waves due to the influence of stormy winds and the earthquakes can lead to floods. This occurs most frequently in the humid regions like equatorial areas due to heavy rains. Nut even in the desert areas, occasional torrential rains can cause flooding.

Factors that can accelerate flooding in lowland areas;

1) Shallowness of the soil due to the presence of the impermeable rock layer just near the surface.

2) The presence of the water table near the surface as a result of soil saturation. When rain water falls on the surface that already is saturated. When rain water falls on the surface

that already is saturated with water, floods occur in the river stream since it does not soil down instead it goes to the river channels leading to overflow.

3) Clearing of vegetation accelerates flowing because on a bare surface water runs freely to the streams and end up filling them.

4) Shallowness and narrowness of the river stream can also lead to the occurrence of floods in a certain place.

5) Floods also can take place where the rivers have so many bends, or are blocked by vegetation or the floors are almost flat such that the water entering the channels does not flow settle down stream leading to overflow of water on either side of the river channel beyond the river banks.

6) Damming of the river by human being or by layer spewed out during volcanic eruptions can cause flowing of water on the upstream side.

7) Blocked up drainage systems in the towns or cities can also trigger of the problem of floods.

8) Earthquakes that take place below the sea tends to lead to the formation of large waves called Tsunamis which send water to the coastal areas and cause catastrophic waves.

Floods have been taking place in many parts of the world like Bangladesh, China, Mozambique, Malawi etc. the floods that took in Tanzania in 1998 were so severe that they led to great damage in many parts of the country. Also on Sunday 26th December 2004 there occurred. It was reported that on that day the tsunamis killed about 100,000 people in about 12 countries. The Tsunamis took about eight hours from Sumatra which was the epicenter to reach the East Africa coast. Ten people died in Dar es Salaam after the Tsunamis.

Impacts of floods;

1) Death of people and animals. For example the frequent floods in Bangladesh have claimed the lives of many people leading to depopulation. The death of animals also affects livestock husbandry in a negative way.

2) Farmlands can be destroyed by the running of water leading to devastation of crops. Devastation of crops leads to poor food supply and hence the prevalence of famine.

3) Outbreak and spread of water-borne diseases occur affecting the health of people and sometimes death. This is due to water pollution.

4) Floods make the governments incur costs in terms of required the victims. They have to help them in terms to medication, food the shelter.

5) Floods also lead to the demolition of houses rendering people homeless.

6) Silting of the dams and other water reservation resulting problems of water conservation and inadequate water supply.

7) Floods can lead to soil and air pollution. During floods the chemical from the dumping places can be taken away and spread other areas leading to soil contamination. Also decomposition of material under water condition such as peat, can lead to the emission of greenhouse gases like methane.

8) Floods lead to the occurrence of soil erosion and the occurrence of landslides.

9) Destruction of infrastructures like railways, roads and bridge. The electricity posts can be dislodged leading to fire out break and blackout in the towns.

10) Floods bring problems of industrial location in a particular place.

11) As a result of disruption of transport system, the movement of goods and services is hampered resulting in the rise of prices of goods and shortage of important services.

12) It leads to migration of people who move as refugees to other places or countries.

13) Destruction of economic sectors like farms and industrial structures leads to the occurrence of poverty in a country.

14) It also affects people psychologically since they feel unsafe and uncomfortable to live like refuses in another place.

15) But in some places especially in the flood plains, they have lead to the development of fertile soil through alluvial deposition. These are used for agriculture.

Response to the occurrence of floods;

1) There should be proper management of the watershed or catchment areas through planting trees. Vegetation checks water movement on the surface and forces into to soak into the ground. Hence people should not be allowed to settle in the catchment areas.

2) Construction of dams across the river channels helps in combating the problem of floods which affects the lowland areas.

3) The stream of the rivers should be deepened, widened and straightened so as to increase the speed of the river down the slope to the sea or lake. This process is called channelization.

4) People should avoid living in areas, which are prone to the occurrence of floods like the lowland areas, especially, the flood plains like those in the Msimbazi river valley and coastal areas which usually experience Tsunamis, such as the coast lands of Chile and Peru due to earthquakes. Tsunamis are the waves in the ocean caused by the shocks produced by earthquakes that start from below the ocean floor.

5) People who live in the lowland areas should create efficient drainage systems that can take water away from their residential areas.

6) There should be frequent inspection and cleaning of the drainage systems in the town to avoid the problem of blocking.

7) There should be established efficient rescue teams, which can help people during floods. The team should be well equipped with rescue facilities.

8) During floods, people should respond fast to go and help the victims and help them in terms of medication, food, clothes etc.

9) International cooperation should be intensified so as to improve the techniques of combating this environmental predicament.

FAMINE

Famine refers to a situation in which there is shortage or inadequate food supply in the country. The severe scarcity of food is referred to as starvation. Famine has becomes a great problem in many parts of the African continent especially in the sub- Sahara countries.

While the developed countries have been witnessing steady increase in food production and supply since the 1960s, the Africa continent has been experiencing an exceptional decrease in food production leading to the rise in number of under bred people. While food production has been declining the number of people has been increasing leading to inadequacy in food supply and hence poor diet, either in amount (quantity) or type (quality), Between 1970 and 1990 there was an increase in availability of food supplies per capital in every developing region except sub-Sahara Africa. It has been estimated that in most developing countries, especially those within the tropics, a person consuming less than 2350 calories per day is

likely to experience chronic malnutrition. In 1990, 20 percent of people living in these countries were suffering from chronic malnutrition. Their numbers have increased from 435 million in 1975 to 600 million in 1990 (David Waugh 1998).

Factors leading to the occurrence of famine in the sub-Saharan Africa;

1) Rapid population growth as a result of high birth rate and falling death rate. This has led to the increase in number of people to be fed and most of them are young children who are yet to be fully engaged in the production process. The rapid increase in population has also led to the problem of pressure for land, causing land fragmentation and hence hinders application of machinery in farms.

2) Poverty is another problem. Few farmers have financial ability to buy high yielding seeds, fertilizer, pesticides or machinery, or to implement irrigation schemes. Also when food is scarce, neither the government nor people can afford to buy high priced food surplus from the developed countries.

3) There is too much emphasis on the production of cash cross since the colonial times. This has made farmers neglect food crops leading to scarcity of food.

4) Political instability in many countries has been another contributing factor. There are incidents of civil wars in many countries like The Democratic republic of Congo, Liberia, Rwanda, Burundi, Nigeria, Cote D'Ivoire etc leading to insecurity and lack of peace. During these wars, many people are restless; some are force to migrate as refugees to other neighboring countries. Tanzania for example has been receiving to many refugees from Burundi and Rwanda as result of strife in those countries. Hence, people cannot concentrate on production leading to problem of food availability.

5) Rural – urban migration has been another factor. The movement of young and energetic people from rural areas to the urban centers has led to shortage of labor in rural areas where agricultural production takes place. Those who remain in the rural areas are the old people, women and children who cannot engage themselves effectively in the production process.

6) Low level of technology among many African farmers is also another problem. People are still using traditional ways of cultivation, using hand hoes is so common in many countries especially in Tanzania, Malawi, Kenya and other countries in this region. Low technology has been attributed to the problem of illiteracy and poverty.

7) Too much selectivity on the type of crops to produce for food has also been affecting food production. There are some communities that need only certain types of crop for

food and they are not ready to switch to the other types of crop. For example some prefer maize as their staple food. During drought maize production tends to be poor. Once such people are told to grow cassava might end up refusing since they are not used to that crop as source of food. This leads to food shortage among such societies when it comes to problem of drought.

8) Land conflicts are other hindrances in Africa. There have been incidents of conflicts in Zimbabwe, even in Tanzania in Kilisa, Arusha and Mara region. These conflicts for land hinder production process as people waste a lot of time in such quarrels.

9) Casual bush fires also lead to the destruction of crops in the farms. Fires are so frequent in many Tropical countries during the dry seasons when people are about to harvest. The fires devastate crops and pose problems of food supply.

10) Lack of or poor agricultural policies in many countries in the sub-Saharan region are a great snag. There are not clear agricultural policies that govern the production process. There are not well stipulated land tenure policies in many countries which are one of the causes of land conflicts. Hence, people produce without having proper guidance on what to produce and how to produce.

11) Poor transport and communication has also affected production and availability of food. There are places, which tend to produce food in great amount while other places experience crop failure in the farms. But problems of transport pose difficulties in ferrying food to other areas which are experiencing food shortage. For example in Tanzania, Rukwa region produces food in great quantities but that food is usually not easily sent to places like Dodoma, Singida and Shinyanga because transport encumbrance.

12) Soil erosion has a great contribution to agricultural failure. Erosion has been so severe in many places of the sub-Sahara region, in some places, like the Sahel region soil erosion has led to desertification. This causes failure in agricultural production. Soil erosion in Tanzania has been experienced in many places like Kondoa district in Dodoma and many parts of Mbeya and Iringa.

13) Poor storage facilities in rural areas have been another problem. Some crops are destroyed in the farms or in poor storage places leading to food scarcity.

14) Negative attitude to agricultural activities and laziness. Some people are despising agriculture as the activity of the poor people and hence they offer other jobs like trade, mining, etc. others are lazy by nature. These contribute to the occurrence of starvation.

15)Smuggling of food to other countries is another problem. Farmers after harvesting they tend to sell virtually all the food through smuggling to other countries where there can be higher prices. For example in Tanzania, there has a big problem of smuggling the food to Kenya, Zambia etc.

16)Misuse of the available cereals. The available cereals are usually misused. For example maize, sorghum and millet are usually used in making local brew in rural areas. Such practices have affected food availability in many countries.

17)Pests and diseases have had a great contribution in the prevalence of famine. Pests and diseases destroy crops and animals. There are birds like quelea, other pests like graining borers, stalking borers and fungal diseases that attack crops. Other diseases like Nagana, Foot and Mouth Disease, East Coast fever kill animals. Human beings also are affected by diseases like AIDS, Malaria, Cholera, and Meningitis which affect their health and sometimes or in most cases claim their life leading to a problem of labour supply.

18)Unreliable rainfall or small amount of rainfall leads to poor agricultural production. This is a big problem in many tropical countries and especially in the central parts of many countries. In Tanzania rainfall is so scanty in Dodoma, Shinyanga, some parts of Tabora and Singida. Those places experience low crop production.

19)Decline in fertility as a result of leaching and over cultivation has been so marked in many countries. Due to over cultivation and leaching, few nutrients have remained din the soil leading to decline in production.

20)Poor marketing system is also a hindrance. The cash crops are sold at poor prices and payments are made so late. This makes most farmers in rural areas fail to buy food since they usually have no money. They also fail to invest in advanced agriculture so as to promote production and diversification of the economy.

21)Lack or poor agricultural researches made and once they are made the results are not utilized effectively to improve agriculture.

22)Competition posed by other activities against agriculture. Mining sectors and industries have been absorbing more labor from rural areas leading to labor shortage in the farms.

23)Lack of cooperation between men and women in the agricultural process. Traditionally, women and children have been the major labor suppliers in the farmers while men are indulging in drinking etc. think has contributed to inefficiency in food production in many countries.

24)Late sowing or planting can cause failure in agriculture. Some farmers plane or sow the seeds when it is too late for the crops to grow into maturity.

25)Natural hazards like floods caused by too much rainfall especially during El-Nino rains.

26)Floods destroy crops in the farmer.

What should be done?

In order to combat the problem of famine, the following measures should be taken:

1) Most countries in the sub-Saharan region should adopt population control policies so strictly so as to have number of people that can be well sustained by the current food supply level.

2) There should be improvement technology through researches, education and training of the farmers in rural areas.

3) Farmers in rural areas should be encouraged to adopt sedentary agriculture rather than keep on shifting from place to place since it is time waste.

4) There should be strict and well – stipulated policies on agriculture and land tenure so as to encourage people to produce food crops and solve and conflicts.

5) The control of pests and diseases should be encouraged. There should be the use of pesticides to kill pests. The medical services should be improved to combat diseases like malaria.

6) Transport and communication of crops to different parts of the sub-Saharan Africa.

7) Reconciliation of conflicting countries like Burundi, Liberia and The DCR so that peace can be attained and maintained. When peace is maintained people will have confidence to engage themselves in the agricultural production process.

8) Restricting rural-urban migration is another response. There should be development planning focusing on rural areas. The farmers should be given loans and social services be given to rural areas like electricity, education, health services, and water in order that people can stay in rural areas rather than going to urban center's.

9) The local markets in the respective countries should be improved to discourage food smuggling to other countries or regions.

10)Construction of good storage facilities in rural areas can help to combat the problem of food destruction.

11)The private sector should be encouraged to get involved in agricultural production instead of concentrating on industrial production.

12)Women empowerment can be another solution in solving the problem of food availability. When women are empowered they can also help in making decision that pertains to agricultural production. Men should also cooperate in the agricultural production process so as to promote efficiency.

13)The farmers should be educated on how to conserve the soil in order to attain sustainable agricultural production.

14)Diversification of crops should be encouraged. People should not depend on only one crop since once that crop fails they can experience problems of food shortage so severely.

15)Introduction of irrigation schemes in arid and semi-arid areas can help to increase food supply in these countries. Together with these schemes, there should be construction of dams that can be used in supplying water to the irrigation areas.

16)Occurrence of heavy rains, severe storms and floods in the eastern part of the Pacific – South America, Chile, Peru, South of California and even in Africa.

17)Heavy rains and floods lead to erosion water pollution and problems of transport.

18)There occurs destruction of crops by heavy rains and flood leading to famine. Also heavy rains and floods demolish houses rendering people homeless.

19)The land degradation and too much water lead to migration of people and animals and sometimes lead to death when the houses collapse or due to drowning in water during floods.

20)Industries and trade decline since goods are not transported from one place to another during floods. Also, the supply of industrial raw materials can be disrupted as of result of the destruction of cash crops in the farms.

21)Leads to costs of repairing the destroyed structures like bridges roads etc.

22)Erosion leads to the reduction in the size of the arable land.

23)Drought conditions occur in places like South East Asia and Australia. This can lead to deforestation as a result of the death of plants, crop failure, air pollution by stormy winds, migration, famine and death of animals due to lack of food and water supply. Likewise, sunny conditions are experience in Oregon, Washington and Britain. The usual rains in these areas stop during the El Nino period.

24)Severe fires that ravage or raze the forest vegetation are common in Indonesia and Australia due to severe drought conditions.

25)High waves occur in California as a result of the dragging effect exerted by the reversed Trade Winds that are associated with the drop in pressure in the eastern Pacific Ocean. These waves affect the coastal areas in terms of erosion and floods.

26)The fishing industry especially in Peru and Chile declines following the death of some fish caused by the lack of nutrient supply. The supply of nutrients stops in these areas because of the absence of water upwelling that is common during La Nina. The upwelling of the cold water in the eastern Pacific Ocean takes place since it tends to replace the water on the surface that has been dragged westwards by the normal Winds. As such they bring nutrients from the bottom to the surfaced water making them available to the fish. But such a supply stops during El Nino since there is no water upwelling.

Loss of Biodiversity

1) Biodiversity – refers a variety of species of living organisms both plants and animals (Flora and Fauna)

2) Loss of Biodiversity – refers to the disappearance of different plant and animal species in a particular geographical unit or community (ecosystem)

3) Ecosystem – is a natural system in which plants (Flora and animals (Faun) interact with each other and the non-living environment.

Environmental problem have affected adversely different species of plants and animals such that there is a high rate of loss of various plant and animal species; especially those, which are valuable to man. The valuable species are among endangered species in the world now since they are highly depleted through injudicious human use in meeting different needs of life. Among endangered species are plants, which are used for lumbering like Mninga in Miombo woodlands of Tanzania and animals like the rhinoceros, elephants, etc which are hunted for their tusks and ivory. In this topic on the Loss of Biodiversity, the focus will be on the depletion of forest resources and different animals' species in the wildlife conservation areas.

FOREST RESOURCES AND THEIR PLIGHT

Forests refer to the thick growth or collection of trees covering a large area. The forest can be natural or anthropogenic (means created by man). The science of planning trees and managing or improving the forest is referred to as Forestry. The process in which an individual or individuals purposefully plant tree and takes care of them until the harvest time, and then after harvesting replant tree under proper management is referred to as silviculture. This is part of forestry only that it deals with man made forest.

Importance of forest;

1) The forest helps in soil conservation since the trees form a protective cover that prevents soil erosion. It prevents erosion from taking place by checking the speed of the flowing water on the ground.

2) It also provide habitat for the animals and birds of different species.

3) The forest helps in the modification of the climate leading to the formation of rainfall. It introduces water vapor into the atmosphere through transpiration, which on condensing forms rainfall.

4) Forests clean the air by absorbing canon dioxide which is used for photosynthesis, the process which in turn introduces oxygen into the atmosphere as the end product. Hence forests are one of the carbon dioxide sinks in the world.

5) Trees are a source of energy since they are used for firewood and charcoal making.

6) From the forest there can be extracted the building materials like poles and timber.

7) The forest is also important in the paper and pulp industry from which writing materials are produced.

8) Some tree species are used for making medicine and some provide fruits. Hence they are the source of food. Also, from the flowers there can be obtained some ornamental flowers.

9) The forest is important in the soil profile development since when the trees dies, they decompose and form humus, which gets mixed with the rock fragments to form soil.

10) The liquid from the trees is used for making gum, dyestuffs and other different types of chemicals.

11)Forests maintain water bodies like river; sources of water like catchment areas, lakes and springs. They also maintain moisture in the soil by reducing the impact of excessive evaporation.

12)The forests also encourage the development of tourism since when there are many tree species they promote the scenic view, which can be very attractive to the tourists.

13)Forests are the centers for recreation. Some picnics tend to take place in the forest.

14)They are also centers for scientific researchers by different researchers from different institutions that are having studies related to botany.

15)They also act as wind barriers so as to reduce destructive impact of wind to the residential areas or in the farms like cocoa farms in Ghana.

16)Forests are a source of employment especially in the forestry centers.

17)Forests are important for flood prevention since they force water to soak into the ground rather than running into the streams.

18)They also help in stabilizing the soil and prevent the occurrence of mass wasting especially the landslides on the slopes of the mountains.

19)Forest products are used for making different things for home use like furniture, utensil, etc.

Deforestation

Deforestation refers to the destruction of the forest through depletion or disappearance of different tree species. This can be by natural processes or by man's influence. Deforestation is a great problem in different parts of the world.

Agents responsible for the disappearance of the forests

These can be grouped into natural factors and human factors.

Natural factors

Natural factors include natural disasters like volcanic eruptions, hurricanes, aridity and lightning.

- Volcanic eruptions usually lead to the occurrence of fire in the forests that ends up destroying the trees. Also, lava spewed out can bury vegetation over a large area, Strong stormy winds like hurricanes up roof trees leading to deforestation.
- Aridity that leads to the drying of soil causes the death of trees and hence deforestation.
- The lightning can cause fire in the forest that can ravage the trees and cause the disappearance of many tree species.

Human influence

Human being has been blamed of being a major culprit in the current times in causing deforestation at an alarming rate. The influence of human being is both drastic (rapid) and dramatic (striking). The role played by human being in the forest depleting has been through various ways as follows:

1) Poorly organized agricultural activities like shifting cultivation, which has cost Africa in terms of felling trees and bush burning when clearing the areas for cultivation. Also plantations that involve clearing of large areas lead to disappearance of vegetation. Poorly organized pastoral farming characterized by overgrazing and browsing as a result of overstocking leads to the depletion of vegetation.

2) Fires that are lit by man when encouraging the growth of fresh grass, hinting as well as extraction of honey has contributed to the wiping out of different species of trees.

3) Lumbering activities involve cutting of the trees. Man has been cutting these trees indiscriminately leading to devastation of forests species.

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5) Construction of roads, railways, dams and establishment of settlement (like urban development) have degraded the forest to an appalling extent.

6) Industrial activities have had a great contribution in the deforestation process. The industrial emissions have led to formation of acid rain in countries like Germany, Scandinavia and Eastern part of Canada leading to the soil pollution and hence death of various plant species. Also the establishment of industries involves cutting of trees, which leaves the land bare.

7) The search for wood and charcoal as sources of energy has also led to removal of trees beyond which re-growth and easy planting can permit. Because of poverty people resort to cheap energy sources like firewood and charcoal therefore encouraging or accelerating the depletion of trees.

8) Rapid population growth that causes pressure or stress on land resources has been another problem. As a result of the increase of people new areas are needed for cultivation and settlement. These involve cutting of trees and hence deforestation.

9) Formulation of relaxed policies on forest conservation in the country can lead to the devastation of trees. When there is no strict policy governing on how to use resources, it becomes very difficult for the people to carry out their activities in a sustainable way.

Effects (consequences) of deforestation;

1) Deforestation leaves the land bare and hence land degradation (soil erosion) can take place easily.

2) Reduction of the size of the land caused by erosion accelerated by deforestation.

3) Deforestation leads to the destruction of habitation of animals and birds.

4) Valuable species used for timber like Mninga, Mvule, mahogany and Sapele disappear as a result of deforestation.

5) Desertification occurs as a result of tree cutting. This gives room for the encroachment of aridity in different areas even those, which were once forests.

6) Drying up of the water bodies like wells, rivers and ponds as well as the catchment areas due to excessive evaporation. Excessive evaporation takes place because of the bare land exposed after the disappearance of trees.

7) Tourism declines due to energy crises, loss of various species of trees and animals, drying of water bodies, occurrence of catastrophic storms and pollution.

8) Women and child girls get problems of walking very far in search of firewood and water. This leads to problems like being raped or being attacked by dangerous animals.

Initiatives towards forest conservation

The following are the advisable options that should be adopted by the government, NGOs and people.

1) There should be introduction or adoption of reforestation and reforestation programs. Forestation refers to planting of trees where there were notes existing before. Reforestation refers to planting trees where there were but were cut for various purposes.

2) Declaring some of the areas as protected by law so as to prevent people from cutting trees at random for lumbering, construction or when clearing the areas for cultivation and establishing settlement. In Tanzania, for example, there are areas declared as "Forests reserves" if "Protected areas"

3) People should be given education and training on how to conserve the forests and the important of that. They should be made to participate in decision making process pertaining to forest conservation as well as other agenda.

4) There should be formulated well – stipulated and practicable policies on forest conserving. These act as guides or plans of action in the process of conserving the forest.

5) Introduction of alternative energy sources, especially in rural areas, such as HEP, Solar energy and biogas so that people cannot put stress on the forest resources only as the source of energy.

6) The country should insist on the control of population growth since as the number of people grows explosively pressure is exerted on land leading to deforestation. The increased people in the population can cause clearing of land for cultivation or establishing new areas for settlement.

7) Destocking is another alternative. When the number of animals is reduced the rate of disappearance of vegetation is also reduce.

8) Changing agricultural methods from extensive to intensive farming system. Systems like shifting cultivation and nomadic pastoralism should be abolished and encourage farmers to settle in one area. Grazing of animals should be controlled and where possible zero grazing can be applied. This goes hand in hand with the viable improvement in science and technology in different communities in the country concerned like Tanzania.

9)There should be fund allocated for forest conservation activities. The fund can be used for conducting seminars, workshops and carrying out different training programs on different nature conservation strategies. The rural areas should be a major focus rather than the experts holding seminars and workshop in town. The seminars should not be aimed at

merely generating income for the participants but should be for promoting the struggle towards curbing the problem of deforestation and sustaining the value of other resources.

10)There should be international cooperation among different countries in the world so as to facilitate forest conservation process. This is indispensable because deforestation, if not arrested or contained, can exacerbate catastrophic global issues.

11)Women empowerment is another very important aspect. Women have to be highly involved in the decision making process, supervision of the programs, and evaluation of the efforts and even in planting the trees. This is important because they are the major producers in many societies especially in the African countries. When they are empowered they can used resources judiciously.

12)The communities should cooperate in preventing the occurrence and spread of casual fires in the forest so as to bail trees out of the peril of being devastated.

13)There should be control of diseases that normally attack the trees and destroy them leading to disappearance of many species.

14)Industrial emissions should be controlled so as to avoid introduction of sulphur dioxide and nitrogen oxide into the atmosphere let acid rain is formed which destroys vegetation.

15)In areas with acidic soil liming should be used so as to reduce acidic condition so as to allow the growth of trees.

16)There should be introduced irrigation schemes in tree estates so as to ensure the smooth growth of trees to combat deforestation.

17)During lumbering, the trees should be cut selectively. So, people should avoid indiscriminate cutting of trees during lumbering and extraction of energy resources.

Problems faced during conservation process.

1) Lack of fund to be used in training people especially in rural areas.

2) Some people are adamant (rigid) to participate in tree planting because of ignorance.

3) When trees are planted, caring for the planted trees is another problem. Hence a big number of trees die due to lack of care.

4) Climatic vagaries also complicate the process of forest conservation. Trees can be planted but can end up drying due to lack of rainwater since in many parts, especially of the developing world, there are very few irrigation schemes.

5) Poverty is another problem. This makes people fail to afford other alternative energy sources and focus on trees. Due to poverty people find that using time in planting trees is wastage hence they go for other activities which can earn them a living.

6) Civil wars that lead to migration of people are another hindrance in combating deforestation. People forced to migrate to other places end up clearing the land, hence contributing to devastation of the forest.

7) Low level of technology is another problem. This forces people to use the land extensively leading to problems in combating deforestation.

8) Lack of coordination and cooperation between the government and even among the people they pose a great difficult in combating this environmental predicament. The alternative sources of energy are also expensive. For example in Tanzania HEP tariffs are high and the supply is not reliable. Most rural areas have not been electrified. These make people resort to the use of charcoal and firewood.

WILDLIFE (FAUNA)

Wildlife animals are of great importance to the economic and social development of any country. They importance can be erucidated as follows:

1) Animals provide food in the form of meat, which is the source of protein.

2) There are other valuable products from animals, which include wool, hides, skin, fur and tusks.

3) Wild animals attract tourists and are the source of foreign currency.

4) Wildlife conservation areas like Mikumi and Ngorongoro have created employment opportunities since there are hotels located in the National parks. Some people are employed as hotel managers, hotel attendants, drivers, guides etc.

5) Development of manufacturing industry for ornaments using the tusks and ostrich feathers.

6) Wild animals are used for researches in biological studies.

Problems facing the wildlife animals

1) Encroachment of wildlife areas by human being through establishing settlement and farms for cultivation.

2) Poaching is another problem. This involves illegal indiscriminate hunting within and around the areas designated for the wildlife animals.

3) Deforestation has led to the destruction of animals' habitat in many places. Some trees die as a result of injudicious forest fires. Fires also kill some helpless animals leading to depopulation.

4) Water pollution by acid rain, agrochemicals etc, leads to water problems to animals.

5) Diseases attack animals leading to death of different animals in the conservation areas.

6) Drought is another problem. During drought there occurs scarcity of grass and drying of water bodies.

7) Floods are another problem. When floods occur many animals dies leading to depopulation.

Wildlife Management and Conservation

Wildlife management and conservation are the processes geared towards preserving wildlife animals so that they can help sustaining the current life dynamics and the life of the future generation. This kind of use is referred to as sustainable use of wildlife animals.

Why conserve or manage wildlife animals?

1) To avoid extinction of animals species most of which are very valuable. Future generations should also enjoy this resource.

2) To promote tourism in the country which is the source of income and employment

3) Animals enhance or expand our sphere of enjoyment, since they are a natural beauty.

4) To ensure reliable supply of some products like skin, wool, mohair, tusks etc.

5) To promote researches that help in different developmental aspects of the country.

6) Generation of income from wildlife helps in combating poverty in a particular country (Poverty alleviation).

7) To enhance the supply of food like meat, this is a source of protein.

8) Wildlife management helps in reducing environmental degradation.

The following measures should be undertaken to conserve wildlife animals;

1) There should be deliberate efforts to protect the natural vegetation, which provide food and habitat for animals.

2) There should be game cropping when there is overpopulation. This should be done systematically under good control. Game cropping helps to solve the problem of overgrazing.

3) Control of diseases in wildlife conservation areas and pastoral areas.

4) There should be formulation of game laws to regulate hunting. Where possible the game scouts should be introduced so as to ensure proper management of wildlife animals.

5) There should be intensification of the fight against poachers who kill animals indiscriminately.

6) Water pollution control in the wildlife areas should be undertaken.

7) In some places there should be established National Parks and Game reserves to protect a big diversity of fauna and flora.

8) Establishing water all through the year. This can involve the construction of dam.

9) Demarcating settlement areas and wildlife management areas. This can prevent people from unwarranted encroaching into the areas identified for wildlife preservation.

10) Involving the community on nature conservation so that they can be able to participate effectively and feel that they are part and parcel of the conservation programs.

WASTES AND WASTE MANAGEMENT

Wastes refer to the discarded or useless or unwanted matter that remains after the valuable components of the material have been used. Wastes can be toxic or no-toxic and hence harmful or harmless. They can be solid or liquid in nature. Solid wastes include crop remains, metals, rocks, glass products, wood, paper, food, coal products, and plastics. Liquid wastes include sewage (effluent) and hot water from the industries.

Sources of wastes;

The principal sources of wastes are household, industries, mining and farms.

1) **From the households: -** There come some food remains, metals like iron sheets, wood material, etc.

2) **From the industries: -** Emanate chemical wastes, hot water, metals, radioactive wastes, plastic material, paper etc.

3) **From the farms: -** Come some crop remains like maize cobs, husks, maize stalks, dung, etc.

4) **From the mining areas: -** Come some rock fragments and some chemicals.

Production of wastes and mismanagement has become a major issue in the world. Wastes are reduced in great quantities especially in the cities but they are poorly managed due to negligence, poor education, lack of cooperation, and lack of commitment. The increase in population and industrial development has been responsible for the increase in the rate of waste production.

Impacts of wastes;

1) Wastes lead to environmental pollution:

   a. Air is polluted when they decompose giving out methane gas.

   b. Water is polluted through sewage disposal in the water bodies. Hot water from industrial is also emptied in the water bodies leading to abnormal rise in temperature (thermal pollution)

   c. Soil pollution due to surface run-off and dumping on the land.

2) Death of plants as a result of soil pollution especially addition of acids in the soil.

3) Keeping people uncomfortable due to the stinking of the decomposing wastes.

4) Radioactive material dumped in the soil lead to health problems and even death of people. Some people suffer from cancer or leukemia.

5) Outbreak of disease like cholera, typhoid, dysentery etc.

6) Wastes in the water lead to eutrophication (increase in nutrients) which later leads to the excessive growth of water weeds like hyacinth.

7) Destruction of the natural appearance and taste causing problems in water supply.

ENVIRONMENTAL ISSUES AND CONSERVATION

LIQUID ISSUES

1. Incineration of toxic wastes in special combustion furnaces in order that carbon dioxide can be given off rather than carbon monoxide which is more harmful.

2. Some of the liquid wastes should be neutralized by chemical process render them harmless.

3. Radioactive liquid wastes should be injected so deep in the rocks by a process called deep well disposal.

4. There should be a policy restricting people from disposing the liquid wastes in the water bodies and once found should be fined.

5. Secure landfills should be adopted in which the liquid wastes are filled in special drums and then dumped in the ground.

6. Treating the sewage before disposal is another proper alternative. This can be done through chlorination.

7. At an individual level there should be permeable pipes allowing slow escape of liquid wastes into the soil installed in the teaching field or absorption field.

8. Waste liquid material like water should be recycled. For example purifies water can be used for irrigation.

SOLID WASTES

Solid waste can be managed as follows:

1. Through dumping in open dumps. This is used where there are so many people like Dar es Salaam. The wastes are dumped in the large open pit like at Vingunguti in Dar es Salaam. But this method is not so good since it still leads to environmental pollution as the wastes can spread over the surface by wind or can produce gas when decomposing.

2. Sanitary landfills. This method involves dumping in the pit and then the wastes are covered with the layer of soil. This is better because the wastes can't spread on the surface and air pollution is reduced since the wastes are confined in the pit.

3. Incineration: involves the burning of wastes at very high temperatures so that they can produce carbon dioxide rather than carbon monoxide.

4. Ocean dumping: Some of the wastes which can be dumped in the ocean are like food remains which are not toxic but not metals or wood materials. This can be done at a municipal.

5. Recycling: The wastes should be recycled rather than dumping. Garbage can be used as animal food, plastic material can be used. The best example is provided by the Coca-Cola and Pepsi cola companies who recycle their bottles. If was not for bottle recycling by these companies the bottles could have been extremely littered in many places leading to environmental pollution.

Other options;

1. Exchange of wastes between countries since some wastes in one country can be used in other countries like the second hand clothes.

2. Producing the plastics which are biodegradable so that once dumped can be decomposed.

3. Educating people on how to handle the wastes properly since some of them are harmful, as they can cause deaths.

4. Population control so that the rate of waste production can be reduced.

5. The dumping places should be located very far from the residential areas.

6. There should be cooperation between the individuals and the government in order to facilitate the waste management.

Constraints hampering waste management;

Some wastes are complicated to handle such as radioactive materials.

1. Poverty is another problem especially in the developing world since some of the measures need money especially for paying workers who are concerned waste management.

2. Poor organization and coordination of waste management activities.

3. Lack of commitment of the officials is another hindrance in the waste management process.

4. High population is another bottleneck since the big number of people leads to high rate of production of wastes.

PHYSICAL GEOGRAPHY 1.4-WATER MASSES

1.1 GROUND WATER

WATER CYCLE:

- -Rain falls on the earth surface in filtrates (soaks into) the soil
- -Some water flows over the surface as overland flow (run off)
- -Some water lie on the surface as ponds and lakes and some return to the atmosphere as water vapour through evaporation and transpiration.

Factors enhancing water cycle

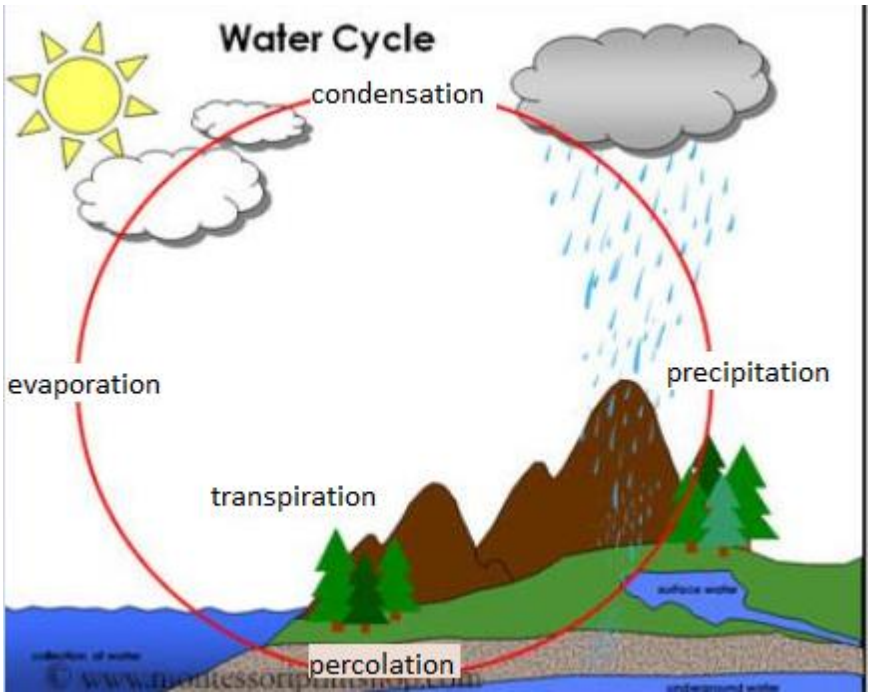
1. 1. Nature of the soil and parent rocks

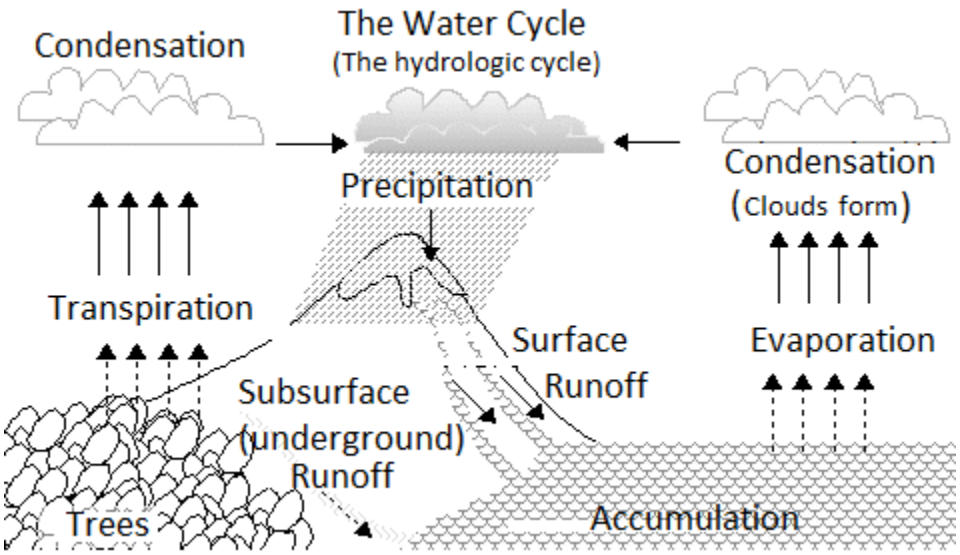
2. 2. Steepness of the slopes

3. 3. Nature of climate ;- Is a continuous succession of movement, condensation, evaporation, run off, percolation and precipitation

-Water vapour is carried by wind to the land where it is deposit as rain or snow

-Movement of water and water vapour form a system called water cycle.





GROUND WATER (phreatic/subterranean H_2O)

- -Is the concentration of water within the ground surface. /Water that sinks into the ground.

-The water existed within the interior of the earth crust. The water within the ground surface covered at the position of the pore space of the soil. A body of water derived from percolation contained in the soil, sub soil and underlying rocks above impermeable.

SOURCES OF GROUND WATER

-There are three main sources;

1. **1.Rain formation**

– Is the source of ground water which existed during the formation of rainfall. It's providing about 90% of the total water.

2. **2. Rock formation.**

   – During formation of rocks formed with the element of water. The common rocks are sedimentary and igneous rocks.

3. **3. Water bodies.**

- The water bodies like Ocean, Sea and river influence the development of ground water. The water penetrates from the water bodies.

TYPES OF GROUND WATER

-The ground water categorized according to their sources;

1. ***1. Meteoric water***
2. ***2. Juvenile water***
3. ***3. Connate water***
4. ***4. Oceanic water***

1. **1. METEORIC WATER:**

- Is the underground water formed due to the influence of rain formation. The rainfall is the only source of meteoric water. (Precipitation)

-The type of H_2O is re – circulated leading to hydrologic cycle.

2. **2. JUVENILE WATER**

- Is the ground water influence by igneous rocks during the formation of igneous rocks formed with the element of water.

  Most of the juvenile water contain a lot of minerals like fluoride mineral and also are super heated water (hot spring)

3. CONNATE WATER

- Is the ground water formed after the formation of sedimentary rock during the formation of sedimentary rocks formed with the element of water (cold spring)

- H_2O is usually salty originate from ancient seas

4. OCEANIC WATER

- Is the ground water formed from the water bodies. Their sources are river, lake and ocean water penetrates from the water bodies.

METHODS OF OBTAINING GROUND WATER.

Ø ***Percolation.***

- Is the rapid penetration of water within the ground surface. This existed when there are availability of joint /cracks /fault on the land surface

Ø ***Infiltration /filtration.***

-Is the penetration of water within the ground surface in very slow motion. The water penetrates through natural space (pore space)

FACTORS AFFECTING GROUND WATER

è -Are that factor influence the variation of ground water. The common factor are;

1. CLIMATIC CONDITION.

- In desert area there is poor concentration of ground water due to increase in evaporation caused by high temperature.

- In equatorial and tropical region there is high concentration of ground water and this is due to heavy rainfall.

ii. **2. RELIEF / ANGLE OF SLOPE**

> -Is the actually appearance of the landscape

> -Steep sided area, there is low concentration of ground water since the water is moving down the slope.

> -Gentle slope (plain) there is large concentration of ground water (free penetration of water) since the speed of water has decreased.

3. NUMBER OF WATER BODIES

-E.g. lakes, ocean, rivers

- Availability of water bodies bring about the availability of ground water.

4. AMOUNT OF VEGETATION COVER

-Presences of vegetable bring about the availability of ground water since vegetation help in the formation of rainfall.

-Absence of vegetation brings about the unavailability of ground water.

5. NATURE/PERMEABILITY OF ROCKS

- -Permeable rocks are rocks which allow free penetration of water downward.
- -Impermeable rocks are rock which do not allow free movement/penetration of water
- -Primary permeability (porosity) result from open texture, pores
- -Secondary permeability (previous) result from joint and cracks.

SATURATION ZONE

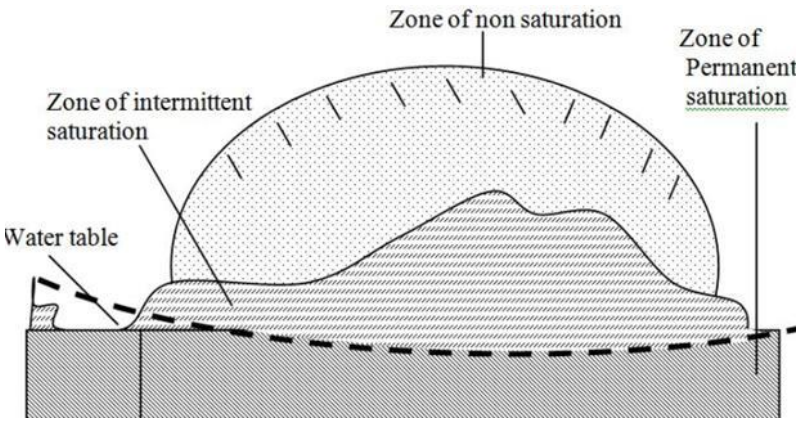
-Are those layers within the ground surface which contain the element of water. These zones either are permanent or seasonal.

TYPES OF SATURATION ZONE

1. ***1. Non – saturated zone***
2. ***2. Seasonal saturated zone***

3. ***3.*** ***Permanent*** ***saturated*** ***zone***

4.Impermeable rocks



1. <u>NON – SATURATED ZONE</u>

- Is the part within the ground surface which is not containing the element of water. / It is layers immediately below the surface. It allows H_2O to pass through.

2. <u>SEASONAL SATURATED ZONE</u>

-Is the part within the ground surface which containing water periodically.

-This layer lies immediately below the non – saturated zone. Also known as intermittent saturation

-This layer can dry out after a period of drought.

<u>3. PERMANENT SATURATED ZONE.</u>

- Is the part within the ground surface which cover with water through out. This layer extends as far down as the impermeable layer, forming the limit to down ward percolation.

  <u>AQUIFER/TABLE</u> -Is the beds which allow water to pass through it and is under lain by an impermeable stratum (rock) forming / becoming water – holding.

AQUICULTURE-Rock mass /layer that prevent the movement of ground water.

4. IMPERMEABLE ROCKS.

-Is a rock which its zone does not allow free penetration of water.

A. A: ARTESIAN BASIN.

- Is the position on the ground surface /landscape which contain the element of water. This slows the element of existence of ground water.

- An artesian basin is basins which consist of a layer of permeable rock lying between two layers of impermeable rocks.

Condition for presence of artesian well

i. Climate condition – Rainfall availability

ii. Angle of the slope –Depression /gentle sided

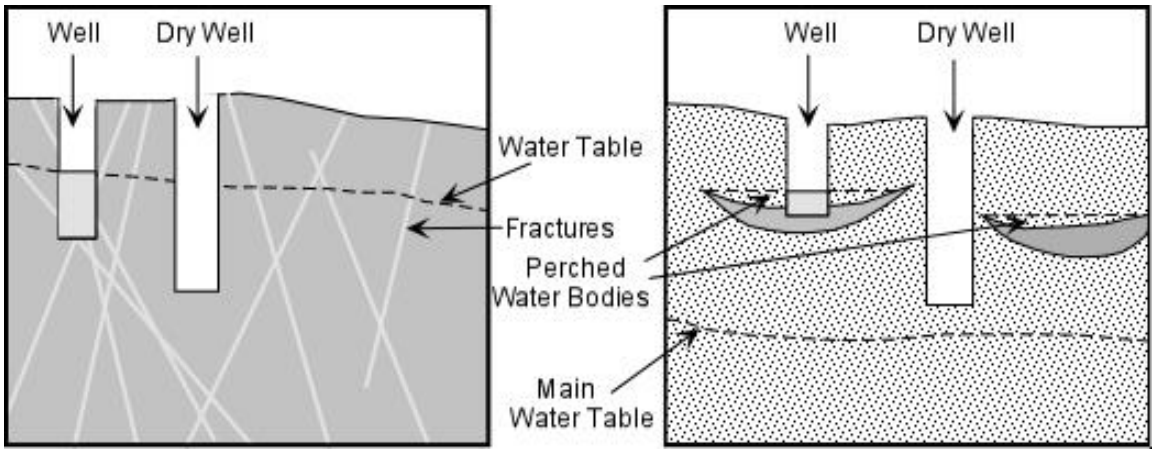
iii. Amount of vegetation cover should be availability

iv. **Pr**esence of water bodies

v. **P**resence of a layer of permeable rock lying between 2 impermeable rock

. B. WELL

- Is a hole / hollow sunk in the ground up to bellow the water table. This is either natural or man made.

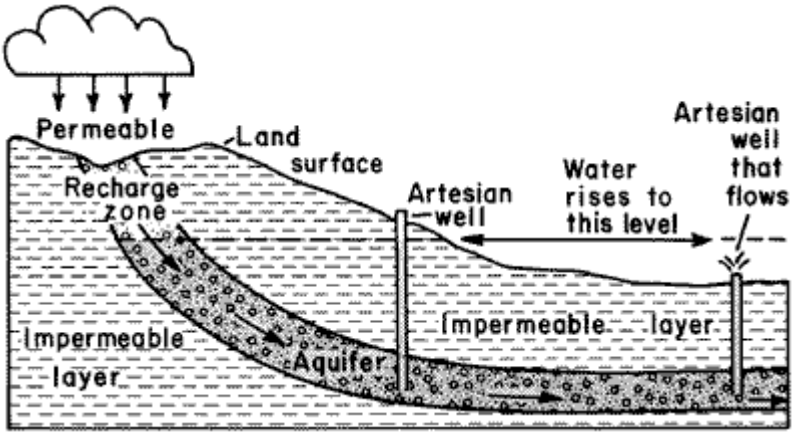


C. ARTESIAN WELL

-Is a position on the land surface which showing the element of existence of well.

-These are well in order to tap water from the artesian basins.

-When the well is sunk into the basin the hydrostatic pressure in the ground force it to come out. If the water doesn`t reach the surface it is known as semi –artesian well. (Construction of well).



Condition for development of permanent well

-Climate condition – Summer season in order to know the dry season water table

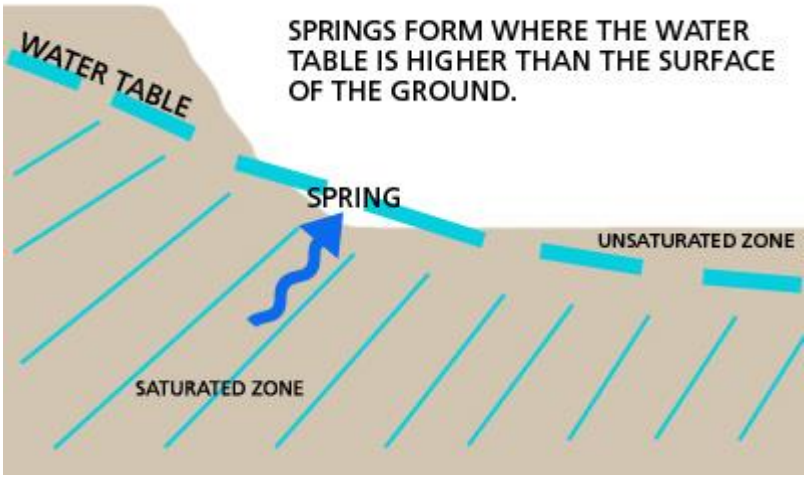
-Angle of the slope – Gentle slope

-Amount of vegetation cover should be available

-Water bodies available.

D. SPRINGS.

- Is the out flowing of water from the group surface.
- Springs develop where the water tables meet the surface.



Condition of development of spring.

i. The presence of enough ground water

ii. The presence of depression on the landscape

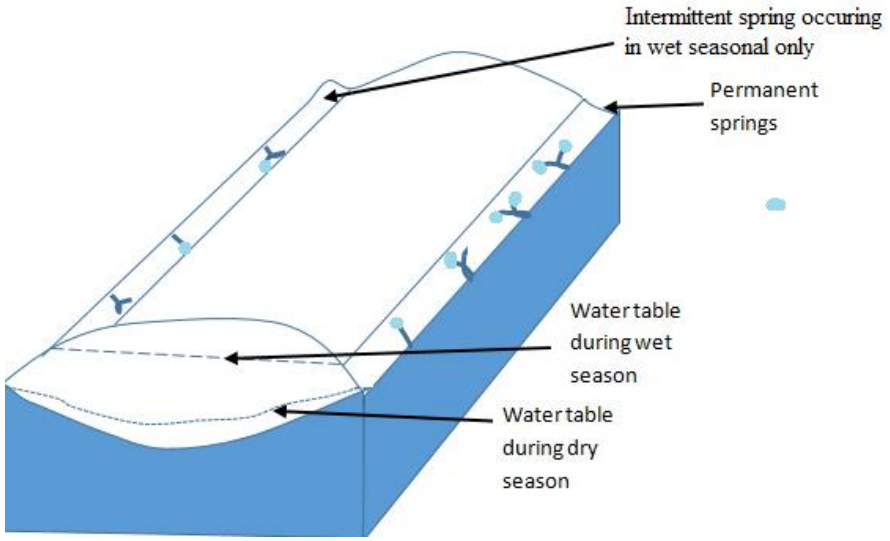
iii. The water table should lie near the earth surface.

iv. The presence of soft rock and cracks on the landscape. They allowing free penetration of water.

v. Permeable rocks should be lies on the impermeable rocks.

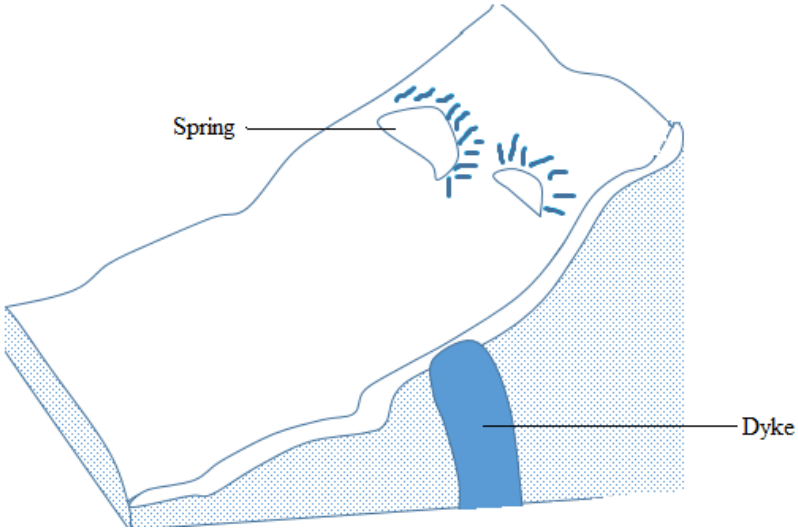
vi. The presence of internal pressure. This force the out flowing of water. Internal pressure influenced by the earth compaction.

Ways in which spring can be formed (types)

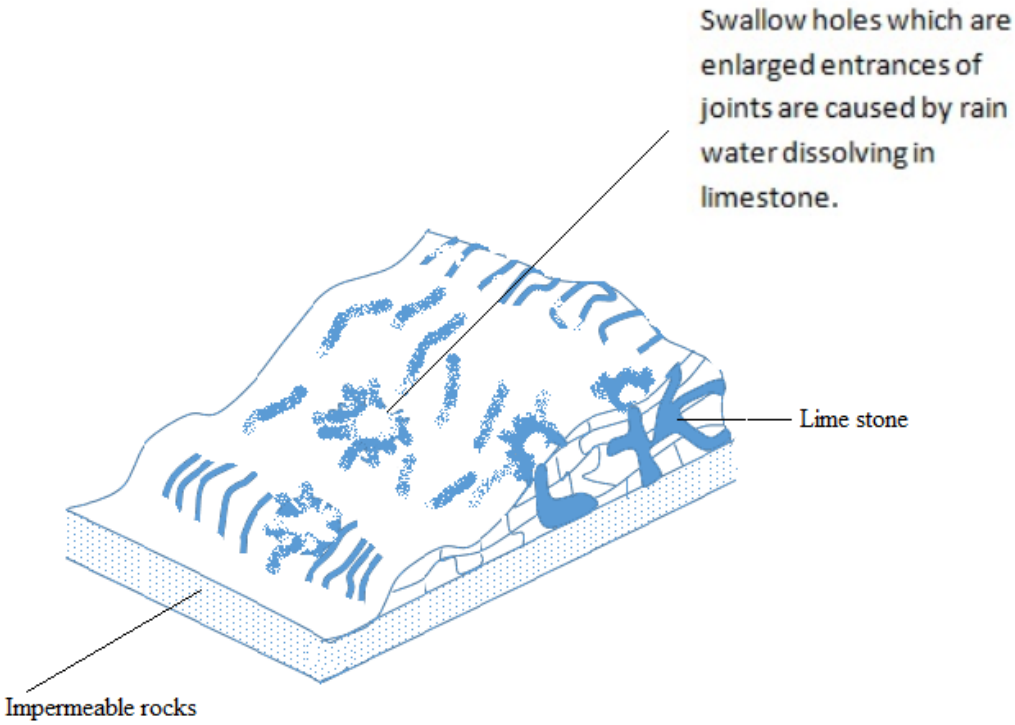


Spring can occur where the rock are well jointed water enter the rock via joint frequently occur where water table meet the surface.

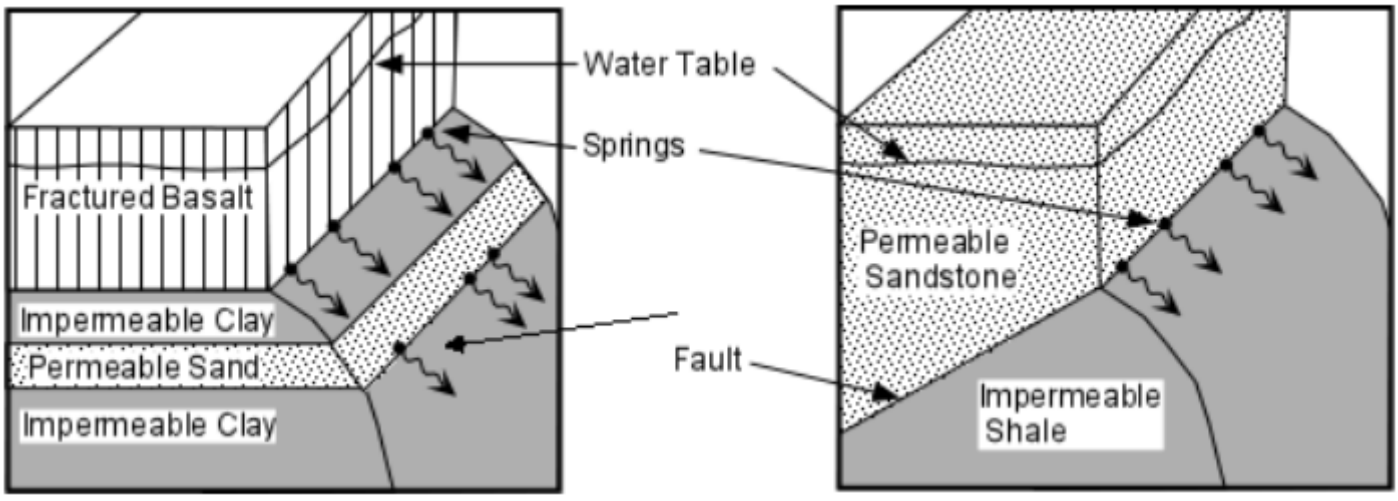
The impounding of water by a dyke whereby it cuts across the layer of permeable rock then the water on the up – slope sided of the dyke is impounded. Water table rises and gives rise to spring where it meets the surface.



-Numerous springs occur where the junction of lime stone rock and underlying impermeable rocks meet t



-Gently sloping layers of alternate permeable and impermeable rocks rain falling on exposed ends of permeable rocks are socked in the sloping bedding planes and finally comes out as spring are sometimes in line



HOT SPRING

-Is the out flowing of super heated water from the ground surface this involves the heated water.

-The hot spring develop from the juvenile water (ground water force during the formation of igneous rocks)

CONDITIONS.

-Refer to the condition of spring.

-The pressure of heat and pressure within the interior of the earth crust

Importance/Effect of ground water

1. Water from wells may be used for irrigation in the dry area in Sahara; agriculture is practiced around the oases.
2. Spring form a major source of water for both domestic and industrial use.
3. Site of settlement in many regions of the world.
4. Formation of hot spring and geyser on areas with volcanic influence, likely to be a tourist
5. Water for cattle ranches Kansas in North America
6. Influence land slides
7. Destruction of mineral
8. Reappearance at a new sight.
9. Karst processes factor and resulting process.

-

KARST SCENERY

Karst

- Is the landscape formed from the dissolution of soluble rocks including limestone, dolomite and gypsum.
- Rain water become acidic as it comes in contact with carbon dioxide in the atmosphere and the soil. As it drains into fractures in the rock, the water begins to dissolve away the rock creating a network of passage overtime, water flowing through the network continues to the passage.$(CaCo_3) + (Co_3) \rightarrow Ca(HCo_3)_2$

Karst Topography

- A form of land form denudation base almost exclusively on carbonation (chemical weathering).

Factors for the formation of karst region.

i. The outcrop should be hard, previous and well jointed

ii. The climate of the area should be humid. The climate found in e.g. temperate region.

iii. The water table should be deep enough to allow percolation of water.

Major characteristics of karst scenery

1. Absence of surface drainage.
2. Outcrop of bare, rugged rock and steep sided dry valley
3. Numerous solution depression and residual hills of various sizes
4. A subterranean network of caverns and water courses
5. Joint are at right angle to each other

LIMESTONE

Is a rock consisting of at least 80% calcium carbonate./is a well-joint rock and its joint and bedding plane soon become opened up by rain water that fall on its surface./is an organic sedimentary rock formed by remains of tiny shells and micro - skeletons deposited on the sea bed.

Carboniferous limestone.

-Formed from the remains of organic matters usually sea shells and plant, coral.

Characteristic of carboniferous limestone

1. It is hard, sedimentary rock with a large number of joint (vertical cracks) and bedding planes (horizontal planes)
2. Main process which affect it are carbonation and solution

Landforms in Karst region

-The land form in Karst region are divided into two

1. Surface feature
2. Subterranean/under ground feature

1.SURFACE FEATURES

·Limestone pavement.

-Is a bare rock surface crisis – crossed by numerous gullies where solution has worked along the joint – these are areas of exposed limestone.

Land form in karst regions.

Example of limestone pavement

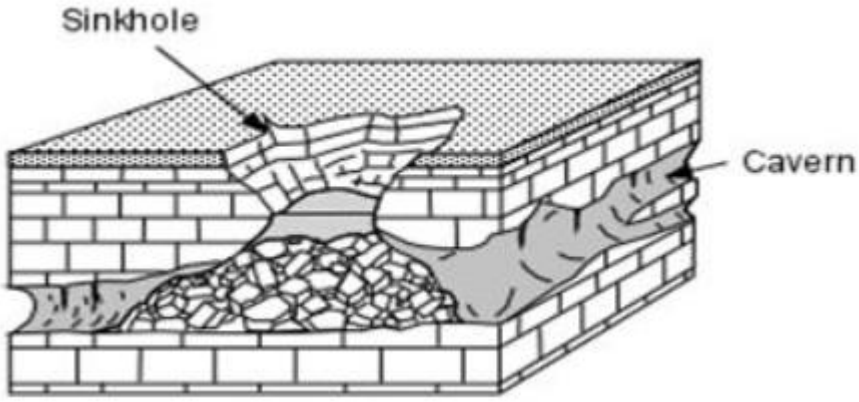
Grikes.

Are deep irregular grooves(gullies) formed when water erode the crack when running on the surface before disappearing underground.

Clints.

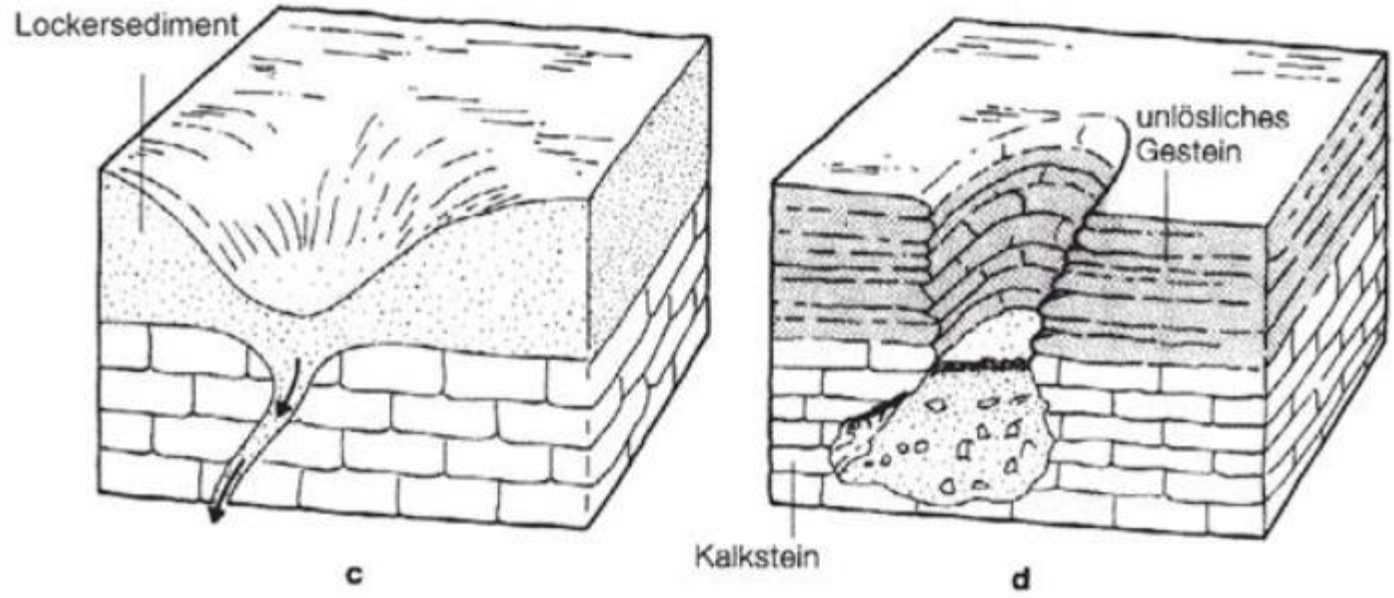
are ridge/blocks on the limestone rock separating the grikes.

Swallow holes (sink holes) – This is a vertical hole leading to an underground cave system which is produced when the joint are in large by water percolating into the rock. The running water may sink down through the swallow hole.



Doline -Is a shallow depression /hollow with gently sloping side and generally circular or oval in plan.

- They originate from water percolating underground at the intersection of major joints.
- When swallow holes join together form a large depression called doline.



Uvala

-Is a large closed depression with diameter general greater than 500m.It is formed by coalescence/joining of several do lines. The floor is often hummocky consist of several interconnected hollows.

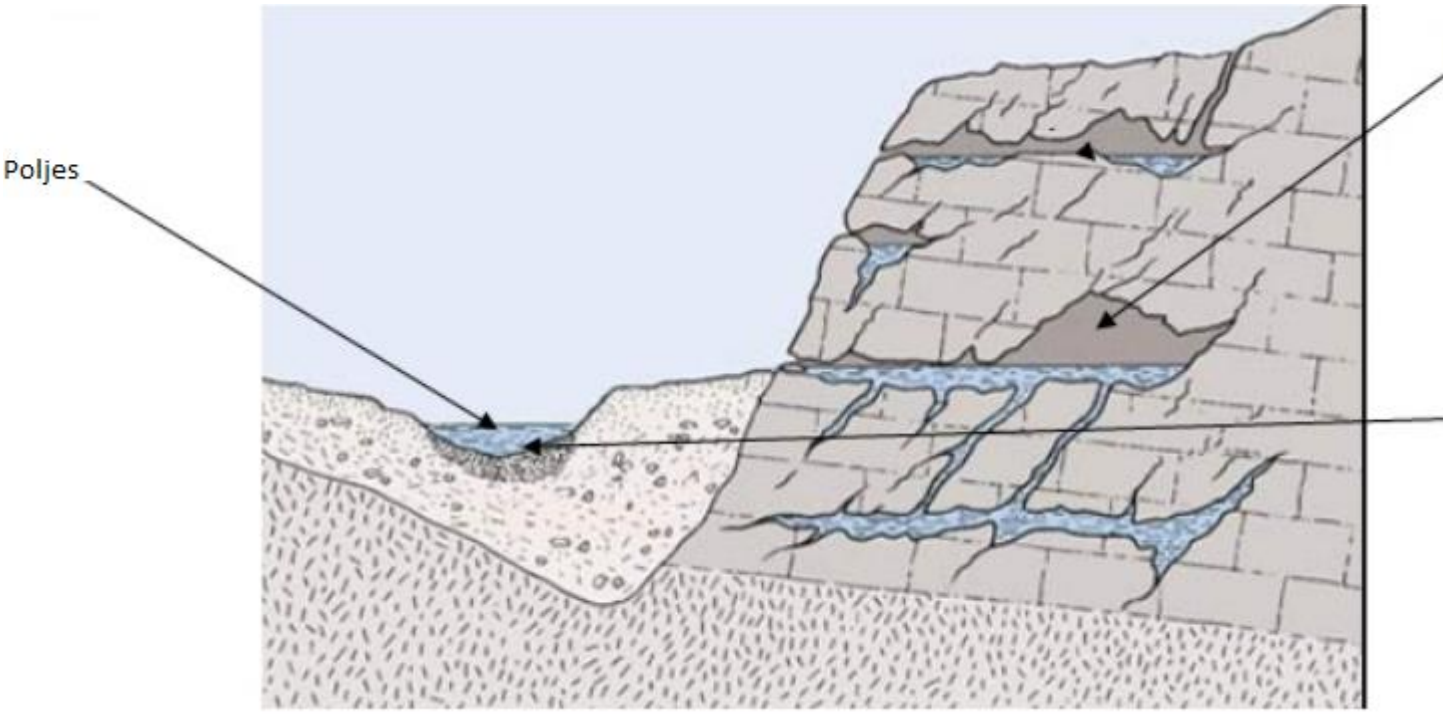
Example of Uvala

Polje:

- This is a very large/shallow steep-sided depression with a generally flat floor.

- It may be many kilometer in size. The flat floor is often emphasized by the deposition of Terra rossa a red clay material which form an impermeable layer and leads to flooding after heavy rains.

-Is a very large depression which is formed when several uvalas collapse, the collapse can be due to faulting some poljes even have small lakes.



Dry valley

-Is a valley with no permanent stream and often with steeps almost vertical sides.

- Most are caused by gradual lowering of the water table which itself is often due to the entrenchment of major stream into the limestone. As the water table falls, small stream become intermittent first and finally vanish.

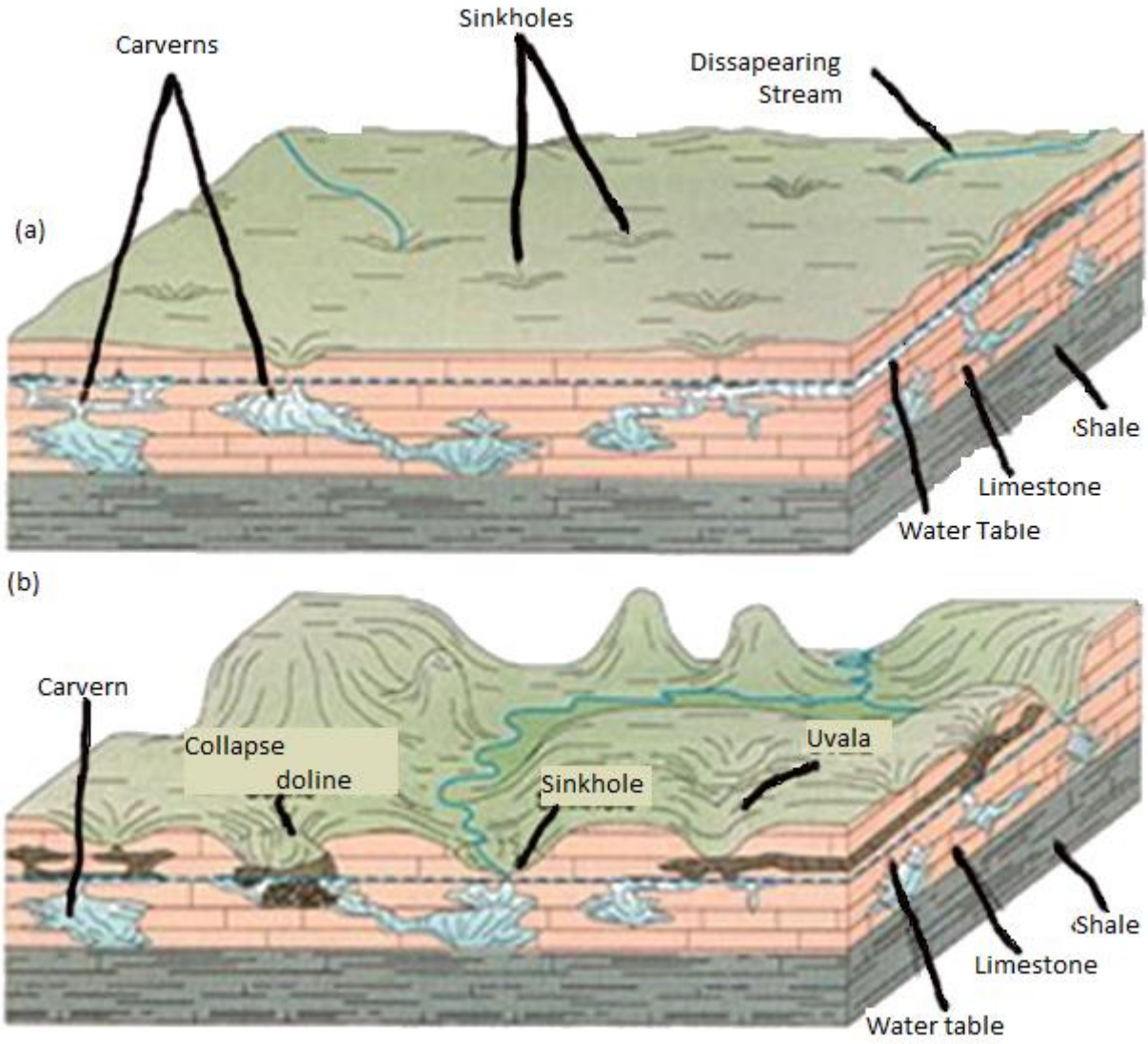
Limestone gorge

- This is the deep steps sided valley formed by a large river with its head waters beyond the limestone area steadily entrenching itself into the land surface. The steeps cross profile is partly a result of the nature of rock jointing, formed when roof of a cave collapses inwards. E.g. cheddar

Example of limestone gorge

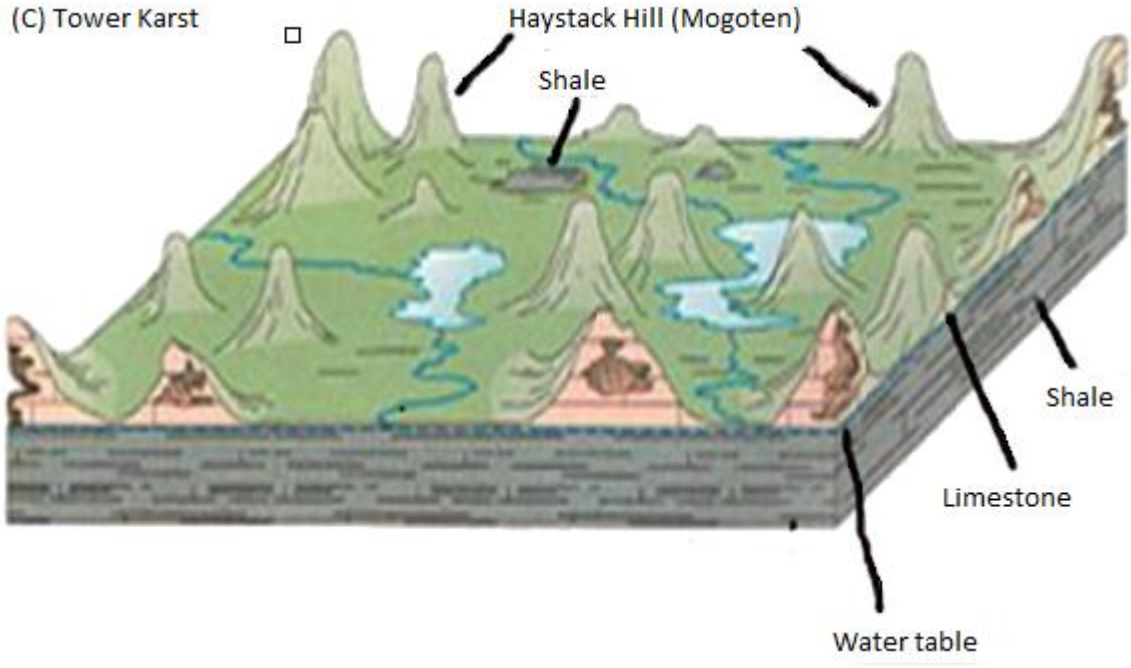
Resurgence

–Here the surface drainage reappears.



2. **SUBTERRANEAN FEATURES:**

-These are feature formed below the surface



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Limestone caves and caverns.

-These are underground chamber formed due to solution of the limestone rock underground.

- First tunnel is form, followed by the enlargement of the chamber or cave. Subsequently due to further solution a layer cave forms a cavern e.g. **Ambon caves in Tanga**.

Example of limestone caves and cavern.

Stalactites:

- These are finger like masses of calcite hanging vertically from the roof of the cavern. They a formed through deposition of drops of water containing calcium bicarbonate which have the crevices /joints.

- Calcite is deposited through evaporation and when carbon dioxide is released from water.

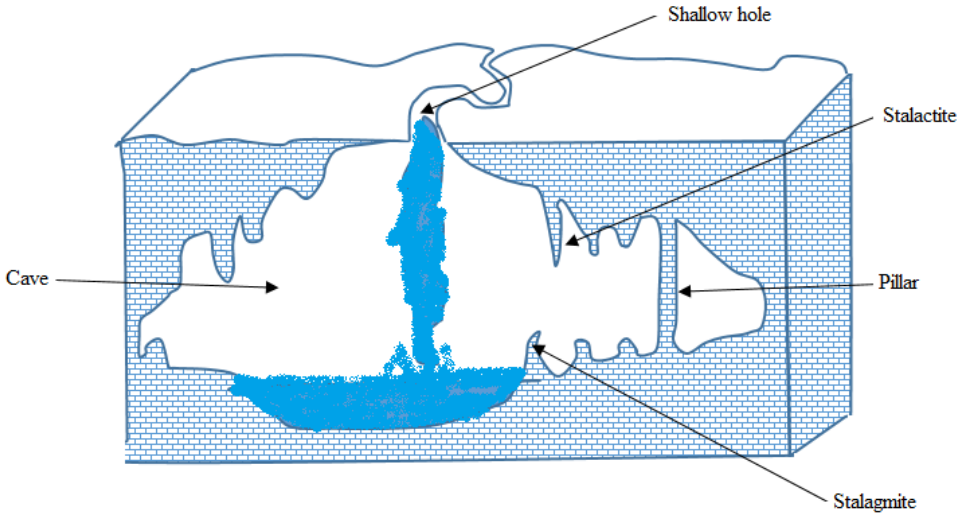
Below is an example of Stalactites

Stalagmites:

- Are stumpy rock masses which grow from the floor of the cavern upward. They are much thicker than stalactites to the floor where they crystalline and grow slowly but steady towards the roof.

Natural pillar

– This is the natural column or pillar formed either when the stalactites and stalagmites join or when the stalagmites grow to the point of reaching the roof.



Example of Karst region in the world

1. Karsts region in Yugoslavia
2. Causes region in south west France
3. Kentucky plateau in U .S .A
4. Ambon – Tanga
5. D R C
6. Morocco –atlas region
7. Madagascar.

Economic importance of karst regions:

1. Used for / as a tourist attraction hence brings foreign currency to the country e.g. Ambon caves in Tanga.
2. Karstified limestone act as an aquifer where water can be store underground and later extract by human e.g. in Texas
3. Create complex underground water flow network and large causes enough for human access.
4. Limestone is an important rock that is used in building and for making cement e.g. sokoto, ewekoro in Nigeria
5. Sufficient pasture to support goals sheep and cattle but not good for activation since the soil is poor an

1.2 LAKES

Is a hollow of which they vary in different size .Some lakes are natural and other are temporary.

Therefore a lake as a hollow which is filled with water coming from natural sources. A lake can be in liquid or in solid or (glaciers) and it can consist of fresh water or salt water. A lake can be formed from different natural forces and is named after that force together with its size (lake size).

The sources of water in the lake is from

(i) On the surface (e.g. run off, ice melting)

(ii) Underground source (e.g carst region)

(iii) From the atmosphere (rainfall)

CLASSIFICATION OF LAKES

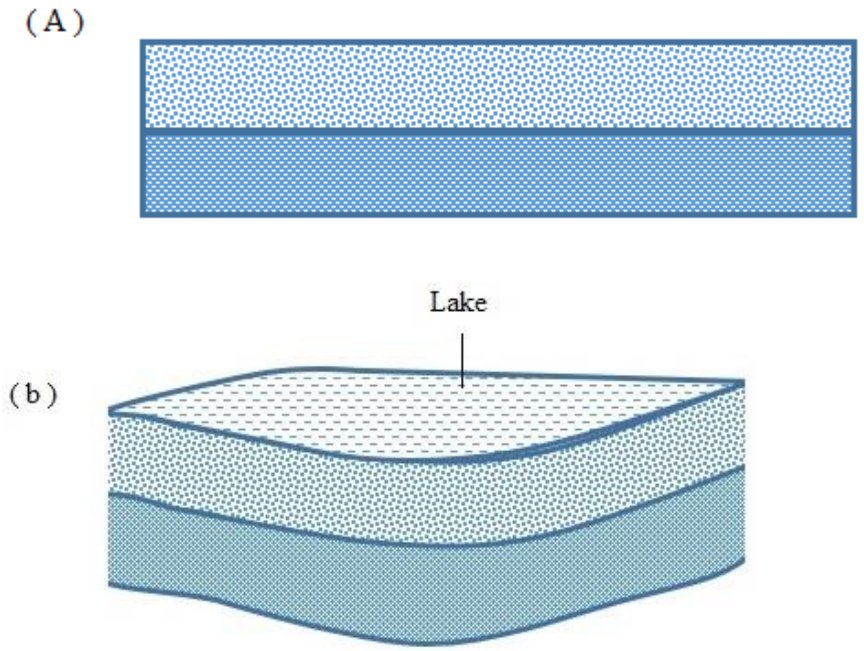
Lakes are classified according to the different criteria as follows:

- Due to earth movement lakes can be formed from folding, warping (especially down warping) and faulting.
- Due to erosion we have lakes which are formed by the wind and graciation.
- Due to deposition there are lakes which are formed due to oxbow and delta.

- Due to volcanicity there are rocks which are formed due to crater, lava blocked and lava subsidence.
- And those which are formed due to different types are solution lakes , mining, ponds and dam.

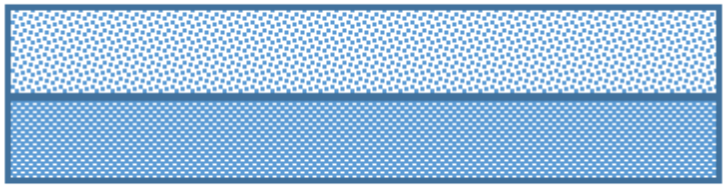
1. **EARTH MOVEMENT**

Folding: Folding lakes can be formed due to compression force .And in young rocks with large piece of rock subsidence occur or down warping.

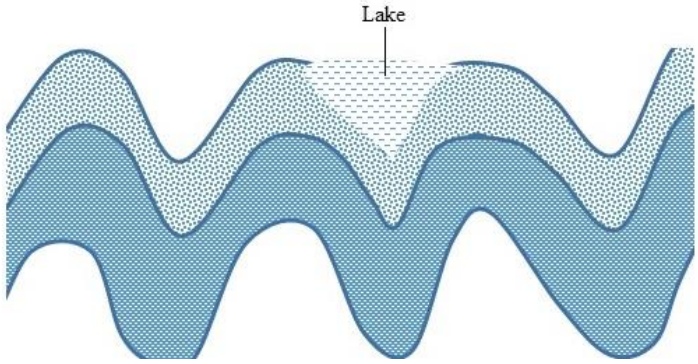


But also in old rocks with enough force leads to the formation of lakes in syclines.

(c)

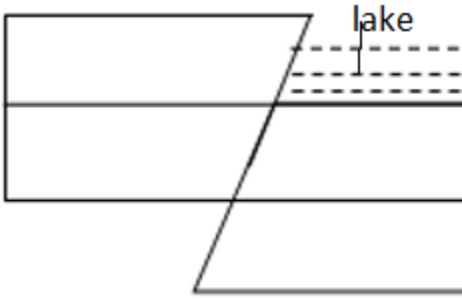


(d)



Faulting: Lakes can be caused by faulting when tension force dominate.

(B)



The examples of folding down wraping lakes include lake Victoria, Lake Tchad ,lake Eyre(Austria),Lake Titicara (Peru) and example of lakes which are formed due to faulting are lake Tanganyika, Laika(the depest) in Russian, lake Nyasa ,Dead sea and ness in Scotland.

2. EROSION

There are lakes which are formed due to erosion especially by wind and glacial.

By wind: Blocks and when it is strong wind it lead to the drug of blocks of rocks and

form depression (oasis). This lead to the creation of lakes especially when the depression reach the water table .

Then when the depression reach the water table is exposed to the surface .It reate the rocks and sometimes underground streams can be opened. Also by wind can form Playas.Playas are holes which are drugged by the wind.But they are dry and sometimes can contain fresh water and salty water.

By Glaciation:Lake can be formed by glacier erosion when evalanche moving from the Highlands they come and being deposited on the law land especially when they meet the obstacle and prevented.In this sense they may form glacier lake or in melting they form fresh lakes.They called basin rocks especially when they meet an obstacle.Example lake Teleki-Cirque(corrie)lake .Trough lakes(Ribbon lake or tinger lake)

Sometimes glacier can erode the surface and cause alongated depression where after ice to melt they form a lake which is know as Ribbon rock.This happen when the ice erode through the flat surface by accelerating(friction). Now with graciation three types of lakes can be formed which are:
(i)Trough (ribbon) elongated feature
(ii) Rock basin
(iii)Corrie/Tarn /Cirque

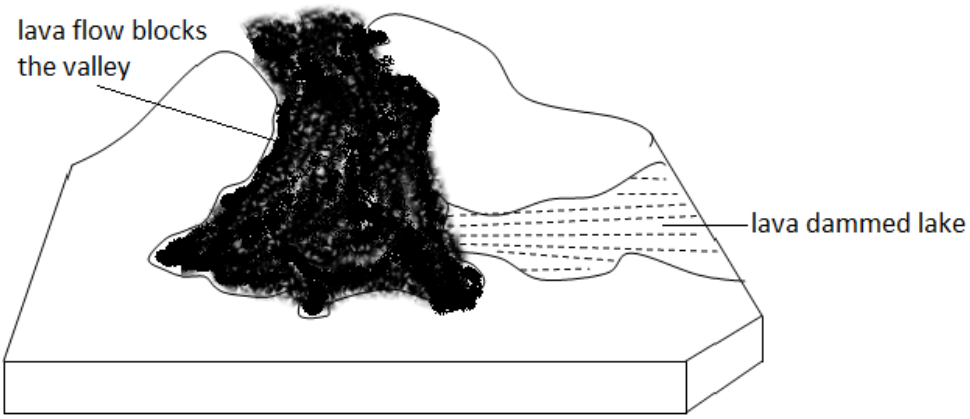
3.DEPOSITION

Delta lake:A delta lake can be formed by revee.This is due to factor that when the water erode the sides of the banks they form deposition on the sides of the banks.Then on ahead the stream may be blocked due to erosion and create a lake.

4.VOLCANICITY

Crater:This is formed after the eruption of melting material and create a crater lake.But sometimes a second eruption can take place and lead to the formation of cardera lakes.

Lava Dammed Lakes:These are the lakes formed when the river stream (i)blocked by highly viscous lava that erupts and runs across the river,When lava cools and solidified it forms a dam behind which water collects to forms a lake.Example Kigezi in Uganda



1.3 WETLANDS AND SWAMPS

Swamps: Is a body of stagnant water which occupies a shallow depression or flat low lying land and dominated by the plants.

-They are common only found near the rivers,lakes and seas.

-they vary greatly in size as some are larger while others are smaller .some of swamps contain water throughout the year while others have water only in some periods

-The favorable topographical nature for the occurrence of swamps include that of:
(1) Flat low lying land

(II)Shallow Depression

TYPES OF SWAMPS

(i)Conifer swamp

These are the one in which the coniferous trees such are cedour , Hemilock predominant.These are common enough in cold temperature areas and the water making swamps are of either precipitation or ice melting.

(ii) Hardwood Swamps
These are also known as the swamps,they are predominant by big trees of hard woods .These are common found in areas of **tropical latitude** featured by heavy rains and where the hard wood trees predominant.

(iii)Shrub swamps

These have small trees and bushes.These common only found in areas that experience

seasonal rains"semi-arid".

(iv)Mangrove swamp
These dominated by the mangrove trees plants.These are common in areas along the wast of Mangrove require ecology of salty water.

(v)Puprus Swamp
These appear to appear to have purpus plants They are commonly found along the shore of lakes.

Note:Most of the swamps makes "wetland".

Wetland

Is a general term applied to an ecosystem intermediates between the terrestrial and aquatic and natural or artificial land escape in which fresh or salt water places a key role that is water logged the water table is at or near the surface or the land is covered occasionally periodically or permanent by shallow fresh or salt water/A land area that is saturated with water either permanently or seasonally.

ECO –SYSTEM.

- Refer to the interaction between living thing and non – living thing and living thing with living thing in the environment.

Water logged -Soil is under water.

Water table – level at which water is found / Settle on the ground surface.

TYPES OF WETLANDS.

Three large groups;

1) Estuarine (coastal/marine) wetland
2) Fresh water (in land) wetlands
3) Human made wetlands

1. **1.ESTUARINE/MARINE/COASTAL/SALT WATER WETLANDS**

- **Estuary** – Is a submerged river mouth

- **Estuarine** – Are linked to estuaries and ocean where fresh and salt water mix. The environment in the estuary is one of ever changing in terms of salinity and temperature the water levels fluctuate in response to wind and tides.

Example;

i. Salt water marshes

ii. Mangrove swamp

iii. Delta

iv. Mud Flats

2. INLAND WETLAND/FRESH WATER

These are wetlands related to riverine ,Lacustrine,forested.These occur in the interior part of areas.These wetland occur in flat flow lying land of rift valley,flood plains,highlands,drainage basins and plateous lakes shore

a) Permanent inland deltas

b) Permanent rivers / stream

c) Permanent fresh water lakes including flood plain lakes

d) Seasonal marshes / ponds

3. HUMAN MADE WETLAND

a) Aquaculture ponds – Ponds made by human being for keeping fish.

b) Irrigated land

c) Seasonally flooded agriculture land

d) Excavations – Open pit mining whereby when the depression is filled with water

e) Canals and drainage channel

CHARACTERISTICS OF WETLANDS

-The water table(the ground water) is very near to soil surface

-They occupy the extensive flat low lying land or shallow depression

-Shallow water cover the surface for at least part of the year

-wetland are the habitats of animals

-Some of the animals which make life in wetlands include tortoise,frog mosquito,fish snakes etc

-wetland are supporting the life of different plant species.These include grasses,mangroves,trees etc

FUNCTION OF WETLANDS

1. Soil anchoring

Soil from the river is retained by the vegetation which is found on the river mouth whereby as this continues it creates landscapes which can be used for different purpose.

2.They provide food to many different plant and animal

- The combination of shallow water, high nutrient level and primary productivity is perfect for the development of the organism that forms the base of the food chain.

- The water, dense plants they are roots mats and the decaying vegetation are food and shelter for the eggs lava and juvenile of many species (acts as nursery for the eggs ->kids)

- When the plants die they are decompose by bacteria available in the water algae that grow on plants and decomposed matter makes the food for many fishes.

3. Habitat for migrant birds

Bio diversity

A wide variety of organism makes their homes in or around wetland because of the availability of water. For example some wetland provide important temporary –seasonal habitats

The physical and chemical feature such as the land escape shape climate and abundance of water help to determine which species lives in which wetland. E.g. water fowl, ducks and geese.

4. Water storage.

- Wetland absorber water by temporary storing run – off and flood water. This help to protect adjacent and downstream property owners from flood damage.

- The slow the flow of water of which contributes to the wetland ability to store the water. The combine effect of storing and slowing the flow of water allow the water to percolate through the

soil into ground water that recharge aquifer and to move through the water shed with less speed and force.

5. Natural water filters.

When water is stored or slowed down by the plant and root mats that grow their sediments settle down and remains in the wetland so that the water living the area is much (less cloudy / clear) that the water that enter. The loss of turbidity water (dirty water) has important consequences for both human health and the environment of the water shed because turbid water is associated with outbreak of disease due to drinking such water and it also bears silting responsibility for supporting plant and animal in rivers land and estuaries.

6. Recreation
They form good basis for tourist industries

7. Commercial fishes

8. Flood control
Also prevent soil erosion in a number of ways-they reduce sediments being carried into stream and lakes.

9. Research

Sub – division of estuarine wetland

a) Marine permanent shallow water

- These are in most cases they are less than 6m deep at low tide under this we have; sea bay straits.

b) Marine sub

- Tidal aquatic base – Under this we have; sea grass base, meadows (tropical marine meadows)

c) Coral reef

d) Estuarine waters

e) Intertidal mud, sand or salt flakes

Problem facing wet land development

i. deforestation

ii. Construction

iii.Wastes from industries

iv. River rejuvenation

v.Climatic change – Desertification

vi. Conversion of wetlands into agricultural land

vii. Introduction of aliens species to wetland areas.

1.4 OCEANS AND SEAS

OCEAN:

- -The body of salt water which cover 70.78% of the earth surface.
- -Is the very wide area on the land surface covered with water. This part of the land should be cover millions of kilometres of water.

SEAS:

- -As applied to the great body of salt water and earth surface (ocean) as opposed to land

OR

- -Are the smaller bodies of salt water of the ocean

OR

-A large body of in land salt water for example the sea of Aral.

OR

- -Is the wide part of land surface covered with water. The sea is intermediate between the ocean and lake in their wideness with salt water E.g. red sea.

- The ocean and sea are interlinking with mineral composition the major mineral composed within the sea / ocean are magnesium , calcium ,sodium and other mineral the dominant mineral is the salt.

OCEANOGRAPHY

- -Is the study of ocean with main interest on the properties of ocean water and its motion

- -It is also deal with the chemical reaction lives (biodiversity) and the structure of the ocean bed including the process that are active in the ocean.

- -The ocean regulate in number of major process that operate on the earth`s surface.

- -They are primary source of the water that reaches the continent as rain and snow.

- -Contain the largest reserves of carbon which is essential to the biological cycle

- -Contain / has a high heat capacity that make it an important regulation of climate (ability to absorb greater quantity of heat)

- -The movement of water in the ocean (ocean current) is important for both marine and life and human for navigation for many years. That is for transport and communication (wires pass under water)

STRUCTURE OF OCEANS:

- -Topography -Ocean floor.

Depth of the oceans – About 4,000m (average depth)

Depth of seas - Is about 1,200m

-In relation to the sea level the ocean are much deeper than the land is high. (Height in depth of ocean is high compare to the land)

- Surface of the earth is only 11%of the land is more than 2000m above the sea level while 84% of the sea bottom is more than 2000m deep.

- The highest elevation that is mountain Everest on the land is 8840m the Marianas Trench in the west Pacific Ocean is 11,000m.

There are 3 major areas in the ocean;

i) Continental margins

ii) Deep ocean basins

iii) **Mid oceanic ridges**

i) **CONTINENTAL MARGINS** - It comprises the continental shelf, continental slope and continental rise.

It is divided into;

a) **a) The shore**

b) **b) The continental shelf**

c) **c) The continental slope**

d) **d) The continental rise.**

a) Continental shelf

- -Extension of the continental into the ocean. / Widest around the shores of lowland areas.
- -Is a gentle slope submerged surface extending from the shores line towards the deep ocean base
- -It is underlined by continental types crust and therefore it is a Clearly flooded extension of the continent
- -There is great variation in width and almost non – existed alongside continental and on the average it is about 80km and 130m deep at the sea ward edge.
- -The average inclination of the continental shelf is lesser than $\frac{1}{10}$ of1 degree a drop of only about 2m per km the slope is so slight that it would appear the observer to be a horizontal surface.
- -It is not completely smooth due to presence of extensive glacial deposits in some places and therefore it is rugged/rough.

Prominate features - Include long valley of many rivers running from the coastline cross the continental shelf into the deep sea water

-Example; Western Europe and north – Eastern North America

b) Continental slope - This area is characterized by a steep gradient compare to the continental shelf

-Marks the boundary between the continental crust and oceanic crust.

-The average inclination of the continental slope is about 5º and in some place may exceed 25º. The average depth vertically from the shelf to the deep sea bottom is on average 4000m.and in some place extend to as much as 9000m vertical over a relatively short horizontal distance.

-Along mountainous coast the continent slope descend abruptly into deep ocean trenches located between the continent and the ocean basin in such a case the shelf is very narrow or non-existence.

ii. **DEEP OCEANIC BASINS**

The deep ocean basins which are about 2.5 to 3.5miles deep, covers 30% of earth's surface and has feature such as abyssal plains, deep sea trenches and sea mounts (70% of entire ocean area

· The abyssal plain – Is the flat deep ocean floor. It is almost featureless because thick layers of sediment cover the hills and valleys of the ocean floor below it.

· Deep sea trenches – Are the deepest part of the ocean the deepest one the Marianas Trench in the South Pacific Ocean is more than 35,000 feet (11,000m) deep.

iii. **MID OCEAN-RIDGE**

-The mid ocean ridge is two chain of mountains separated by a large depression (or rift valley) that form a spreading center (or where two plates are drifting apart). The mountain ranges can have peaks as high as 12,000ft (2500m) and some even reach above the ocean surface.

- -Ice land along the mid – Atlantic ridge is an example.
- -In the rift valley which can be 15 – 30miles (24 to 48kmwide, new ocean crust is being made which means a lot of seismic activity is happening.
- -Sea Mountain began life as volcanic formed over hot spot in the ocean floor. After the crust moves off the hot spot the volcanic activity stops.
- -Sea Mountain is usually 25miles (40km) in diameter and can be 3000 – 4500m tall. Some are so tall that their peaks pierce the ocean surface forming a volcanic island.

LIST OF SOME OCEAN AND SEAS FOUND IN THE WORLD:

NAME	AREAS (square meter)	AVERAGE depth (m)
PACIFIC OCEAN	60,060,700	4,028
ATLANTIC OCEAN	29,637,900	3,926
INDIAN OCEAN	26,469,500	3963

SOUTHERN OCEAN	7,848,300	4,000 – 5,000
ARCTIC OCEAN	5,427,000	1,205
MEDITERRANEAN SEA	1,114, 800	1429
CARIBBEAN SEA	1,049,500	2647
SOUTH CHINA SEA	895,400	1652

SALINITY IN THE OCEANS:

- -Salinity is the amount of salt concentration within the sea/ocean. Salinity means the rate/ amount of salt.

- -Most of the salt in the ocean come from land. Over millions of years, Rain, River and streams have washed over rocks containing the compound sodium chloride (Nacl) and carried into the sea.

- -Actual mineral content of river water differ materials from that of the sea.

- -River water contains much of calcium salts (calcium carbonate) than sodium salt.

- -The average salinity is said to be 35% for the whole ocean

- -Sodium chloride (78%) most important salt in the sea water.

Distribution of salinity

- -Rainfall, evaporation, river run off and ice formation (melting) cause the variation of salinity in the ocean where by the average of salinity varies between 32 and 37%.

- -Areas of highest salinity lie near the tropic (about 37%) where skies are clear constant high temperature and brisk trade winds maintain active evaporation.

- -Salinity decrease towards the equator (equatorial) 35% where rainfall is heavier and evaporation less because of the higher relative humidity, greater cloudiness of calmer air masses of the doldrums.

-There is also a decrease towards the poles (less than 34%), the result of melting ice and decreasing evaporation.

FACTOR AFFECTING THE RATE OF SALINITY WITHIN THE SEA

i. Climatic condition :

During winter season, rain formation, addition of water within the sea reduce the amount of salt while during summer there is high rate of temperature, high effective evaporation of water influence large concentration of salt.

ii. Ocean current:

Is the surface running water within the sea. They are moving in specific channel within the sea.

Types of ocean current.

- ***Warm ocean current.***

High rate of temperature influence high evaporation and large concentration of salt.

- ***Cold ocean current.***

Low rate of temperature, poor evaporation and low rate of salt.

iii. Amount of river stream within the sea.

Presences of river entering the sea reduce the amount of salt and absence increase concentration of salt.

iv. Wind action.

Strong winds affect the concentration of water and salt.

v. Wideness of the sea.

Wide sea leads to large concentration of salt since cannot/difficult to be affected by variation situation.

vi. Amount of vegetation cover.

Presence of mangrove trees which use a lot of salt reaches the amount of salt in the ocean.

OCEAN WATER TEMPERATURE

-The water of the ocean has considerable degree of heat known as sea temperature; the temperature is created as oceans warmed by heat radiated from the sun. However the surface water warmed more slowly than the land, and looses heat to air also more slowly.

-Temperature of the sea water varies considerably from region to regions, time to times and depth to depths due to some determinant factors and includes the following

1. Latitudinal position of an area

-Amount of solar radiant energy, differs from region to regions. Usually all tropical area experience higher insulation than the Polar Regions as heat radiated from the some received at right angle. Hence the temperature of the ocean in equatorial region is higher at about 26 $^{\circ}C$ and gets progressively low towards the poles.

Latitude (North and South)	Average temperature
Equatorial region 20° 40° 60° Polar region	20°C 23°C 14°C 1°C

2. Local cloud covers

-The clouds tend to absorb the heat radiated from the sun to the water surface, It is thus, if clouds make intensive coverage lower the sea temperature.

3. The sun's altitude from the water surface

-If the sun's altitude is greater enough to the earth's surface more heat from the sun is scattered and absorbed on the way before reaching the earth surface at which absorbed. It is thus: the marine water in tropical regions is warm as the sun's altitude is small to the surface compared to polar seas like that of Arctic seas.

4. Distance of the earth from the sun

-When the earth is at farthest position from the sun, less heat received by the earth surface and makes low sea temperature, Conversely, when the sun is at nearest position, more heat received and makes high sea temperature is much based on the sun over head. In the same geographical

region. The sea temperature can vary time to time depending on the prevailing season whether or winter.

5. Ocean currents

-Warm ocean currents maintain steadily higher temperature by warm water brought into the area. Cold ocean currents lower sea temperature.

6. Atmospheric absorption an scattering

-If more heat from the sun scattered and absorbed in the atmosphere, make low sea temperature as less heat reach the surface and absorbed. Conversely, if less heat scattered and absorbed sea temperatures become high as more heat reach the surface.

MOVEMENT OF OCEAN WATER

-Surface water in the ocean basin is not stationary. It moves differently and thus recognized to have varied forms of movement. There are three forms of ocean surface water movement and include the following.

- i.Waves
- ii.Tides
- iii. Ocean currents

Note:

- Waves and tides make vertical movement of oceanic water.

- Ocean currents make horizontal of oceanic water.

I.WAVES

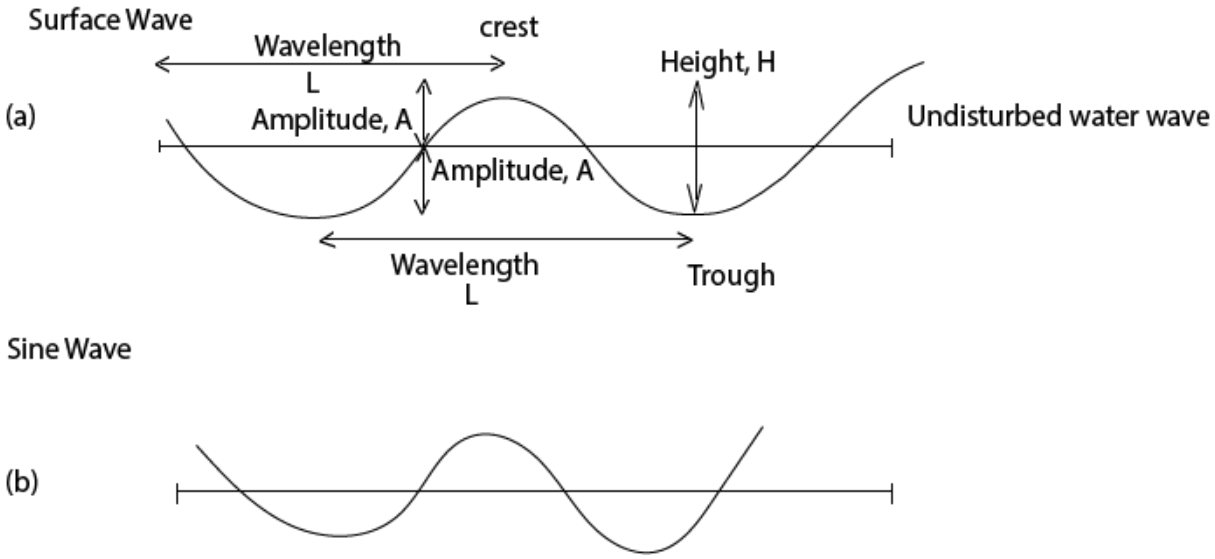
Waves refer to upward and down ward movements of sea water. Waves are produced by the following causal factors.

- -Transfer of energy by the wind blowing over surface of the sea.
- -Earth quakes refers to the occurrence of sudden uplift of the oceanic bed.
- -Gravitational attraction of the moon and sun. The waves tend to occur as water rise to high tide level.

The structure of the wave

-The structure of a wave is by its contrasting parts.

- -The upward part of the wave s called crest or anticline.
- -The lower part of the wave is called trough or syncline.
- -The horizontal distance from a crest to another successive crest is called wave light. The vertical distance between the crest and trough is called



-Waves make movement towards the coast and back away from the coast. The forward movement of a wave to the coast is called swash, and the back ward movement is called backwash. Hence swash is the water approaching the coast from the sea; while backwash is the water returning from the coast

Classification of waves

-Waves are classified according to causal factors and their nature of effects along the coast.

According to causal factor waves are classified into the following types

(a) Seismic waves; these are the larger waves generated by the force of wind blow.

(b Seismic waves; These are the large waves generated by the oceanic bottom (sima) usually caused by earth quakes, They are alternatively called tsunamis

(c) Tidal waves; these are the waves generated by the gravitational attraction of the moon and sun. They occur when the sea water rises to high tidal level.

According to their nature of effects along the coast waves are categorized into two types

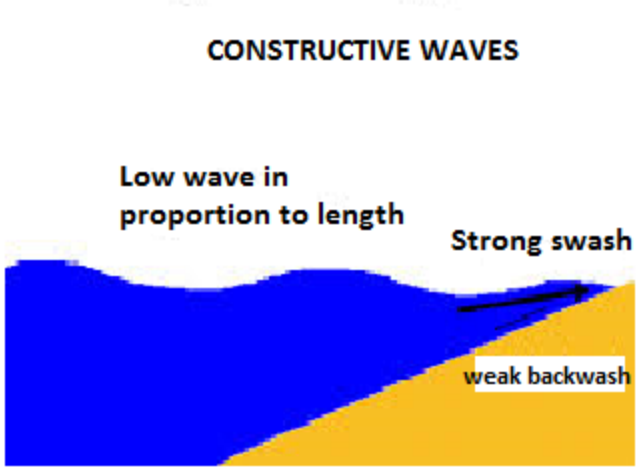
(a ***a) Wind waves;*** These are the waves produced by the force of wind blow
These are the ones whose swash is more powerful than the back wash and mostly causes the deposition of materials along the shore line

(b ***b) Seismic waves***; these are the larger waves generated by the suddenly movement of the oceanic button (sima) usually caused by earth quakes. They ate alternatively called tsunamis

(c ***c) Tidal waves:*** These are the waves generated by the gravitational attraction of the moon and sum. They occur when the sea water rises to high tidal level

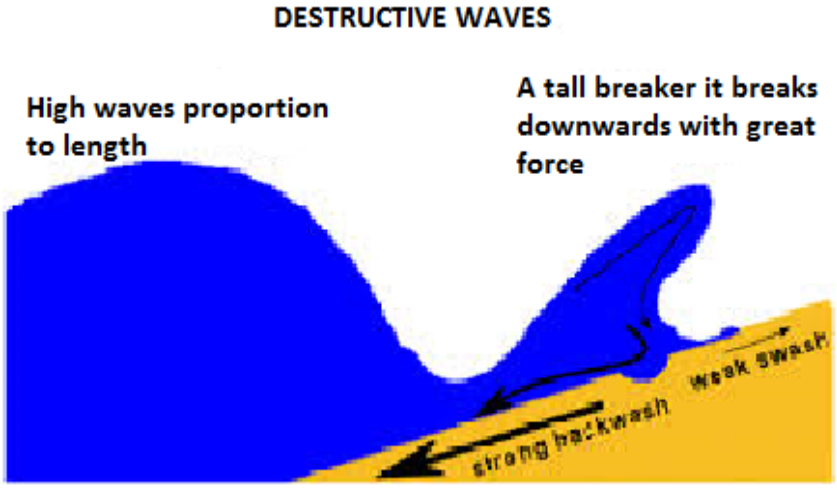
According to their nature of effects along the coast waves are categorized into two types

(a)**Constructive waves**
These are the ones whose swash is more powerful than the back wash and mostly causes the deposition of materials along the shore line.



(b)**Destructive waves**

Destructive waves are the ones whose backwash is more powerful than swash and mostly causes destruction along the shore a line.



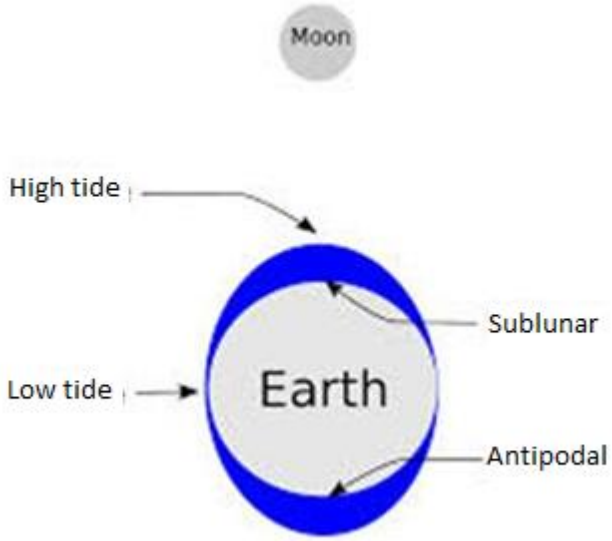
II.TIDES

Tides are the periodic rise and fall in the level of water in the oceans. Or regular periodic alternating rises and falls of the level of water in the oceans.

The rising of water level in a day is called flood tide, while the failing of water level in a day is called ebb tide. Tides commonly occur twice in 24 hours.

In day water rises to its highest level and fall to its lowest level to produce high tide (LT) respectively. The interval between the high tide and low tide levels is called tidal range.

Tides are produced as a result of pull of gravity of the moon and the sun, but the pull of gravity of the moon. Contributes more because of being closer proximity to the earth. The sun's great mass, however causes it to have an appreciable effect, despite its great distance from the earth. The moon attracts or pulls water to the side of the earth nearest to it. This creates a bulge or high tide.



TYPES OF TIDES

Tides are classified according to:

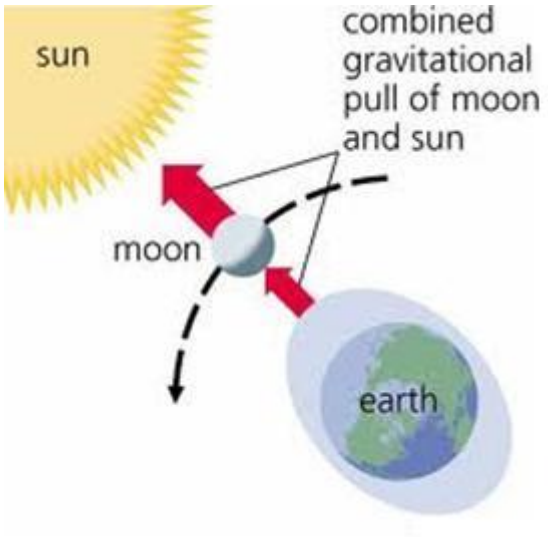
Their varied degree of tidal range

Rate of occurrence in a day

According to their varied degree of tidal range, tides broadly classified into spring and neap tides.

Spring tide

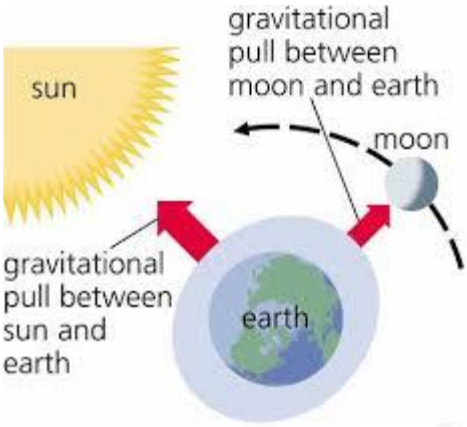
It is the one with maximum tidal range produced when the moon and the sun are in alignment on the same side, increases gravitational attraction production same side, increases gravitational attraction producing the and lowest low tide. This is also known as syzygy tide in basis that, the position when the earth, the moon and the sun are all in straight line is called syzygy period.



2. **Neap tide**

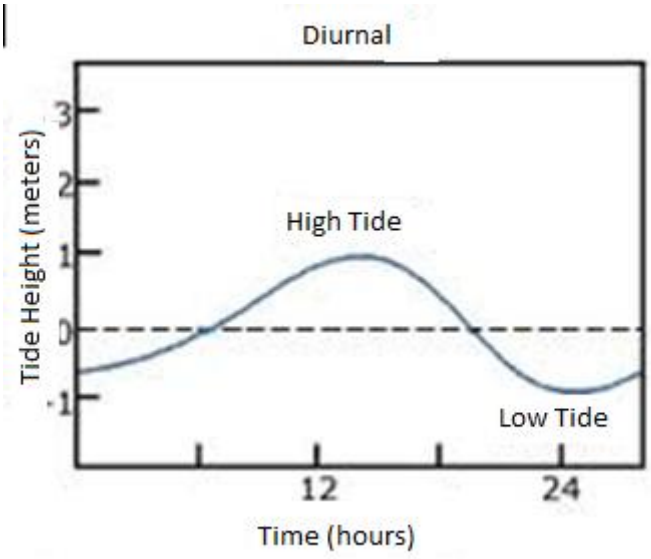
It occurs when the sun, earth and moon form a right angle with the earth apex as result, the tidal range is made least, This is also known as quadrature tide, in basis that, when the moon, earth and sun are in such a position that they form right angle with the earth apex is called quadrature period. At this position the moon and the sun are pulling the water on the earth to themselves. The result is that, the force of each body is weakened. The high tide will also be lower than normal

According to rate of occurrence per tidal day, tides classified into the following types



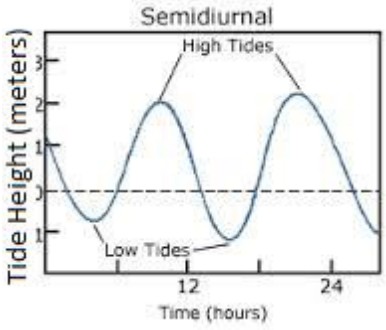
1. Diurnal tides

These are the simplest form of tides characterized by one high water and one low water per tidal day, It is very common in Northern Gulf Mexico and south East Asia



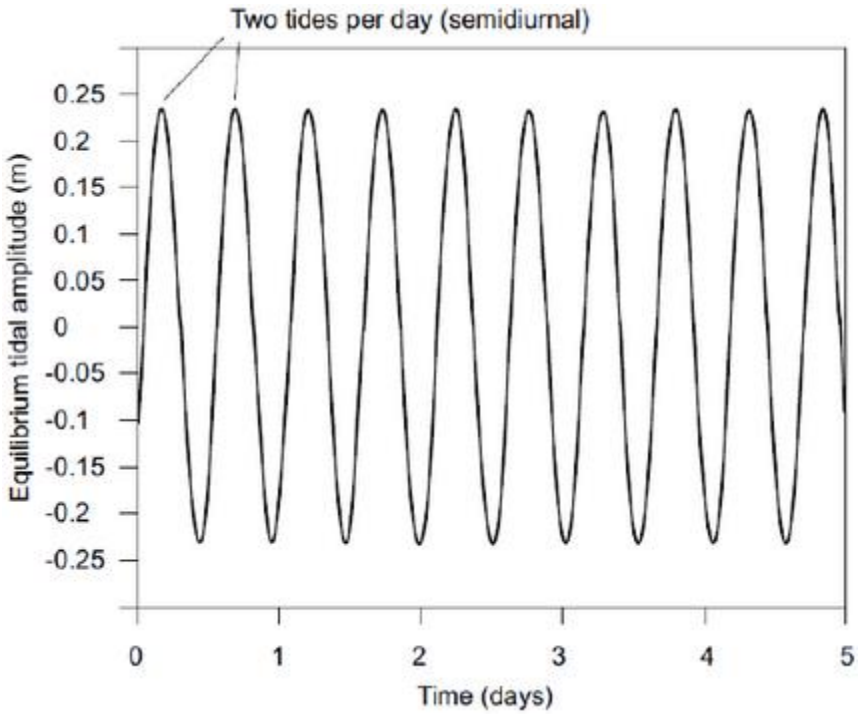
2. 2.Semi diurnal tide

-It is a form of tides, characterized by two high water and two low water per tidal day as the successive high water and low water levels are approximately equal. They occur provides, both the sun and moon are along the equator in a region at varied time per tidal day



3. 3.Mixed tides.

-The form of tides, characterized by having successive high water and low water levels stand differ appreciably i.e. There are higher high water level, and lower high water level as well as higher low water level and lower low water level per tidal day.



OCEAN CURRENTS

-The knowledge of major surface currents comes principally from compilation of mariner's observation begun in 1840 by the American oceanographer, Mathew Fontanel Maury. It was discovered that, ships courses, are deflected by surface currents. The currents cause discrepancy between ships intended position, and its actual position after it has traveled for a period. With this it was once discovered that, sea surface water have currents. ***Therefore ocean currents defined as are the movements of surface water masses in the ocean in the ocean basin horizontally covering a considerable distance.***

There are two types of ocean currents namely **cold and warm currents.**

-The cold ocean currents in the world includes; *Peruvia, California, West wind drift, Benguela, Canaries, South pacific current, south Atlantic current, south equatorial and Oyashi.*

-The warm ocean currents includes; North equatorial currents, North Atlantic drift, North pacific current, Kuro siwo, Mozambique, South Equatorial current, Brazil and Others. The ocean current is produced by the combined factors which are also considered as interplay factors for ocean currents. These include the followings.

*1.**The world wind belts**; the blow of global wind systems over oceans, set up the surface water in motion and thus produce currents. Moreover the directions taken by the wind blow.*

*2.**The temperature of the ocean water**; the ocean waters temperature of region produce either cold and warm currents. Cold currents develop in Polar Regions, while the warm currents develop in areas of tropical latitudes.*

In Polar Regions the average temperature is around 4 $^{\circ}C$ and sometimes is much lower. The water is therefore cooled, descends and moves towards the Equator at great depths in the oceans. In tropical regions where the average water temperature is around 26 $^{\circ}C$, the water is heated and expand. Hence ocean water moves away from the area at shallow depth towards the polar.

*3.**The rotation of the earth;** The rotation of the earth exert the force on the earth's surface which deflects the movements of objects from their normal position to the right in the northern hemisphere and to the left in southern hemisphere. Hence the movements of ocean water surface are also deflected to the right and to the left in the northern and southern hemisphere respectively.*

*4.**The shape of land masses; The** shape(angle)of the coastline affect the direction of water current by redirecting it in certain path. Hence the path taken in any particularly current partly depends on the shape of coastline.*

SEA LEVEL CHANGE

Sea level change is defined as a variation in the general level of the sea. The average position of the sea in relation to the land has remained relatively constant for the nearly 6,000 years. Before that time, there are had been several changes in the mean sea level. The most dramatic change being as a result of the quaternary ice and plates movement.

Sea level refers to a general level of the sea as if it were influenced by tides of waves.

Sea level changes in classified into

1. Negative changes (negative movements) in which the sea level is falling relative to land level. The coastal land emerges.
2. Positive changes (positive movements) in which the sea level is rising relative to the land level. The coastal land subsides.

Causes of the sea level changes.

1) Glacial formation and melting of ice.

2) The rising and falling of coastal land i.e. Isostatic movements.

3) Eustatic change can also be caused by the change in the size of the ocean basin.

Coastal Scenery resulting from changes in the sea level

Relative move of the sea level can be grouped into negative and positive as mentioned earlier .

-Negative movement produce **Emerged coasts**

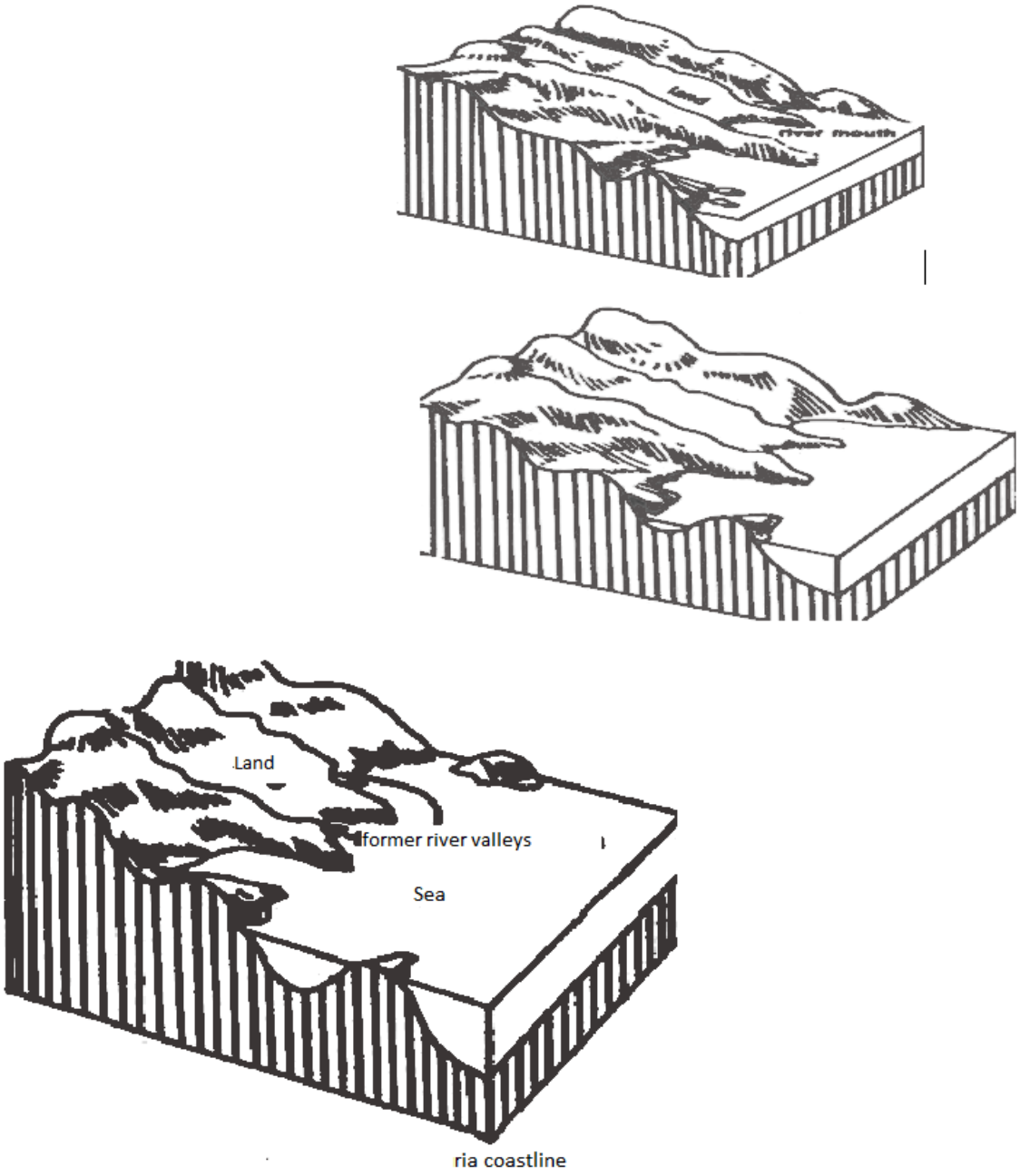
-Positive movements produce **submerged coasts**

1. **SUBMERGED COASTS**

-Occurs when highland along/near the coast lines become submerged (sinking of the land).

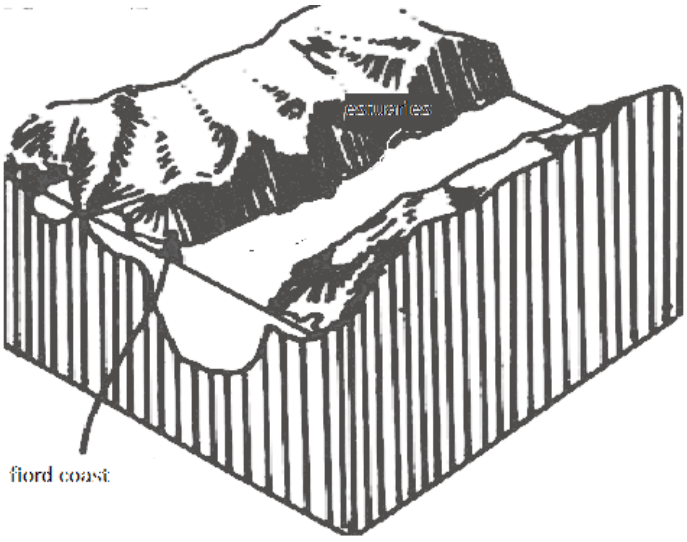
a) RIA coast

This is the coast which is formed when the highland area with level valleys is submerged and the lower parts of its river valley becomes flooded by water from the sea. The submerged river valleys are called **rias**, formations of harbors. E.g. Between Sierra Leone and Gambia, coast of guinea Bissau West Africa. Mombasa and Dar coast (harbors)



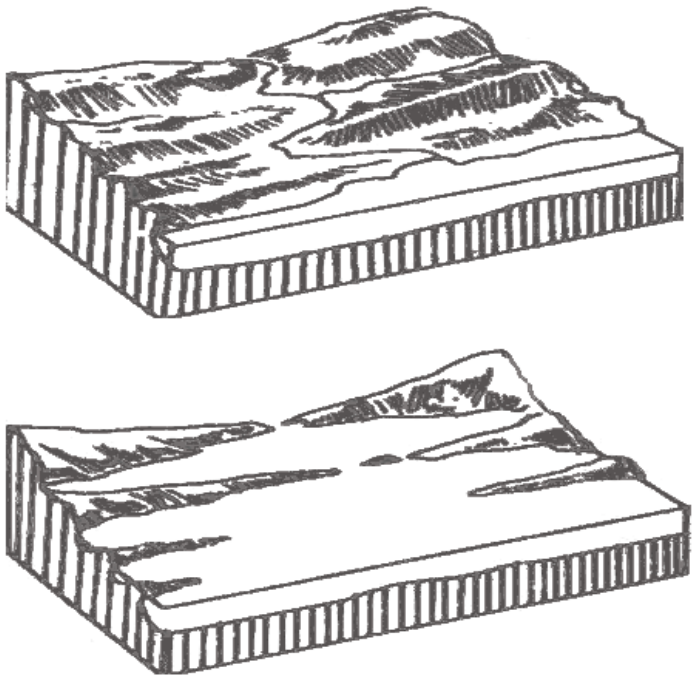
b) Fiord coast

This is formed when glaciated U-shaped valley are flooded after the submergence of former coastal highland. The flooded glaciated U-shaped valleys are called fiords. E.g. Alaska in U.S.A, South island in New Zealand, Fiord in Chile.



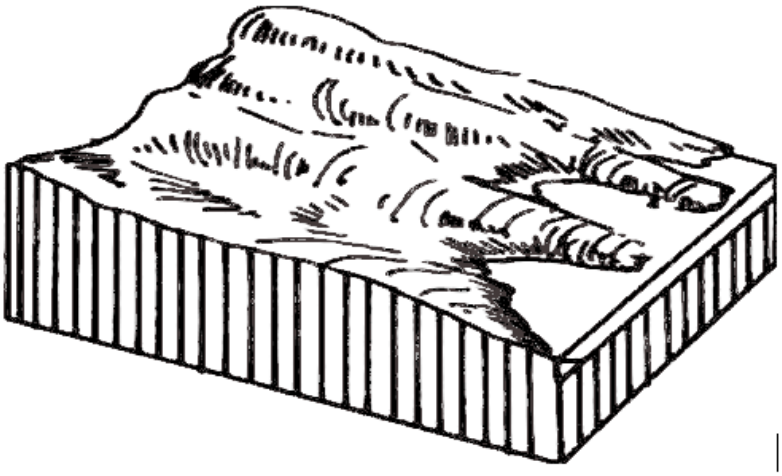
c) Dalmatian/longitudinal coasts

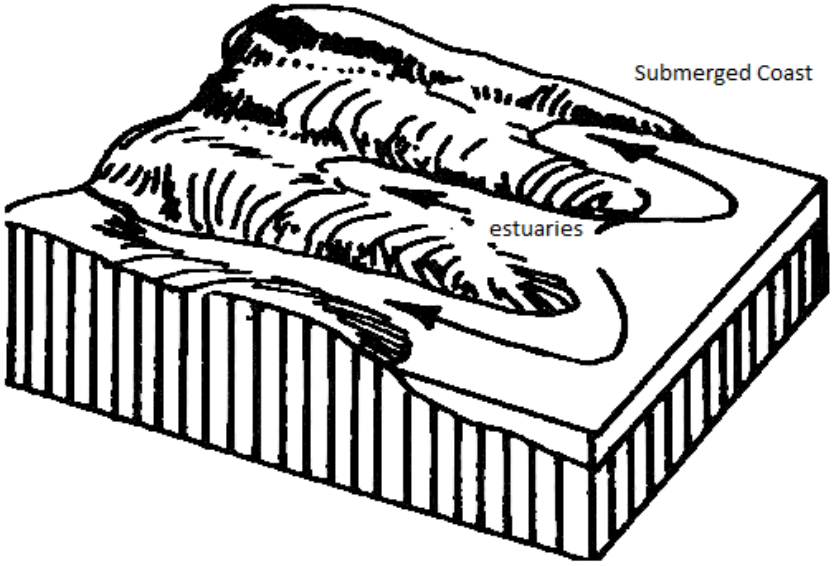
-Coasts formed/found in regions made up of hills and valleys which lie parallel to the coast are submerged. After submerged; - The valleys which are between the mountains are flooded. The flooded valleys are called sounds and mountain ranges become chains of island E.g. Dalmatian coast in Yugoslavia.



Submerged coast in lowland

a) Estuarine coast –flooded parts of river valley at their mouth.
-Formed when the lowland area along the former coast is submerged due to penetration of water inland after the rise sea level. The submergence leads to the formation of the feature like estuaries. Estuaries coast are formed when the river mouth is drowned.



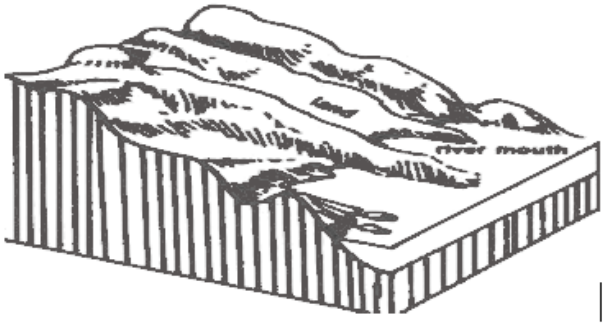


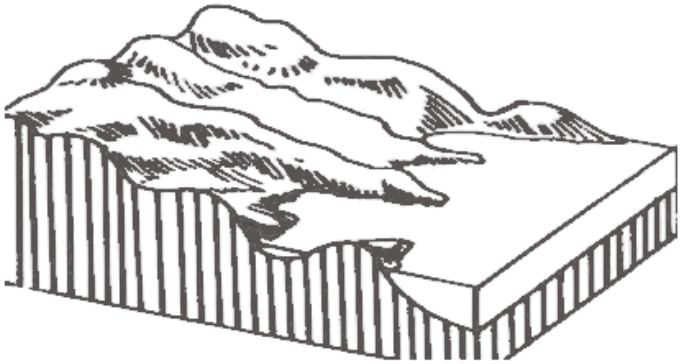
2. EMERGENT COAST

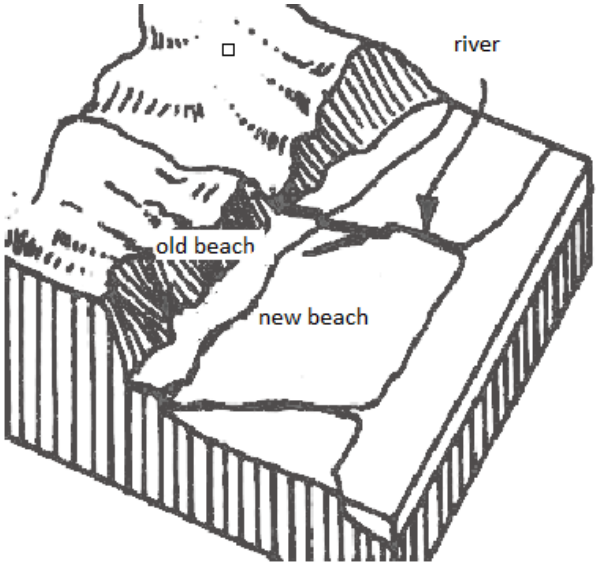
-Form when the lands under water (continental shelves) become dry land by uplift. /formed where there is a relative fall in the sea level leads to emergence of larger part.

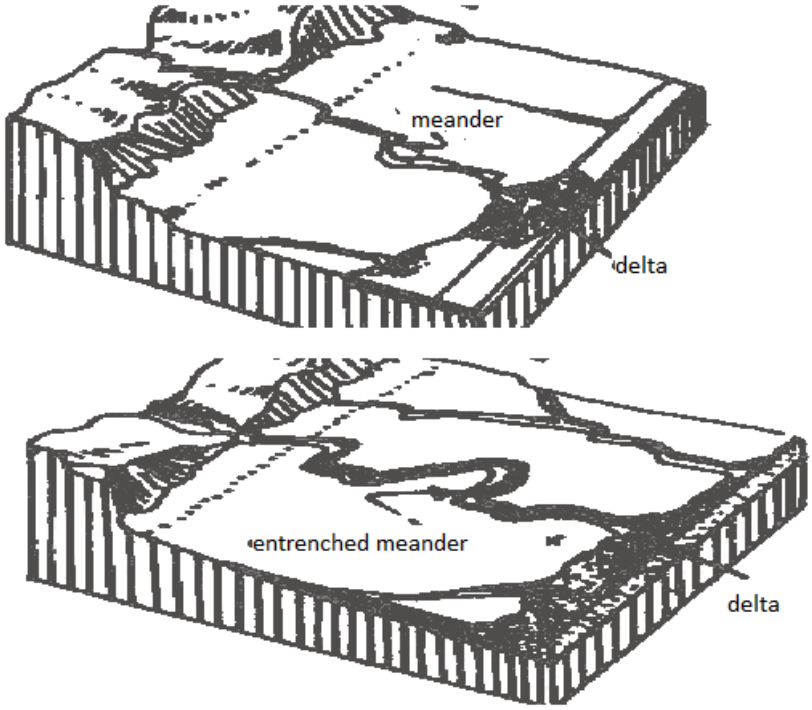
Emergent upland (of the continental shelf)

i) Raised beaches - These are the beaches which stand above the present shore line.eg in Mombasa


river mouth




river
old beach
new beach



ii)Wave – Cut Platform:
-These are platform like features standing above the present shoreline.

iii)Notches:
-These are v- shaped cut formed as of undercutting of a cliff during the high tide on the emerged coast.

iv)Old Cliff:
-Is the cliff which stands above the next cliff.

ACCORDING TO STRUCTURE TREND OF LAND

i. **CONCORDANT COAST**

-Type of coast where by the structure trend of the land is parallel to the coast, in this the highland like mountain and valleys run parallel the direction of the coastal alignment e.g. Dalmatian of Yugoslavia.

ii. **DISCORDANT COAST**

-Type of coastal where by the structure trend of land is at height angle top the coast. It is mountain and valley running at right angle to coast. Example fiord coast in the Scandinavian

Classification of sea level changes.

- Sea level change is classified into two basic types according to the causal factors influenced it to occur and include.

i. Eustatic Sea levels change

It is the variation in the general level of the sea taking place at a global level (worldwide) usually caused by either melting of ice or severe freezing of water. Severe freezing of water causes the rise in sea level as more water discharged into the ocean basin.

ii. Isostatic sea level change

-It is the local variation of the sea level caused by he changes in the level of land as a result of earth's movement. When land rises, sea level falls, and when the land level falls sea level rises.

- Sea level change is also classified as positive and negative change:
  Negative change is the fall of the sea level relatively to the land level while positive change means the rise of the sea level

EVIDENCES INDICATING THE PAST CHANGE OF THE SEA LEVEL.

1. GEOMORPHOLOGY EVIDENCES

The geomorphology evidences are principally to the features related to submerged and emerged coasts resulting from the rise and fall of the sea level relatively to land level.

The features associated with the submerged coasts include the following:-

(i**). Estuarine coast.**

It is a low lying coastline with a fully flooded river valley. The feature is produced as the low lying coastline with river valley submerged following the rise of the sea level making the valley of the river fully flooded by the oceanic water.

Where estuarine coast found, it becomes difficult to recognize the levels of the river and sea. The most classic example of estuarine coast in the world is that of Thames coast in England

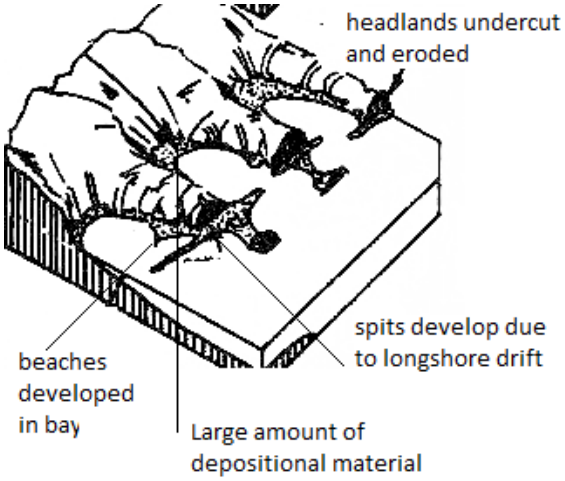
(ii). **Ria coast.**

It is highland coastline with a partially flooded river valley. It results where a coastline of high level with river valley submerged as sea level rises making of rises making the lower parts of the valley flooded. Ria coasts are common in SW Ireland, SW England and New Spain

(iii) **Longitudinal coast.**

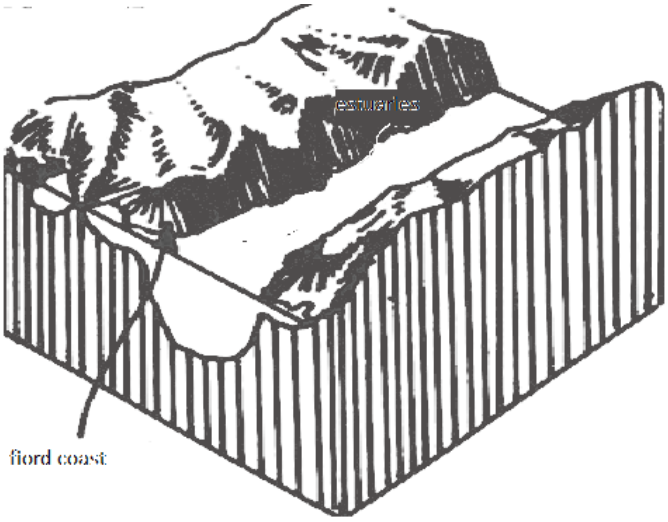
It is a coastline lies parallel to the submerged valleys of mountain chain.

Where highland coast whose mountain valleys parallel to the coast, after submergence, the valleys will be flooded and the mountains separating the valleys, become chains of island. A good example of Dalmatian coast, is the coast of Yugoslavia



(iv) **Fiords.**

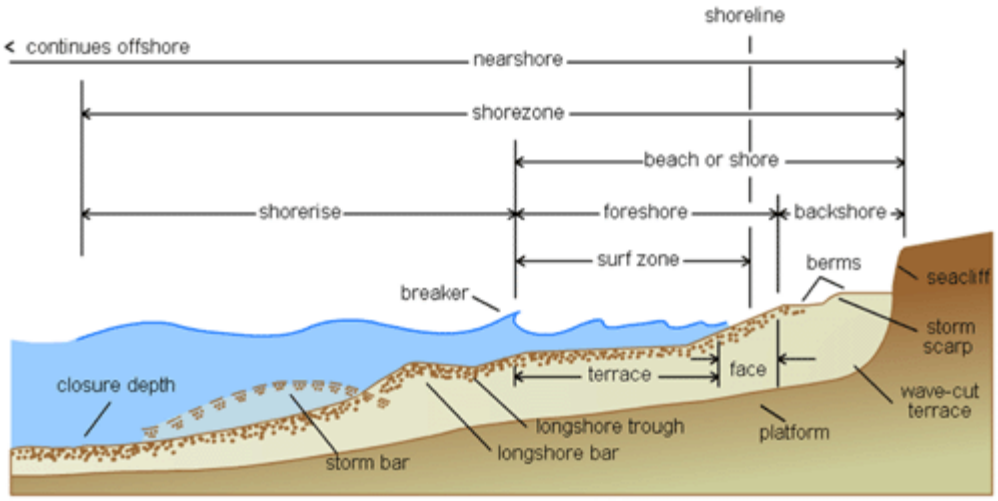
Fiord is a long narrow steeply sided and deep sea inlet along the coast. A coast line with this unique feature, is called fiord coast. Fiords were produced by the drowning of glacial troughs after submergence. A good example of fiord is that of also in Norway



The features associated with emerged coastlines include the following

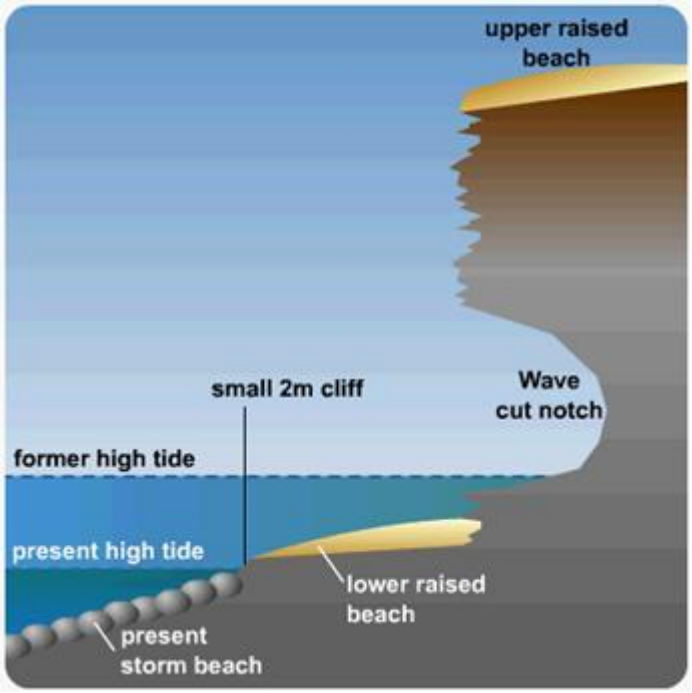
(i) Offshore features like beaches

These were produced after the low land coast to have been emerged. The emerge of the coast makes the features which were along the shore line to appear out of the shoreline as a new shore line formed. Off features are more observed along the Gulf of Mexico.



(ii) Raised features

The features which appear high enough away from the sea. These have resulted after the high land coast to have been emerged. These include mostly the raised beaches. E.g. Raised beach in western Scotland.



2. ARCHEOLOGICAL EVIDENCE

It is much based on Neolithic settlements and Roman pavements in the Southern Sweden, which appear below the present low tide mark.

3. ROTANIC EVIDENCE

It is principally to the finding of peat, formed due to the submergence of forests on the coast of Wirral peninsula nearly Harleth in North Wales.

4. REJUVENATION OF RIVERS AT LOWER COURSE

Most of the rivers at lower courses characterized by having gentle or general level gradient giving to low water velocity. Some rivers have high water velocity which indicates that, the gradient of water flow has increased due to the fall of sea level relatively to the coast land.

LIFE IN THE OCEAN

Ocean water supports the life of organisms because of its aquatic eminent. The aquatic environments provide organisms with important gases nutrients, food and other important requirements

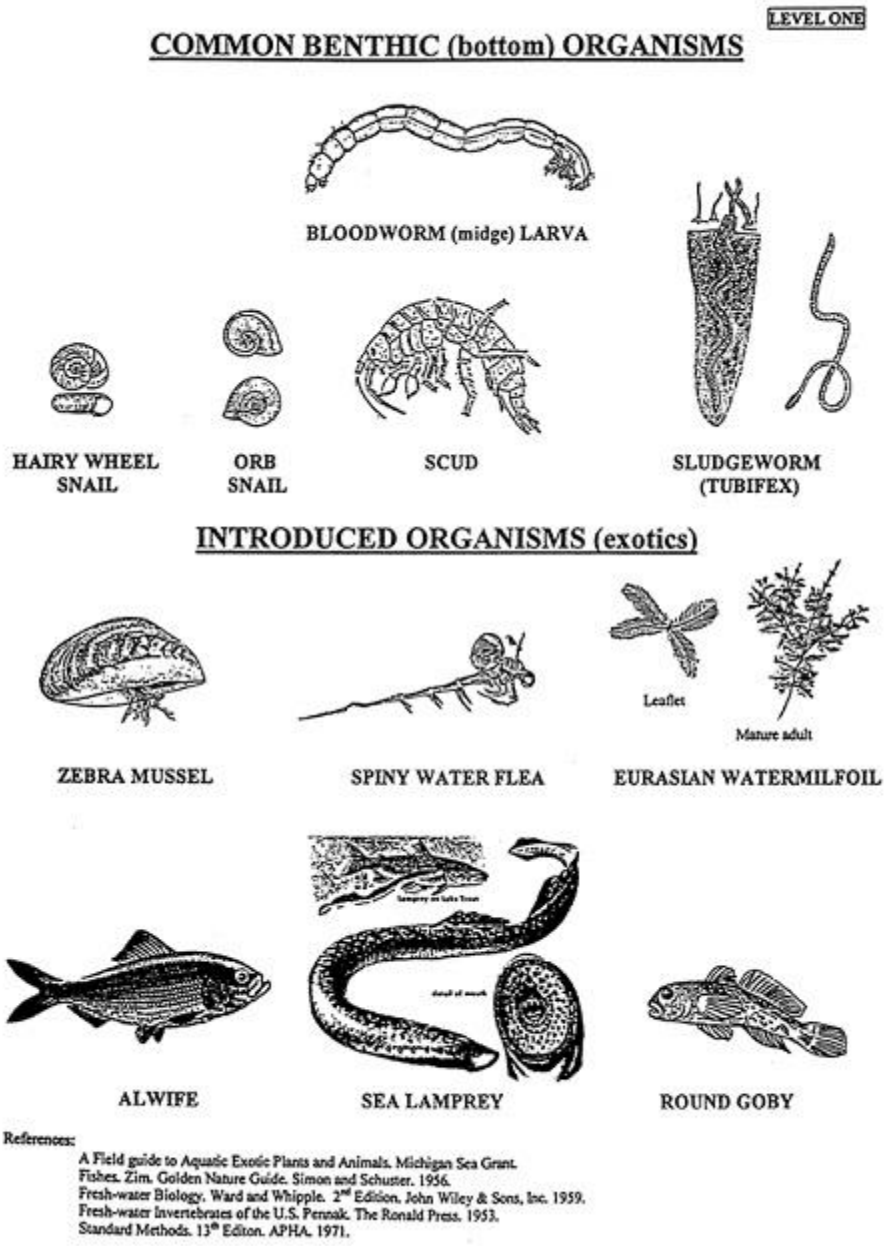
The organisms found in marine water are of both***, plants*** and **animals**

Organisms in the marine aquatic ecosystems are of married nature, and also have varied habits. By being varied in such aspects, organisms broadly categorized into the following forms.

According to their habits, marine organisms include the following groups

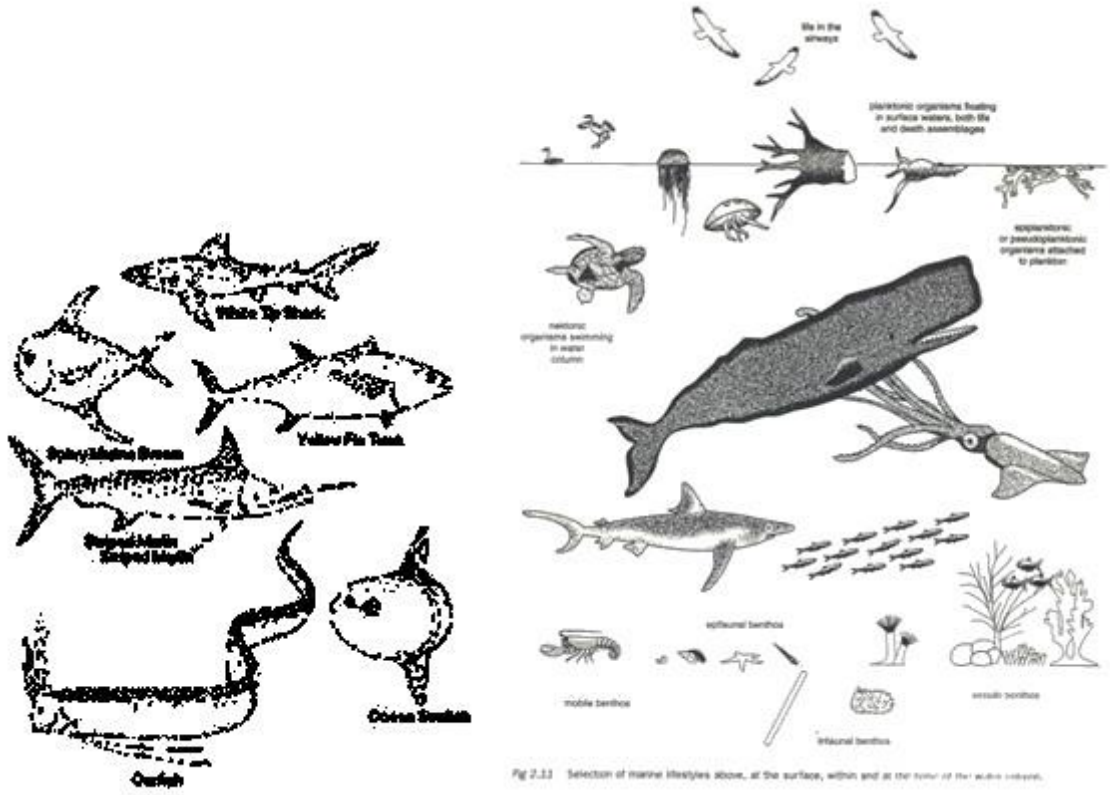
a. Benthos

These are the organisms living on or in the ocean bottom (benthic environment) some live on bottom sediments. And called in fauna. And others live near bottom water called epifauna. Examples of benthos include; marine warms, mollusks, crustacean, star fish and others. Generally speaking, benthic organism is far more abundant in shallow water than on the deep ocean bottom.



b. Nektons

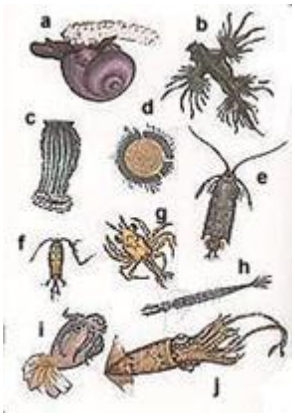
These are the free swimming animals, they are more abundant in near surface waters, but occur at all depths in the ocean. Many types of nekton organism have regular daily vertical migration, At night they swim to the surface water to feed up on the abundant life in this layer. During the day they return to greater depth where they are more difficult to be seen and less likely to be eaten



Some common nektonic organisms

c.Neutrons

These are the marine organism live at the upper surface layer of the sea. Some live on the water surface, and others live just below the ocean surface neutrons include, Valella, physalia and other related forms of organisms



c. Neutrons

Marine organism according to their varied nature include the following.

1. Plankton

These are the minute pelagic plants and animals that are weak swimmers and can easily moved by currents. Plankton are further divided into:-

(a) Phytoplankton(plant plankton)
There are the minute single called plants. They live nearly to surface in the environment called euphoric zone, because of requiring sufficient sunlight for photosynthesis,

(b) Zooplanktons, (Animal plankton)
These are the animal plankton in the marine ecosystem.

2. Marine mammals.

Marine mammals include: Whales, dolphins, seals, sea lions and others. They are warm boded, breath air and give live birth to their young. These are legless and have streamlined bodies.

3. Sea birds

Sea birds are among of conspicuous and familiar form of marine life. Some spend nearly their entire life in the sea, others can barely walk on land, Some sea birds only use seawater for food. Some fly over the seawater and other swim under water

SIGNIFICANCE OF OCEANS TO HUMAN LIFE

(Positive significance)

i. Manufacture of drugs and other chemicals from marine organisms, Marine organism contain many biologically active compounds, that are potentially useful for medical purpose.

ii. Energy electricity is generated by using the tidal range. The rising and falling of water can be used to generate electricity. E.g. At St. Malo in North west France, The electrical energy is known as tidal power .

iii. Parts of the sea can be reclaimed into new land to accommodate more population and give a room for agricultural and industrial expansion

iv. Many resources are extracted from the sea water, sea water supplies several materials such as fresh water, salts , bromine, and magnesium water evaporates, Eg North of Malindi – Kenya

v. Extraction of petroleum and natural gases. These have been formed by decomposition of the plant materials primarily marine plants. Hence they have been formed by submerged deposits.

vi. Oceans are the source of fish everywhere in the world.

vii. Allow the sailing of large vessels of ships. It saves as an important route way connecting the widely separated parts in the world.

viii. Used as sewage disposal system.

ix. Tourism Oceans provide sites for a variety of recreational activities. These include. Swimming surfing, water skiing, sport fishing, and cruising e.g. tropical seas are a tourist attraction because they are warm all year around.

x. Port development. Some features on the submerged coasts favor the development of deep and well sheltered natural harbors. E.g. Fiord coast in Norway

(Negative significance)

i. Infertile soils. Some emerged coastal lands are characterized by sand, gravel and bare rock, such surface cannot support proper plants growth because they are infertile.

ii. Transport barriers; deposited sands, sandbars and coral reefs are a barrier to water transport, Sometimes, ships have been wrecked after hitting some of those features.

COASTLINES

-Coast refers to the part of the landmass that is situated immediately after the sea. It is separated from the sea by a shore line. Shoreline means, a piece of land that lies in between of high tide and low tide levels.

COAST EVOLUTION

Coast evolution means, the structural change in appearance of the coastline. Usually the structural appearance of coast varies from place to places or time to times. E.g. the structural appearance of Dar es Salaam coast differs from the Bagamoyo. The structural appearance of Dar es Salaam coast currently, is not the same as it was in many years ago. Hence the phenomena of the coast to change in it structural appearance place to place or time to time geographically described as coast evolution

The evolution of a coastline is brought by one or combination of two or more of the following factors.

1. **Wave action**

   Wave has a considerable impact to a coastline structural change through the activities of erosion and deposition. Wave erosion may cause a coast line eroded to have features of marine erosion of like; cliff, notch, stacks, bay and others of the same consideration. Wave deposition may cause a coastline developed with features of marine deposition of like; beach, barrier beach, spits, tombolo and others.

2. **Tectonic forces.**

   Tectonic activities have changed and may continue to change the form of appearance of coast lines through uplifting and sinking relatively to sea level. Uplift of a coast line, produces emerged coastline. Down warping produces the submerged coastline.

3. **The nature of rocks along the coast**

   A coastline may change partly because of its nature of rocks along. For instance: the coastline with alternative rocks of hardness, one subjected to erosion, may change into indented coastline as it can be compared to a coastline of uniform rock hardness.

   Beside to this, where the coastal rocks are resistant to erosion a highland coast is formed with cliffs.

4. **Man activities**

   Human activities of like land reclaim nation harbors construction, canals construction change the natural appearance of coastlines. For example: the land reclamation in Netherlands, have changed the form of appearance of coasts along the North Sea.

5. **Volcanic activities**

   Eruptions of volcanoes have caused some coasts to change in physical appearance as landforms related to the geological phenomena form along the coasts.

6. Glaciations.

It is considerably on the occurrence of glaciers along the coast. This leads to coast evolution in two varied ways. Firstly; the melting of ice has caused the rise of general sea level, and then made parts of coasts to immerse in water, and thus submerged coasts have been formed. Secondly glacier activities of erosion and deposition resulted into the occurrence of some physical features related to glacier erosion and deposition.

7. Organisms

Marine organisms like coral polyps have caused coasts to change in physical appearance as coral reefs develop along them.

CLASSIFICATION OF COASTS

Coasts are extremely varied due to several determinant factors of like; marine action, organisms, earth's movements and others. The earth's scientists have classified coasts according to their varied considerations. The most striking criteria which have been employed to classify coasts include the following.

1. Change in sea level, devoted by Johnson 1919

Neither the level of the land, nor the level of the sea remains unchanged. One of these changed and produced either ***submerged*** or ***emerged coastlines***. Considerably to this, coasts are classified into the following forms.

- *Submerged coasts*
- *Emerged coasts*
- *Neutral coasts*
- *Compound coasts*

Submerged coasts

These are the coast lines whose lower parts immersed in water due to the rise of the sea level.

Submerged coasts are sub divided into two and include;

- **Submerged lowland coast**

- **Submerged highland coast**

Lowland submerged coasts form following the fall of lowland coast as the sea level rises. Highland coast produced after the fall of highland coast line due to the rise in sea level.

Emerged coasts.

These are the coastlines that have been produced after the fall of the sea level, and rise of the coastal land. These are also classified into lowland and highland emerged coastlines. Low land emerged coasts are produced after the lower parts of highland coasts to become out of water as sea level falls while the highland coasts are produced after the lower parts of highland coast to become out of water as sea level changes.

Compound coasts.

Those with a mixture of at least two or more of the features of submerged and emerged coasts. i.e. the coastline is observed to have characteristics of both emerged and submerged coastlines.

2. ***According to the structural appearance relatively to other coastal features***

With respect to this consideration, coastlines broadly classified into the following types.

- ***Discordant coast line***
- ***Concordant coast line***

Discordant Coast line

It is the coastline that extends across the trend of the mountain ranges and valleys. Usually the coastline is irregular with many inlets. Discordant coastline has alternative terms of ***transverse*** and ***Atlantic***. The later is because such high proportion of this type of coast is around the Atlantic Ocean.

Concordant Coast.

It is a coastline that lies roughly parallel to the mountain ranges and valleys. When such a coast is submerged, produces the Dalmatian coast. A concordant coast is very common

in areas of around Pacific Ocean and that is why they are alternatively known as pacific coasts.

3. ***According to the relationship between coast and other processes of erosion and deposition***

This was devoted by Sheppard in 1963. According to the approach, gives two types of coast

Primary coasts

The coasts where the influence of sea has been minimum. The coasts characterized by the presence of features not formed by marine action

Secondary coasts

Where marine processes have been dominant. The coasts are characterized by the presence of the depositional and erosion marine features of like.

4. ***Advancing and retreating coasts (Valentine 1952)***

-It assumes that, a coast can be fitted into two of the following forms.

Advancing coasts

-The coast line that whose level rises as a result of marine deposition or uplift of the land

Retreating coasts

-The coastlines that appear to diminish because of marine erosion or submergence of the coastal land

1.5 CORAL COAST

-It is a coast which is made up of skeleton of the small marine organism is known as coral polyps consist of lime stone rocks resulting from skeleton of marine organism.

-Is a limestone rock which accumulates from the sea to the land.

Coral polyps

- Are living organism found on the marine and live in sheath like sacs composed of calcium carbonate ($CaCo_3$) which they extract from ocean water. **Coral**:

-Is the limestone rock made up of the skeleton of very small marine organism called coral polyps

Characteristics/coral polyps thrive under this condition.

i. Found in sea temperature around 21°c-30°c

ii. Sediment free salty water

iii. Found in lower tides. Sunlight which penetrate to a depth of at least 50m.

iv. Enough supply of oxygen and food (plankton) v. Coral features normally develop at latitude of 30N and 30S because of warm ocean currents.

TYPES OF CORAL REEFS

Coral reefs are of various structure and in this basis broadly categorized into three types involving.

i. Fringing

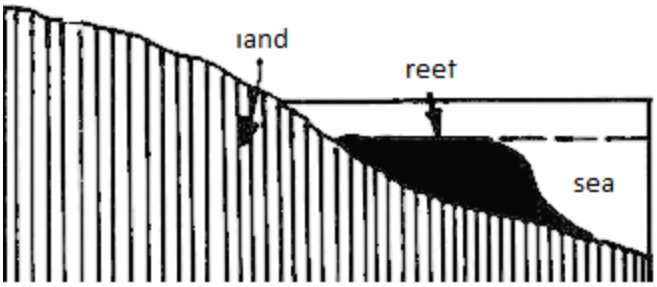
ii. Barrier

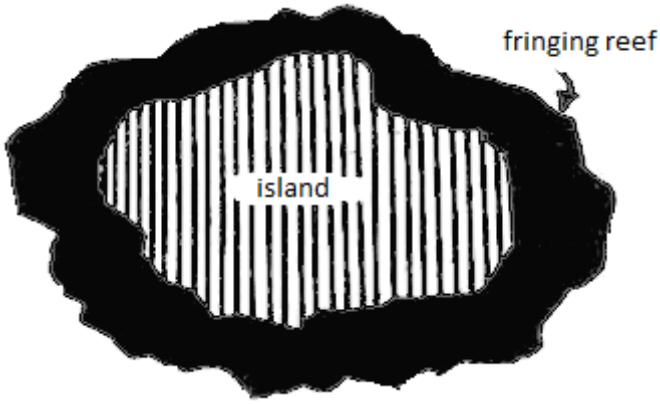
iii. Atoll

i. FRINGING REEF: (Connected to coast)

-This consists of a plat form of a coral connected to and built out form a coast. The plate form surface is usually flat or concave and its outer edge sleepily to the sea floor.

-The lagoon is shallow separating the coast and edge of e.g. fringing reef along the coast of the reef Kenya and Tanzania.

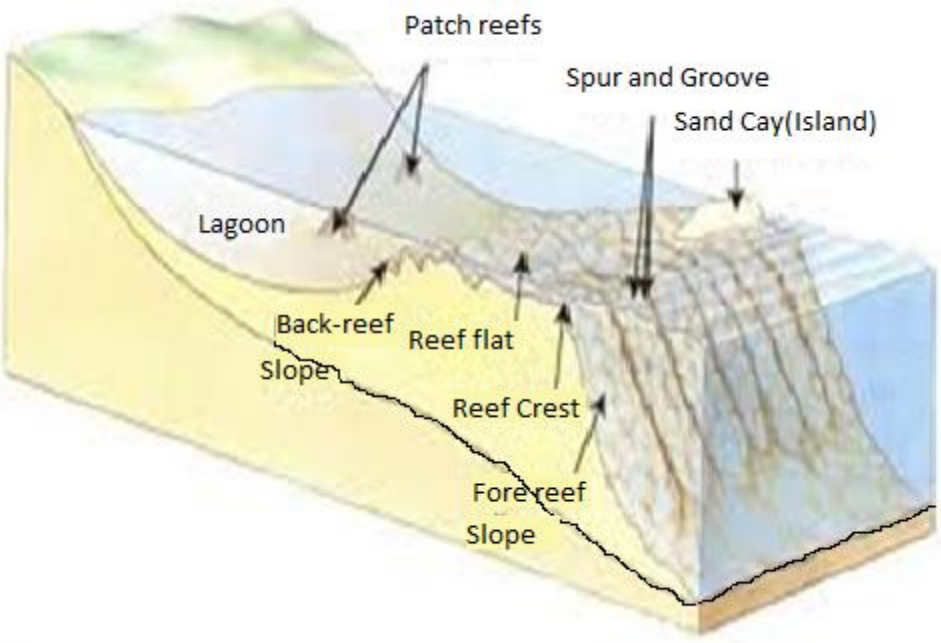


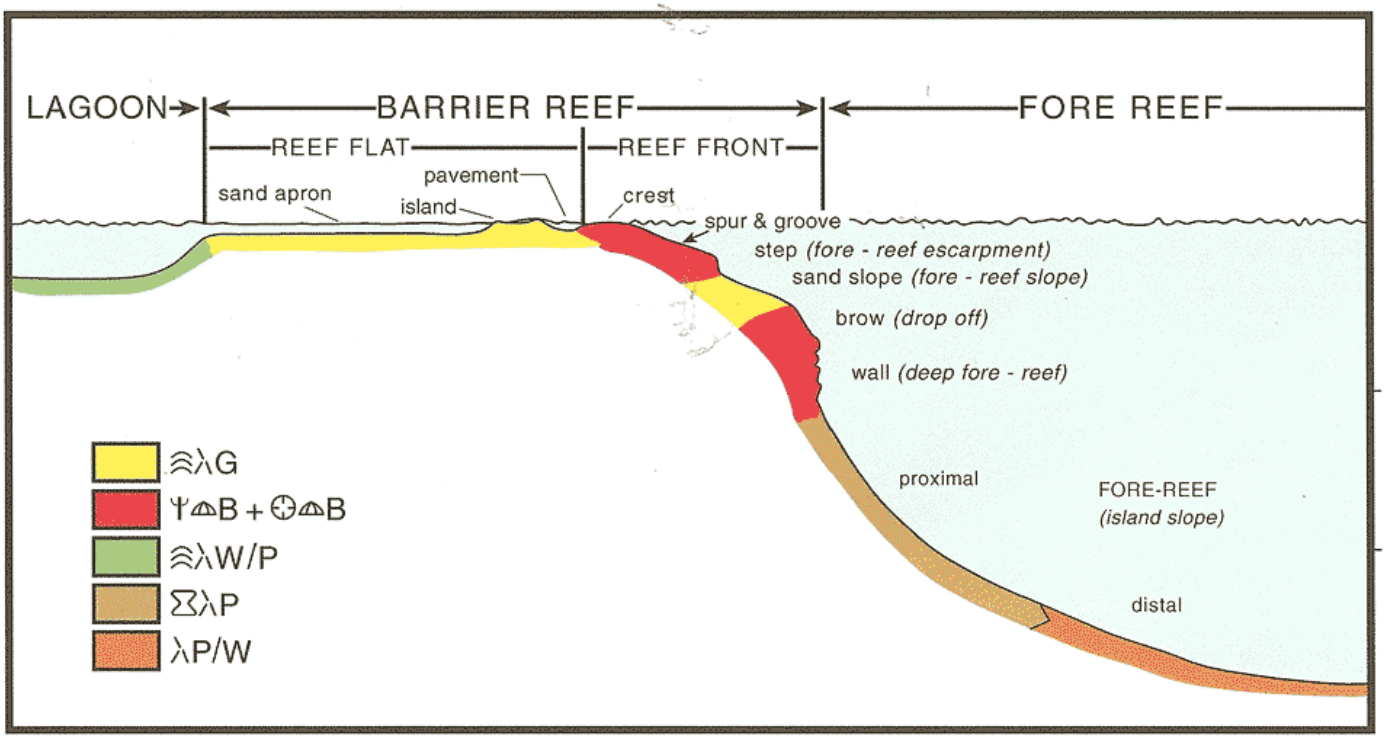



Fringing Reef

· **ii. BARRIER REEF.**

– Similar to the fringing reef except that it is located several kilometers from the shore and is separate from it by a deep –water lagoon. The coral of a barrier reef is often joined to the shore, although the lagoon may be too deep for coral to grow on its bed.

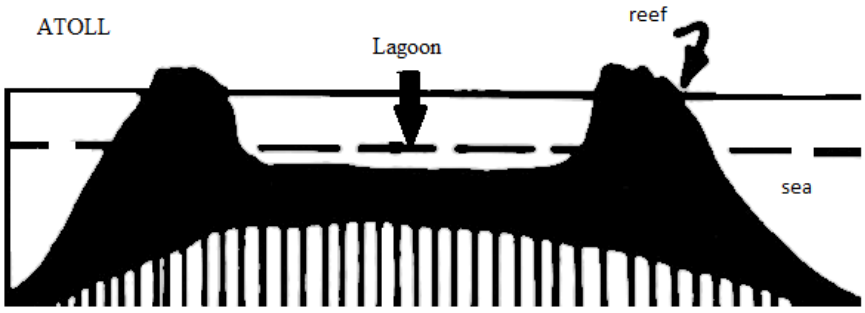

Patch reefs
Spur and Groove
Sand Cay(Island)
Lagoon
Back-reef
Slope
Reef flat
Reef Crest
Fore reef
Slope


LAGOON
BARRIER REEF
FORE REEF
REEF FLAT
REEF FRONT
sand apron
pavement
island
crest
spur & groove
step (fore - reef escarpment)
sand slope (fore - reef slope)
brow (drop off)
wall (deep fore - reef)
200m
200m
proximal
FORE-REEF
(island slope)
distal
ΣλG
ΨB + ⊕B
ΣλW/P
ΣλP
λP/W

iii. ATOLL:

A circular coral reef usually broken in several places, surrounding a shallow lagoon.e.g. Aldabra atoll that lies between Zanzibar and Malagasy

- It is concave shaped. (atoll formed in deep-sea)



Importance of coral Reefs (value)

i. Provide habitat for fish species and protection

ii. They are used as raw materials in manufacturing of cement in the cement industries (limestone)

iii. They attract tourist and lead to the earning of foreign currency.

iv. They are used as decorations in different building e.g. marble, some well shaped pieces of coral rock are usually stuck on the walls of the building with cement.

v. They also lead to the formation of island which can be used by man for different purpose like settlement or recreation.

vi. They also protect the coast against the strong waves, which can cause coastal land degradation and destruction of property.

vii. Source of income since some people collect coral stone and sell them.

Problem posed by coral reef in the world.

i. They are great barrier to navigation.

ii. Piece of coral rock that breaks during coral quarrying especially by using dynamite and the solution of coral rocks due to the presence of acidic material lead to water pollution.

iii. Coral reef can block the waves and lead to the failure in the formation of attractive beaches.

iv. Coral masses and discourage the growth of plants (sea weed) that tends to pollute, discourage, fishing, swimming and navigation.

CORAL REEFS FORMATION THEORIES

The classification of coral reef theories is divided into two major groups.

i. Those theories which require a change of sea level relative to reef foundation

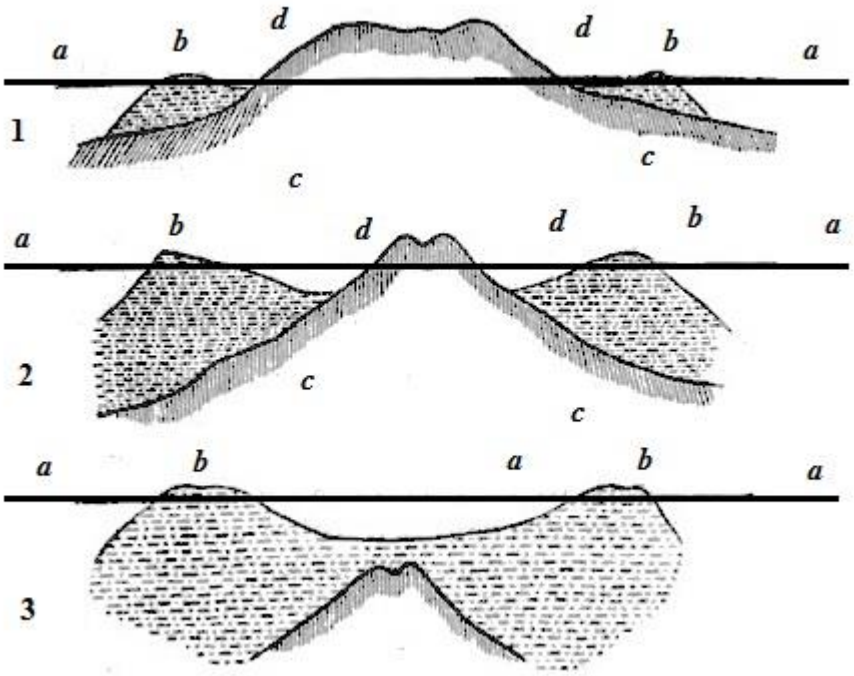
ii. Those theories that hold that coral reef may develop without a change in sea level relative to the reef foundation.

Under the 1st group;

1. DARWIN`S THEORY

Of sinking land area and consequent rising sea level. Under those condition it is started the corals grown upward and outward converting fringing reef into barrier reef and final atolls.

These depend on the subsidence of land masses. As an island subsides, the coral reef grows upward and outward keeping pace with the subsidence.

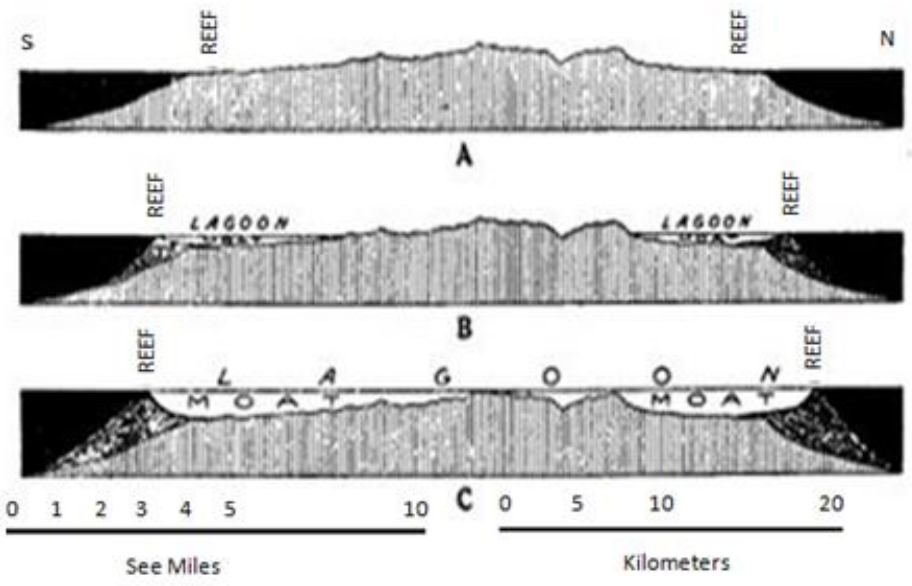


2. DALY`S THEORY

– The glacial control theory develops by Daly postulate a rising sea level due to the return of water to the sea following periods of glaciations.

This is based on the changing level of the searching and after the last ice age.

a.



Under the 2nd group;

MURRAY`S THEORY:

– The formation of the barrier reef doesn`t involve subsidence. He argues that coral reefs might have grown as a result of deposition of the coral debris on the seaward sides of the fringing reef. The deposited materials eventually form a base for further growth of polyps.

-The material deposited on the main hills or plateaus reduce the depth of the oceans thus making them sunlight and consequently the condition becomes conducive for polyps habitation. As these polyps die, they lead to the growth of coral reefs.

GLOBAL DISTRIBUTION OF CORAL REEFS

-As it has been already discussed coral reefs are in abundant supply on the esteem sides of the major land masses in the latitudes position in ten teen 30 North and South where sea temperatures reasonably high as warm ocean currents how nearly the coasts.

-The specific areas with coral reef include the following

-Along the edges of continents, E.g Along the edge of Australia where there is the greatest Barrier Reef of the world.

-Around island shores in the pacific ocean e.g. New Guinea and Caledonia

-Around the shores of volcanic peak especially in central and western pacific e.g. Fiji and Samoa islands.

-In the Atlantic Ocean in the west Indian Archipelago where there ia a group o f Island

-Around some islands in the Indian ocean e.g. Mauritius and Seychelles

Significance of coral reef to human being (constructive significance)

-They are used a raw **materials** to manufacture cement

-They are for building decorations

-They provide attractive sceneries and thus form the basis for tourism.

-Provide good breading stations for fish

-They have resulted into the formation of beautiful islands which used for recreational purposes

-They protect the coasts against erosion by marine waves

Destructive significance

-Coral plat forms encourage the growth of weeds which have a lot of setbacks

-Coral reefs impose barrier to navigation

-Contribute a lot to coast zone degradation because of being exploited

-They impose difficulties in fishing activities

-

1.6 WATER USES AND MANAGEMENT

1) **WATER USES**

Water uses understood as the utilization of water resource to meet various needs. Water is our most precious resource. Water is vital to life. Humans, plants, and animals are made up of mostly water. All living things would die in the absence of water.

There many ways that we use our water these include:

-Water is used domestically for drinking, washing clothes, cleaning, bathing, cooking, and other domestic uses. It is estimated that 8% of worldwide water use, is for house hold purposes.

-Power generation; water is used to generate power which supplied to the industries, commercial areas and residential areas. Of all the electricity in the world, about 20% is generated by H.E.P.

-Water is used the manufacturing industries. In manufacturing industries water is used to wash raw materials and for cooling the industrial machines. Moreover, water is heated and steam is used to run machines, in other industries water is used to cool metals. It is estimated that 22% of worldwide water use, is for industries purpose

-Water of larger bodies is used to serve communication. They are used as important route ways to transport people and goods from one area to another. Many people use boats and ferries to commute to and from every day. People also enjoy going on cruise ships or just going sailing.

-Water is also used outdoors for washing cars, watering lawns, filling swimming pools.

-Every town and city, whether small or big, uses water, cities use water for fire fighting street cleaning, and watering public areas such as parks, grass, shrubs, and flowers.

-Recreation is another way that we use and enjoy, Many people enjoy fishing, boating, sailing canoeing, sailing, rafting, and swimming, as well as many other recreational activities that depend on water. However, recreational water use is usually a very small but growing percentage of total water use.

Generally as already pre described water is a vital resource to human life as well as the general ecological system. Thus there is a need for water to be properly conserved and managed.

2. *WATER MANAGEMENT*

Population growth together with changes in lifestyle and economic development in many countries has heightened the pressure on water resources that are already limited. Moreover, Environmental problems, especially climate change, add to those pressures. Furthermore, poor water management can be a source of conflict. Therefore, water being an essential resource for all life on the Earth planet, there is a need of making sure that, water resources used equitably, by making proper plans on how water can be retained and

distributed to meet the numerous demands by people. This is what understood as water management.

Water management is the activity of planting, developing, distributing and managing the optimum use of water resources. In an ideal world, water management planning has regard to all the competing demands for water and seeks to allocate water on an equitable basis to satisfy all uses and demands, In water management much effort is put on optimizing the use of water and in minimizing the ornamental impact of water use on the natural environment.

IMPORTANCE OF WATER MANAGEMENT

i. Water management ensures the supply of water to all people demanding with balance to the needs to industry and environment

ii. It makes restorage and monitoring the amount of water

iii. It ensures water quality and sanitation

iv. To ensure sustainable and fair access to clean water suitable for all purposes, which meets, in particular, the basic needs of the most disadvantaged population

v. To ensure fair and appropriate distribution of water between users of different kinds

vi. To solve the problem of water use conflict

vii. To prevent wastage and pollution of water

viii. To protect the wetland areas

viii. To protect and conserve the water resources areas

METHODS OF WATER MANAGEMENT

There are about four methods for water resources management, They include:-

- 1) Conservation
- 2) Allocation of water charges
- 3) Retrofit water conservation
- 4) Behavioral practices

1. ***Conservation***

-Water can be conserved by harvesting rain water, ground water recharge and recycling waste water.

-Rain water harvesting system involves the collection of water from the surface which directly receives rainfall. The water harvested is stored in tanks or diverged to artificial recharge system.

-Ground water recharge; It is by allowing percolation of water into the ground, this is achieved by planting trees and construction of lakes.

-Recycling of waste water, waste water can be recycled by being retreated with chemicals to become clean and safe for reusage.

2. ***Allocation of water charges.***

-This method is by two system of the following

(i)***Ratio utility billing system***

Under this system water costs in residential areas like apartments distributed according to each resident based on allocation formula such as number of occupants, square footage, Number of water fixtures, number of bathroom, size of apartment (2bhk, 3bhk) or charge a fixed amount per apartment . However the system has significant disadvantage as residents or consumers won't understand the true cost or unit of water consumed by their family members

(ii) ***Sub-metering***

A typical sub-metering system consists of a meter to measure usage of a specific utility for each unit and wireless system to transmit the data to a central computer to allow for remote reading. This system enables residents or owners to pay for the water they use rather than paying a fixed amount. For effective water management, this system is recommended as this automatically encourages people to conserve water.

3. ***Retrofit water conservation***

-Retrofitting involves the replacement of existing plumbing equipment with equipment that uses less water.

4. ***Behavioral practices***

-Behavioral practices involve modifying water use habits to achieve more efficient use of water thus reducing overall water consumption. Changes in water use behavior can be

implemented without modifying existing equipment. Behavioral practices involve water conservation measures such as replacing or repairing leaky facets. Awareness activities to promote sustainable management of water resources etc.

Implementation approach to water management

Five activities have been identified and are required to achieve integrated management of water resource. They include the following.

1. Awareness and participation. Users must be aware of the importance of water as a resource and their responsibilities in relation to sound management of this precious resource.
2. Institution capacity building. The success of activities depends largely on the capacity, resources and expertise of the instructions concerned. Support must be provided for the institutions responsible for water management. The main institutions for water management include. Urban or municipal water authorities and river basin project institution
3. Demand based management, It is not enough to manage only water distribution; supply must also be managed. The challenge is to reduce demand while increasing output through initiatives as reuse of water, protecting water resources etc.
4. Expanding the knowledge base, the necessary knowledge and information are essential for drawing up effective policies.
5. Coordination among donors must be strengthened

WATER RESOURCES AND MANAGEMENT IN TANZANIA.

Tanzania has great growing demand for water sources. Access to safe water is essential for addressing poverty and health problems. The poor, most of whom live in rural areas, have limited access to clean water for domestic use and crop production and adequate sanitation. Moreover One third of the Tanzania receives less than 800 mm of rainfall and embraced to semi arid areas. Only one third of the rest of the country has precipitation of above the rest of the country has precipitation of above 1,000mm. Also the long dry season normally extending from June to October, has an effect on low river flows and drying of water reservoirs.

In response to such prevalence, there is need for the water resource available in the country to be well managed to assure water supply to people for their varied needs.

Water resources available

-Tanzania has both surface and ground water sources. Surface water sources include; lakes rivers, ponds wetland reservoirs and others

1. Lakes;

-The country has a number of fresh water lake, they include; Victoria, Tanganyika, Nyasa, Rukwa, Natron, Eyasi and Manyara.

2. River

-Tanzania also has a number of rivers which drain into ocean and lakes, They include; Pangani, Wami, Mkondoa, Ruvu, Rufiji, Ruaha, kilombero, Mbarangandu, Matand, Mbwamkulu, Lukuled and Ruvuma all of which drain into Indian Ocean, Others include Malagarasi drains into lake Tanganyika, Songwe and Ruhuhu draining into lake Rukwa; Meri, Maru and Kagera draining into lake Victoria

3. Wetlands:

-Tanzania has 5,439,000 ha, of lakes and swamps which represent 5.8 percent of the total land surface but this number excludes seasonally inundated flood plains.E.g Rufiji,Ihefu,Jangwani in Dar es salaam.

4. Ground water Resources

-Ground water a major source of water for many areas in Tanzania and actually the most viable alternative supplement in the central and northern parts of the country/ the drier regions of Dodoma, Singida, Shinyanga, Tabora, Mwanza, Mara, Arusha coast and Southern Kilimanjaro.

-Most of the water resources in Tanzania are managed by the water projects

RIVER BASIN DEVELOPMENT PROJECTS IN TANZANIA

-River development projects are the schemes which developed for different purposes. They are established to meet a number of goals such as floods control, water supply for domestic consumption, industries and irrigation schemes

River basin projects are implemented by doing the following:-

-Construction of dams for retaining water

-Dredging of the river i.e Removal of silts or mud from the river

-Clearing of vegetation where economic activities are taking place

-Planting of trees on the sides of the river so as to prevent erosion and to control the speed of water flow.

-Straightening and widening of the river width so that it can hold more water

-Establishment of canals and installing of pipes to make distribution of water

1. KILOMBERO IRRIGATION SCHEME

Kilombero irrigation scheme is located along river Kilombero in Southern Tanzania which is a tributary of Rufiji river. The scheme has large plantations of sugarcane owning to a size of about 2800 hectares, under the schemes other crops such as maize, rice, beans and vegetables are grown.

Objectives of the scheme

-To improve crops production of sugarcane as the chef crop and other crops of maize, rise, beans and vegetables

-To open up the remote and potential lands be used for crops production

-To control the floods of river Kilombero

Implementation of the scheme

The scheme has been implemented as the following were done

-Establishment of the sugar cane estates

-Establishment of the sugarcane factories at Msolwa and Ruembe.

-Small scale farmers were allowed into the area to cultivate sugarcane and other crops

-Establishment of roads to enhance production of crops

-Supply of electricity to the factories and to the site machines which pump water to plantations.

-Establishment of the sugar cane production company to make overall management

-Construction of dams for retaining water to be used all the year around

-Training of the local people on their economic activities like fishing, timber production and wild life conservation.

Achievements of the scheme

-It has increased the production of sugarcane as it can be compared to the previous time

-Development of certain towns like Makambako, Mikumi and Kidatu which provide services to the people working into the scheme

-To some extent, the schemes managed to control the floods of the river as much of the water used to irrigate the farms

-It has stimulated the development of the physical infrastructures like roads and railway of TAZARA

-The scheme has opened up the remote areas like Ifakara and Msolwa.

Challenges against the scheme

-The problems of drought in same years. This creates low water supply to the scheme

-Transportation problem since the road and bridge have not been well constructed

-Poor labor supply due to the higher rate of rural to urban migration

-Prevalence of diseases mostly malaria which affect the farmers

2. THE RUFIJI RIVER BAISN DEVELOPMENT (RUBADA)

-Rufiji basin is one of the most potential areas in Tanzania. It has great river of Rufiji which steadily flows throughout the year, It has attractive features such as waterfalls, meanders, alluvial fans, delta and oxbow lakes, The valley of the river is very fertile for cultivation of crops. It has diversity of flora and fauna. By being so much potential efforts are taken to make the river basin well developed. To meet this, river basin development association of RUBADA, has been established.

Activities taking place in the basin

-Generation of hydro electricity at kihansi

-Fishing activities under the local people

-The cultivation of the crops such as sugarcane, paddy, maize and vegetable

-Tourism is taking place in the sellers game reserves

-Hunting of the wild animals bye ht local people

-Lumbering is taking place by the local people

NOTE

Even if special organization has been established to develop the basin yet the Rufiji basin is not well developed due to the following problems

-Frequent floods which affect the crops and people properties

-Poor market by the local people. A good number of the inhabitants are low income earners and thus do not provide steady markets for the goods that would be produced.

-Remoteness of the river. For instance the river is not utilized to supply water to the big city of Dar es salaam by being in a remote site.

-Poor capital outlay to be invested to the basin

-Poor labor supply due to the higher rate of rural to urban migration

-Low level of technology.

3. KAGERA RIVER BASIN PROJECT

-The project was established in 1977 by three countries of Tanzania, Burundi and Rwanda, Uganda joined later in 1981. The project was established with found mental objective of establishing Hydro electric power station at Rusumo falls.

Achievement of the project

-Production of the hydroelectricity for the member countries and even he neigh boring countries.

-It has provided employment to people in the four countries.

-Development of transport infrastructures in the region.

-Development of tourist industry.

Problems incurred in the implementation of the project.

-Low level of technology in the region.

-Low capital outlay to finance the project effectively.

-Land alienation to give room for the expansion the project.

-Political conflicts in Rwanda, Burundi, and Uganda.

-The researches and preliminary plans are taking too long.

-

WATER POLLUTION

-Water pollution is the contamination of water bodies such as lake, river, oceans and ground water. Or is an environmental pollution problem of a water body being contaminated with hazardous solid, liquid and gaseous materials which affect its natural setting. i.e. a body of water is adversely affected due to the addition of large amount of materials to the water. In other words, Water pollution is considered when the body of water is unfit for its intended use.When the body of water is unfit for its intended use.

-Water pollution is among of the serious environmental problems and it is serious enough in developing countries. It affects organism that live in the water bodies.

-Water pollution occurs when pollutants discharged directly or indirectly into water body system without adequate treatment to remove harmful constituents.

-Water pollution may occur **naturally or culturally**, naturally is by materials of dust which added to the water through the natural processes of wind erosion and deposition. Culturally by the households, industries, mining and others.

The materials which make water adversely affected are known as **water pollutants**.

Types of water pollution

Water pollution is of two varied forms including; Surface and ground water pollutions

Surface water pollution is pronounced if water contained over the earth surface of lakes, rivers and lakes contaminated with pollutants.

Ground water pollution Occurs when water contained into the ground contaminated with harmful materials which brought down by the process of leaching.

Source of water pollution

As it has been introduced, water pollution occurs culturally and naturally as harmful materials discharged into the water body systems by following sources

1. Agricultural activities

The agro chemicals such as fertilizers, insecticides, herbicides and others, washed away in solution into water body systems by runoff. Also the agro chemicals cause the ground water polluted through leaching process.

2. ***Households sewage***

Residential areas produce a lot of sewage that mostly cause water pollution. The sewage contain farces, urine, and laundry wastes all of which are organisms which live in the systems of water body

3**. Damping of littler**

If litters derived from varied, sources damped into seas, lakes as well as rivers, cause water pollution. The litters as damped into water bodies take long time to degrade, these include the following

- Call board: They take 2 weeks to degrade
- New papers: take 6 weeks to degrade
- Foam: take 50 years to degrade
- Aluminum: take 200 years to degrade
- Plastic packaging take 400 years to degrade
- Glass: Take long to degrade but the exact time not well known

4. Industries

Industries is a huge source of water pollution, Industries produce pollutants that are extremely harmful to people and environment and thus, cause pollution as discharged into the water body systems without adequate treatments. The common pollutants which cause water pollution include asbestos, leads, mercury, nitrates, phosphate, sulfur, oils, petro chemicals and others

5. Commercial activities

Commercial activities particularly in town centers produce a lot of solid and liquid wastes, Most of these wastes discharged into large water body systems and cause pollution

.6. ***Mining activities***

Water used to wash the minerals usually discharged into water bodies' e.g the Kiwira river (Mbeya Tanzania) is seriously polluted with the liquid wasted from Kiwira coal mines.

7. Oil spill

Ocean lakes and rivers are polluted with oil spills on a daily basis from motor vehicles, routine shipping, runoffs, dumping, oil underground storage linkages and others. Oils cannot dissolve in water and thus form a thick shade in the water, This suffocates fish and other aquatic life

8. ***Occurrence acid rains***

In the atmosphere water droplet mix with pollutant gases of sulphur dioxide, carbon dioxide and nitrogen dioxides to form acidic rains. These as fall on the surface of water bodies' causes pollution.

9. ***Global warming***

This causes an increase in water temperature, it can results into health of many aquatic organisms.

`10 ***Radio activity element***

These are the nuclear wastes produced from industries, medical, and scientific processes that use radio activity materials, these materials have detrimental effects on marine habitats.

EFFECTS OF WATER POLLUTION

Water pollution has great impact to people and environmental in general in number of ways

1. ***Water pollution affect human health***

Some health effects recognized immediately, while others take time to be recognized as may take months or years. People use to suffer from water borne diseases as parasites and other diseases causing organisms are transmitted via the contaminated water. The common diseases include typhoid, intestinal parasites, amoebas, cholera, and poor blood circulation, vomiting, diarrhoea nervous systems damages. Heart and kidney injury, skin irritation and tooth decay

2. ***Water pollution affects the aquatic ecosystems***.
   Pollution caused by acidic rains, oils and others sources harm greatly the life in water body systems. It makes animals as well as plants adversely affected to the extent others parish completely.

3. ***Water pollution affects the chain of food***
   The toxic contained in water travel to animals mostly fish, then travel to human as eat meet. The first international scare related to toxic chemical in the water occurred lake in the 1950 when large number of people in Minamata bay Japan, began to contract an usual disease. Research revealed that, they were buffering from mercury poisoning as a result of wastes

that had been discharged into water ways and ingested by fish that had been discharged into water ways and ingested by fish that were eventually consumed by human beings.

CONTROL OF WATER POLLUTION

Water pollution problem can be controlled by the following measures

(i) Sewage's and others wastes should be treated before are discharged into water body systems.
(ii) People should be educated in such a way can be aware with the bad effect of water pollution and on how to control water pollution.
(iii) Establishment of water control ordinance.

PHYSICAL GEOGRAPHY 1.5 -STUDY OF SOIL

2.1 CONCEPT OF SOIL AND SOIL PROFILE

Soil appears very complex and thus different scholars (soil scientists) have developed a number of definitions about a soil according to varied considerations, commonly by regarding soil nature. It is thus a soil is defined as:

The thin upper most part of the earth's surface consisting of water, air, organic and mineral matters made by accumulation of the weathered materials on which plants and animals do live.

Or

The upper most surface layer of unconsolidated (loose) materials which overly the crustal rocks and on which plants grow.

Or

The natural occurring substance forming the thin upper most part (layer) of the earth's surface made by the accumulation of the weathered materials on which plants and animals live.

Or

A natural body of adjoining horizons of the parent materials which have undergone to a greater or less degree, a natural change, under the influence of water, air and various species of organisms and died matters. This definition was developed by soil scientist Dukucheiv.

Or

A natural body synthesized into profile formed from the parent materials acted upon by climate and organisms and modified by relief over a considerable period of time.

Or

A natural body resulting from interrelation ship between and interaction of several physical, biological, and chemical processes all of which vary according to different natural environments.

Or

It is a loose top layer of our planet's crust on which we live.

Or

Is a natural body of organisms, minerals, and organic constituents differentiated into horizons of variable depth which differ from the materials below in morphology, physical make up, chemical properties and composition, and biological characteristics. It is the most universal accepted definition developed by Joffe (1949).

The term soil has been derived from a Latin word of **Solum**, which means ground.

The scientific study of a soil, on its origin, characteristics and distribution is called **Pedology**. Hence, **Pedology** is defined as the scientific study of soil on their origin, properties, significance and distribution. The soil scientists are called pedologists.

IMPORTANCE OF A SOIL.

1. Soil is the medium in which most of the plants grow or rooted and thus; soil is used by man to grow crops. Soil acts as medium to plants growth in varied ways as follow.

- Soil provides mechanical support to plants as their roots held within the soil body
- Soil is important for the foundations of engineering structures, sewage disposal, gardens and lawns.

2. Soil is important for the foundations of engineering structures, sewage disposal, gardens and lawns.

3 . Soil is important for industrial purposes. I.e. it is extracted and used as raw materials to manufacture certain industrial goods. E.g. pottery, tiles, brick industries use soils as the chief raw materials.

4. Soil forms the most important base for the life of organisms. Hence, it is among of the elements of the ecological system for living organisms. For instance, soil supports the life of plants and other organisms feed on plants.

5. Soil is used to bury died bodies of human being.

6. Certain soils contain minerals which can be extracted commercially. E.g. Apatite mineral is extracted from the lateric soils and used as important raw material to manufacture phosphate fertilizers. This is done near Tororo in Uganda.

7. Soil makes the drainage of the surface as water supplied by the occurrence of rainfall is absorbed into it.

SOIL COMPONENTS

Soil being a natural body forming the thin loose upper most part of the earth's surface, contained with numerous materials. The numerous materials contained in soils collectively referred to soil components. **It is thus, soil components are the constituents of the soil body or materials that contained in the soil body.**

The materials contained in the soil body are externally varied in nature. Some of the materials are organic in nature, while others are inorganic. Some are in liquid state, while others are in gaseous state. Thus; by considering the nature of the materials, the soil body recognized to have four major components, and they differ in their amount of abundance with in the soil body.

The main components present in the soil body include:-

1. Mineral matters
2. Organic matter and living organisms.
3. Water
4. Air

1. MINERAL MATTERS.

Mineral matters in the soil body include all soil inorganic substances (particles) found in it. These materials are mainly the small pieces of rock of different size, derived from parent materials by weathering process.

The mineral particles present in the soil vary in size from smaller ones to larger ones. By considering the size of these mineral particles, soils recognized being distinctive as have particles of varied size. Thus; pedologists categorize soils into different types and include the following.

- Gravel; 20mm-200mm.
- Fine gravel; 02mm – 20mm
- Course sandy; 02mm – 2mm
- Fine sandy; 0.02 – 0.2 mm
- Silty; 0.02 – 0.002mm
- Clay; less than 0.002mm

Mineral matters in relation to others have volume of abundance of about 45% of the total soil components.

2. ORGANIC MATTER AND LIVING ORGANISMS

Organic matter and living organisms together have volume of abundance of about 5% of the total soil components:

ORGANIC MATTERS

Organic matter include the remains of died organisms (plants and animals) that have been fully or partially decomposed and mix with the soil mass. Part of the soil body largely consists of the organic matters is known as **humus.**

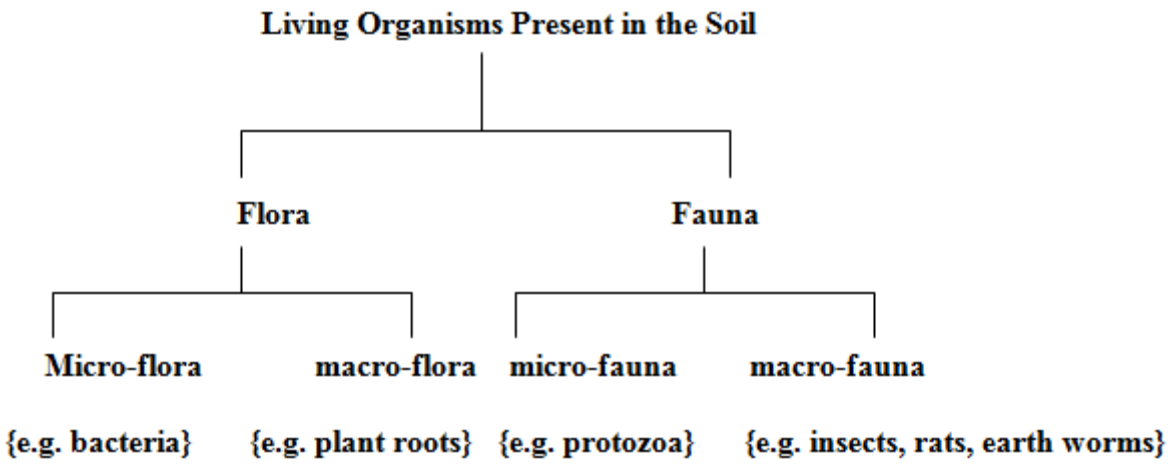
Soil supplied with organic matters from organic manures applied to a soil through agronomical practices. Other sources include died plants, died animals, and industrial organic waste products.

Soil organisms

The soil body contains living organisms. Life in the soil include; plants and animals. Plants are also known as flora, while the animals known as fauna.

Fauna is categorized into micro and macro fauna depending on the size of animal – organisms present is in the soil body. Micro fauna include the smallest animals that cannot be seen by naked eyes unless a microscope is used e.g. protozoa. While macro fauna include the organisms which are relatively large in size and can be seen by naked eyes e.g. all insects and worms.

Similar consideration prevails to flora as are also of varied size and categorized into micro and macro flora. Macro flora, include the plant – organisms which are quite small in size and not seen by naked eyes, while macro flora are the plant-organisms of relatively large in size and are easily seen by naked eyes



IMPORTANCE OF ORGANIC MATTER AND LIVING ORGANISMS IN THE SOIL

1. Organic matter influence soil moisture by retaining water in the soil. This is by varied ways and include the following:-

   - By reducing the rate of evaporation from the soil
   - By limiting the water percolation process

2. Organic matters as well as living organisms influence various physical, chemical and biological processes taking place in the soil body. For instance;

   - Physical process like that of physical weathering done by the penetration of plant roots especially of big trees.
   - Chemical process like that of materials decomposition in the soil body by soil living organisms.
   - The presence organisms and organic matters in the soil, form biological role

3. Organic matters help the process of soil aggregation to bind soil particles together. The remains of died organisms act as a glue to bind soil particles together to form aggregates. Hence, soil structure through the aggregation of the particles.

4. Organic matters reduce the plasticity of the soil. Certain soil readily turns into plastic once excessively saturated with water and such soil pose a number of disturbances. But the soil that is with organic matters, the degree of plasticity much minimized.

5. The remains of died organisms provide good habitable environments for the life of the soil organisms. For instance, organisms of earth worms make life in soil habitable environment with organic matters.

6. Add more plant nutrients to a soil body released from tissues of died plants. For instance; nitrogen, sulphur, magnesium can be supplied and mostly act as the storehouse of exchangeable captions. The process for nutrients being released into the soil from the broken tissues of organic matters is known as mineralization.

7. Organic matters regulate the chemical condition for the soil through the release of minerals from their broken tissues.

3.SOIL AIR

Soil body contains air, which forms 25% the total soil components. Air in the soil occurs in pore spaces (open spaces) of both micro and macro pores. The amount of air in the soil body depends on two determinant factors.

- The size of the soil particles. Usually the soil body of large size particles has more amount of air than that of fine particles.

- The amount of water present in the soil body. When water occupies a pore space, reduces the amount of air in the soil body, because water also occurs in pore spaces. Hence; there is an inverse relationship between the amount of water and air in the soil body.

The kinds of air present in the soil body include:-

- Oxygen; 20.25%
- Carbon dioxide; 0.25%
- Hydrogen and others; 79.5%

Importance of soil air

a) Air is needed to enable plants to manufacture their own food by photosynthesis process. In the process of photosynthesis, water absorbed by plants, is broken down by sunlight into hydrogen and oxygen, then hydrogen combines with carbon dioxide in series of reaction to manufacture carbohydrates.

$Co_2 + H_2O$ sunlight ⟶ carbohydrates + Oxygen.

Chlorophyll

4. SOIL WATER

Soil body contains water which is derived from rainfall, stream flow and irrigation practices. The amount of water present in the soil is of about 25% of the total soil components.

Types of soil water

1. Gravitational water:

It is the amount of water that enters the soil and passes out vertically through soil body by gravity. It normally causes the occurrence of leaching.

2. Field capacity soil water;

It is the percentage of water remains in the soil body after all gravitational water has been removed i.e. water retained in the soil despite the force of gravity.

3. Wilting point soil water:

It is the amount of moisture remains in the soil, when the soil reaches a point where its moisture content is similar to that of soil to the extent plants fail to absorb enough moisture and start to wilt.

4.Available soil water

It is the amount of water held in the soil between the field capacity and the wilting point levels. The water can be absorbed by the plants.

5.Unavailable soil water

It is the amount of water in the soil body below the level of wilting point. The water cannot be absorbed by plants and eventually die.

Importance of water in the soil body.

1. Water acts as a solvent of various minerals in the soil body. The makes plants to absorb minerals easily from the soil in solution form.

2. It fastens the process of weathering.

3. Soil water is used by plants to manufactures their own food by the photosynthesis biological process.

CO_2 + H_2O Sunlight carbohydrates + oxygen.

Chlorophyll

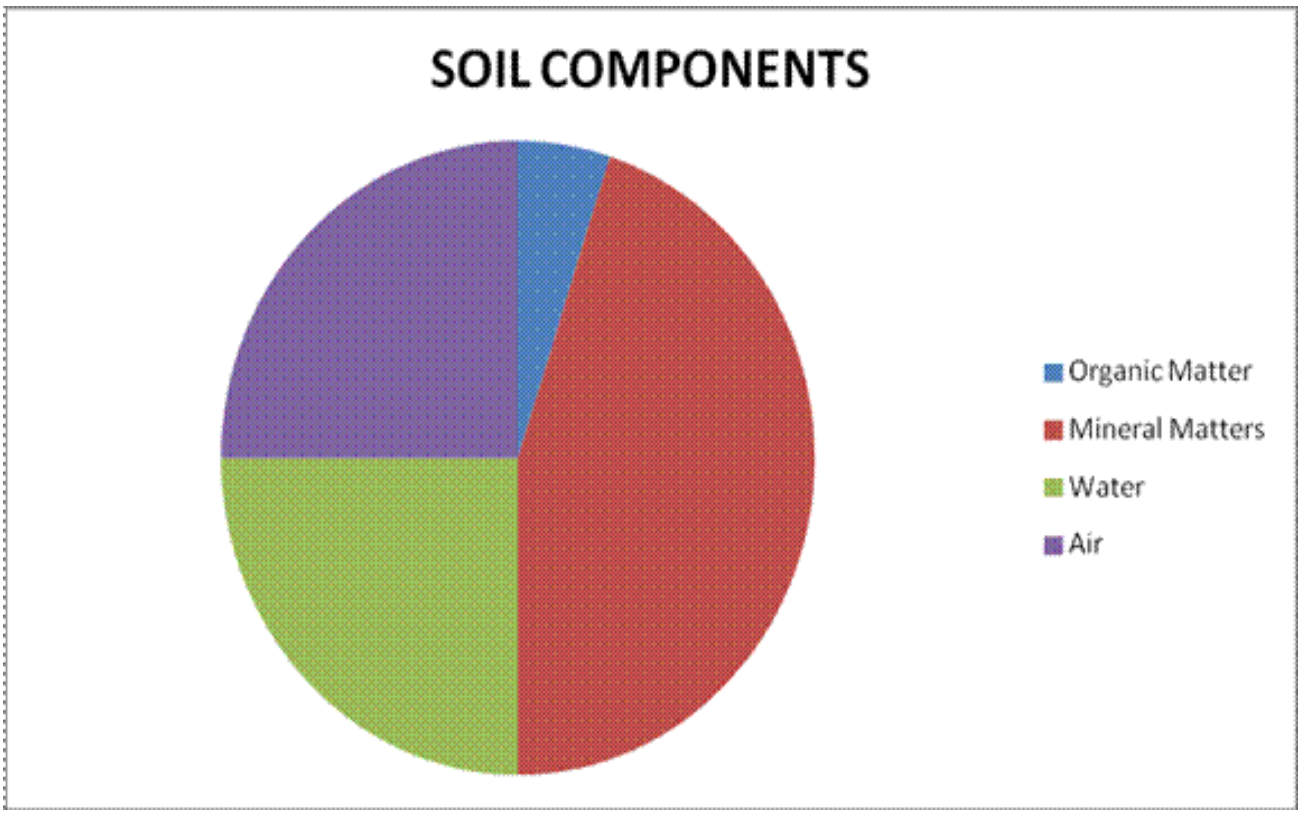
4. Water regulates soil temperature.

5. It is needed for the activities of soil organisms to decompose the remains of died organisms. i.e. water enhance biochemical processes taking place in a soil body.

NOTE;

Water is also inversely related to the amount of air in the soil.

Soil Components:



5% - Organic matter, 45% - Mineral matter, Water – 25%, Air – 25%.

2.2 SOIL FORMATION (SOIL DEVELOPMENT)

As we look at a soil, we find it largely consists of mineral particles which realized to have been derived from parent rocks by weathering process. This reveals that, soil originates from broken rocks by weathering and other processes under the control of certain variable like climate. Therefore; soil formation **is defined as the evolution (genesis) of a soil from parent rocks**

under the control of both active and passive factors through a number of processes. The whole process for soil development is known as pedogenesis and it is continuous.

The exposed surface rocks are broken down by weathering process to produce simpler unconsolidated materials known as regolith. The regolith further break up into more simpler materials known as mineral substrates which then mix with other soil forming materials of water, air, organic matter and organisms to form a thin loose layer of a soil supporting the growth of some plants.

The supported plants help further development of soils by attracting animals. When plants and animals die, get decayed and add organic matters into the soil. With time considerably after a number of decades or centuries, soils get fully developed and then support the growth of a wide range of plant species.

However, soil formation is a complex process in a sense that, it involves a wide range of physical, chemical and biological processes.

STAGES IN THE DEVELOPMENT OF A SOIL

The occurrence of a soil has critical points of development. These critical points of development are known as stages of soil formation.

The first in the development of a soil is the accumulation of a layer of loose, broken, unconsolidated parent materials called regolith.

Regolith can be derived from insitu or of the transported materials.

Regolith of insitu results as the exposed surface rocks in the environmental area broken into simpler materials by weathering process.

The regolith of transported materials brought into the environmental area by the running agents include; alluvium by fluvial action, till by glacier, loess by wind or volcanic ash.

The second stage is the formation of a true soil or top soil which results from the addition of other materials of water, gases, and organisms and died matters.

PROCESSES FOR SOIL FORMATION

These are the natural activities involved in the occurrence of a soil (soil formation) i.e. the activities which make a soil to develop. There are various processes of soil formation and broadly categorized into simple and complex processes.

· Simple processes included those which organize on their own and play a particular function in soil formation. i.e. process which is sufficient to perform particular role without to involve others. Some of these result into the occurrence of soil horizons.

· The complex processes are those which involve the combination of other processes in soil formation. These mostly produce distinctive soil types and operate in varied climatic regions.

Simple processes for soil formation.

1. Weathering:-

It involves the gradual weakening; and disintegration and decomposition of rocks into simpler particles under the influence of different weather forces of like rainfall and temperature changes. Weathering makes the exposed surface rocks broken into simpler materials of regolith then into simpler materials of mineral substrates. Weathering is what prepares the materials for other processes to take place to make a proper soil, and it is considered being the most fundamental process in soil formation.

Weathering is extremely varied as it causes rocks breakage in different ways. It is thus; categorized into the following forms.

a) Mechanical weathering

The exposed surface rocks are gradually disintegrated into simpler substances without being altered or decomposed by chemical reaction. I.e. a rock is disintegrated into successively fragments by mechanical means without any change in chemical composition. It takes place through the processes of exfoliation, frost action, salt crystallization and slacking.

b) Chemical weathering:-

It is the decomposition of the exposed surface rocks by chemical reactions, which involve the combination of water, certain atmospheric gases, and certain atmospheric gases of like oxygen and carbon dioxide, penetrates the rocks and make them decomposed and gradually break apart. This takes place through the processes of carbonation, hydrolysis, oxidation, hydration and solution.

c) Biological weathering:-

By biological weathering, the exposed surface rocks are gradually disintegrated in simpler fragments by the organic activities like **wedging action of the roots of big trees**.

2. Leaching:-

It is the removal of materials in solution or suspension downwards as water move vertically through the soil body by the force of gravity. It results into the movement of soluble and suspended materials in water percolating.

Leaching has two folds of eluviations and illuviation. Elluviation is a washing out of materials in solution or suspension from the overlying parts of the soil body. While illuviation, is the accumulation of the materials taken from the overlying parts of the soil body. Eluviations is of two categories and include; chemical eluviations and physical eluviations. Chemical eluviations occurs if materials removed from the overlying parts in solution after to have been dissolved in water; while physical eluviations takes place when materials removed in suspension.

Leaching is considered being a process in soil formation as it may causes a soil body developed with some horizons particularly the A and B by eluviations and illuviation respectively.

3. **Humification:-**

It is process by which the remains of died organisms of both plants and animals accumulate, decompose and mix with soil to form humus in a soil body. The process is greatly done by the soil living organisms. It is one of the important processes in soil formation as it makes a soil to have humus, which is one on the soil components. The process occurs rapidly in tropical humid areas. It takes place gradually in cool regions.

4. **Organic sorting.**

It is a process of re organizing the mineral particles and organic matters to form soil aggregates. This process improves soil structure.

5. **Mineralization.**

It is a process by which the dead plants and animals are broken down and mineral-nutrients which were present in their body tissues are released into the soil body and then taken by other plants.

6. **Cheluviation:-**

It is a process in which the minerals are dissolved and transported down wards under the influence of chelating agents. Chelating agents are the organic acids produced after the decomposition of organic matter.

7. **Capillary action:**

It is an upward movement of water to a surface and may cause some materials deposited to form a layer materials depending on the nature of bed rocks from which the solution has been derived.

COMPLEX PROCESSES FOR SOIL FORMATION.

Complex soil forming process operates in different geographical regions with varied climatic conditions. They are so pronounced for forming distinctive soil types. These have been named in basis of soil types produced.

Complex soil forming processes include:-

1. Podzolization.
2. Laterization/ferralization.
3. Calcification.
4. Salinization.
5. Gleization.

1. Podzolization

It is a soil forming process which leads to the occurrence of podzols soils in cool wet climatic regions. It involves humidification, severe leaching of basic oxides and limited leaching of organic materials to form acidic ash-grey colored soils known as **podzols**.

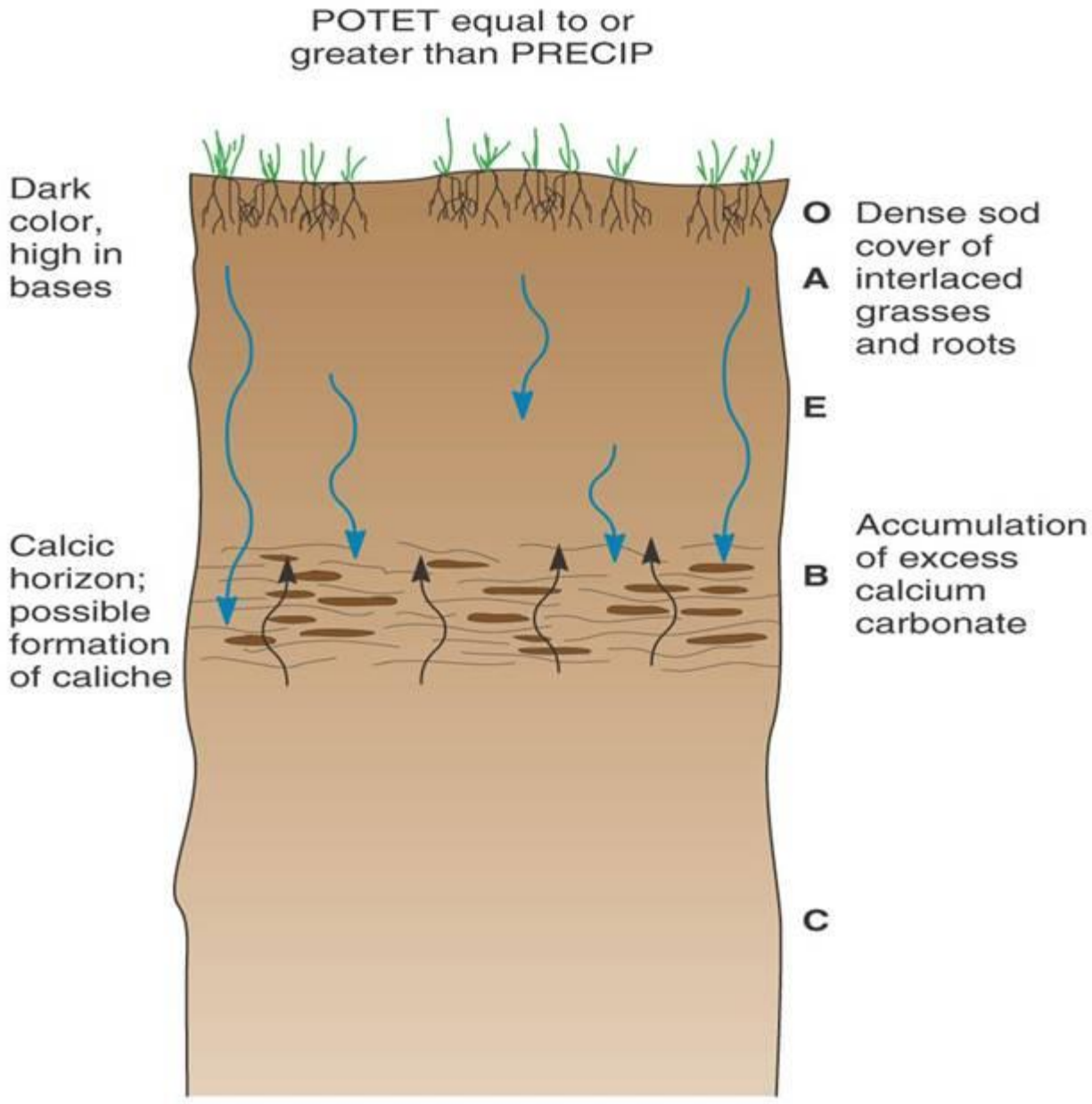
The process mostly occurs in cool humid regions where the rate of organic matter decomposition is gradual due to the prevailing low temperature. The humid condition results into eluviations and illuviation of minerals, but most of the organic materials are not removed and remain nearly the surface to form soils with remarkable organic horizon called **podzols**.

2. Laterization / ferralization

It is a complex soil forming process which leads to the occurrence of lateral soils in humid tropical and sub tropical regions. It involves a rapid rate if organic matter decomposition and severe leaching of both organic and inorganic materials from overlying soils. The water supplied by occurrence of rainfall makes most of the organic materials which have been well decomposed, and minerals easily washed from the overlying parts of the soil body as water percolate. This forms lateric soils with little organic matter nearly the surface. Such soils become hard in dry season and are reddish in appearance.

3. Calcification

It is a soil forming process that leads to the occurrence of calcific (calcareous soils) with calcific (Petroclacic) most top horizon in dry areas of semi arid. It involves limited leaching and severe upwards movement of dissolved calcium carbonates from the lower parts of the soil body. The calcium carbonate moves upward in solution by capillary action and reaches the surface or nearly the surface at where it evaporates making the solution to change back into original state of calcite deposits. Thus; **calcareous soils** with **calcite deposits** develop.



4. Salinization

It is a process by which salts are drawn upwards to the surface in solution through capillary action to form saline soil in hot desert areas.

It takes place in regions where evaporation is greater than precipitation. It leads to the increase in soil salinity and hence gives to poor plants growth. Deposition of salt materials leads to the development of a hard crust on top which adversely affect the growth of plants.

5. Gleization

It is a soil forming process which leads to the occurrence of immature soils (glei soils) in areas of poor drainage where both organic and inorganic matters incompletely decomposed.

Glei soils by Gleization develop commonly in areas of the following nature.

- Cold climate where frost is common making incomplete materials decomposition.
- Gentle sloped (depression area) where the underlying rock is impermeable.
- Water tables is high enough to enter profile

Heavy rainfall where the underlying rock is impermeable.

FACTORS OF SOIL FORMATION

The rate and nature of a soil to be formed in environmental area is influenced by certain variables. The variables which influence the occurrence of soils are known as factors of soil formation.

The factors influencing soil formation are summarized as follows:-

Soil = f (PCROT) whereby:

- P – **Nature of parent rocks**
- **C – Climate.**
- **R – Relief.**
- **O – Organisms**
- **T – Time**

The factors of soil formation are broadly categorized into two major groups of active and passive factors.

- The active factors include those which exert their own energy to make the occurrence of soils and also other factors depend up on them. They include:- climate and organisms.
- The passive factors include those which depend on other factors as do not exert their own energy to make occurrence of soils. They include; relief, time and nature of parent materials. i.e. the factors which depend on others to give soil to give formation.

All factors for soil formation are interdependent to one another.

1. <u>The nature of parent rocks</u>

Parent rocks influence soil formation in a number of ways as follow:-

a) The nature of parent rocks has a lot of influence on the speed with which weathering occurs. Some rocks are more resistant to weathering than others. For instance. Acidic rocks are more resistant to weathering like granite, while the basic rocks are less resistant to weathering like gabbros. Hence; the rate of soil formation is greater enough in environmental areas of basic rocks than areas of acidic rocks.

b) Nature of parent materials influences physical soil properties like; texture, structure, water permeability, porosity and others. For instance; the rocks which are resistant to weathering, once weathered produce particles of relatively large size and produce a course textured soil. Such soils are relatively permeable have larger pore spaces and whose particles lie loosely. It is conversely to rocks which are less resistant to weathering.

c) The nature of parent materials from which soils form, influences mineralogical composition. I.e. kinds of minerals contained in a soil primarily derived from parent rocks.

d) The nature of the parent rocks makes the occurrence of certain types of soil. For instance, the limestone underlying bed rocks, may give to the development of calcareous soils of either terrarosa or rendzina.

2. <u>Climate</u>

Climate influences soil formation in varied ways and mostly include the following.

a) Climate influences the disintegration of parent rocks through weathering to produce simpler particles which then mix with other materials of air, water and organic matter to form true soil body. For instance; temperature influences both chemical and mechanical reaction is double for every $10^{\circ}C$ Rise in temperature and also exfoliation depends on temperature change. Rainfall also influences both chemical and mechanical weathering.

b) Climate influences soil formation indirectly by favoring the growth of vegetation which then plays following roles.

· When plants die and decay release organic matter and minerals in the soil body

· The roots of plants especially of the big trees influence biological weathering as their roots penetrate into the ground making rocks breaking apart.

c) Climate determines the types of soil at a global scale. I.e. the distribution of soils corresponds much closely to patterns of climate and vegetation. E.g. the cool humid climate gives to ash grey colored soil known as podzols.

d) Climate makes soils to have horizons formed by leaching and capillary action as water percolate or rise upwards respectively. Leaching makes a soil developed with A and B horizons, while capillary action makes a soil developed with calcite or saline layers depending on the nature of rocks from which the solution has been derived.

3. Relief (topography)

It is considered on the general physical appearance or surface form of the environmental area where a soil is formed. Relief has the following effects on soil formation:-

Relief by slope of the land determines the rate and depth with which a soil is formed as follows.

· In steep sloped areas, soil formation takes place gradually (takes so long) as the running agents easily remove most of the soil forming materials. It has also to be noted that, a soil which formed in areas of steep slope, is shallow.

· In gentle sloped areas the rate of soil formation is faster enough because the soil forming materials readily accumulate, and mostly result into deep soil.

· Level lands are poorly drained and mostly develop into marshy. These do not make soil develop to maturity due to slow rates of leaching and decomposition of the soil forming materials.

b) Relief modifies the effects of climate on soil formation. In highland areas, temperature much lowered by higher altitudes and results to low rate of materials decompositions as it can compared to areas of low altitudes.

c) Relief by aspect influences the rate of soil formation as follows.

· Wind ward side has higher rate of soil formation as materials rapidly decomposed by the adequate moisture as heavy rains experienced.

· Lee ward side has low rate of soil formation due to slow rate of materials decomposition made by scarcity of rains.

d) Relief makes variation of soil characteristics in the same area if it has contrasts. Such a soil is known as soil catena. Soil catena is defined as the sequence of soil types down a slope where each soil type (facet) is different from but linked to its adjacent facet.

Or

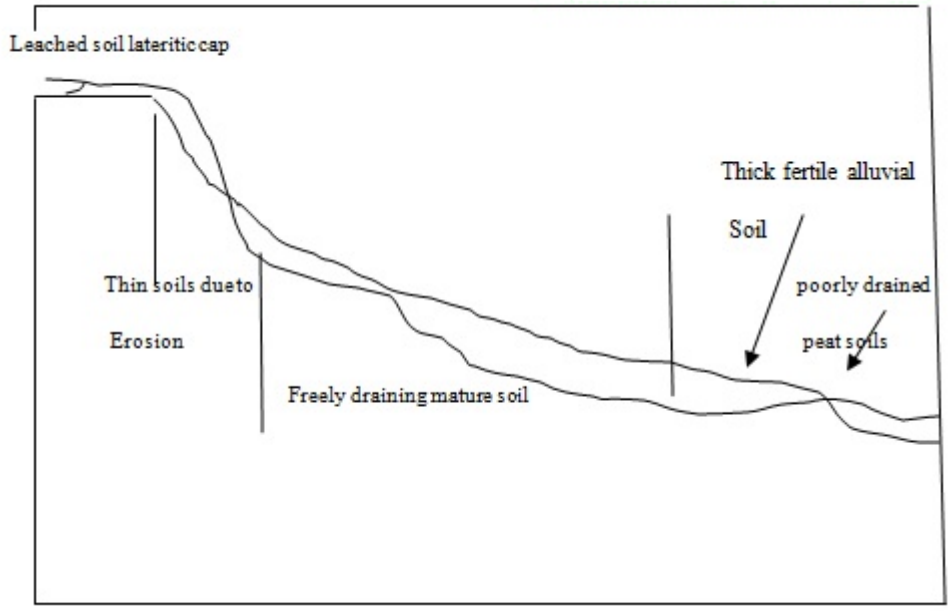
A series of soil formed from the same parent materials which are similar in composition and age and in areas of similar climate but have different characteristics because of the difference in relief set up.

A good example of soil catena is that of ukiriguru area in Mwanza.

Soil catena illustrates the way in which soils can change down a slope where there are no marked changes in climate and parent materials.

Note:

The word catena means a chain in Latin. It thus, a chain (sequence) of soil down a slope.



4. Organisms

Organisms influence soil formation in the following ways:-

i) i) Organisms of plants particularly the big trees, cause biological weathering as their roots penetrate into the group to produce mineral substrates which then mix with other materials to form soil.

ii) Organisms of like ants, worms, termites, mites, woodlice and others; cause decomposition of material in varied ways and some include the following

· iii) They burry leaf litter with soils.

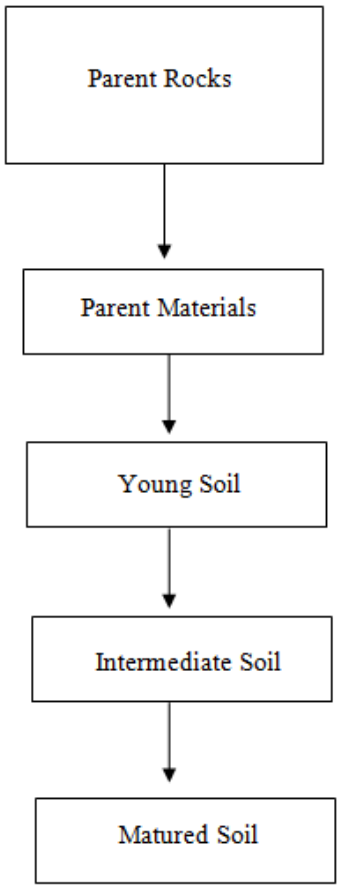
· iv) They make eating some of the litter.

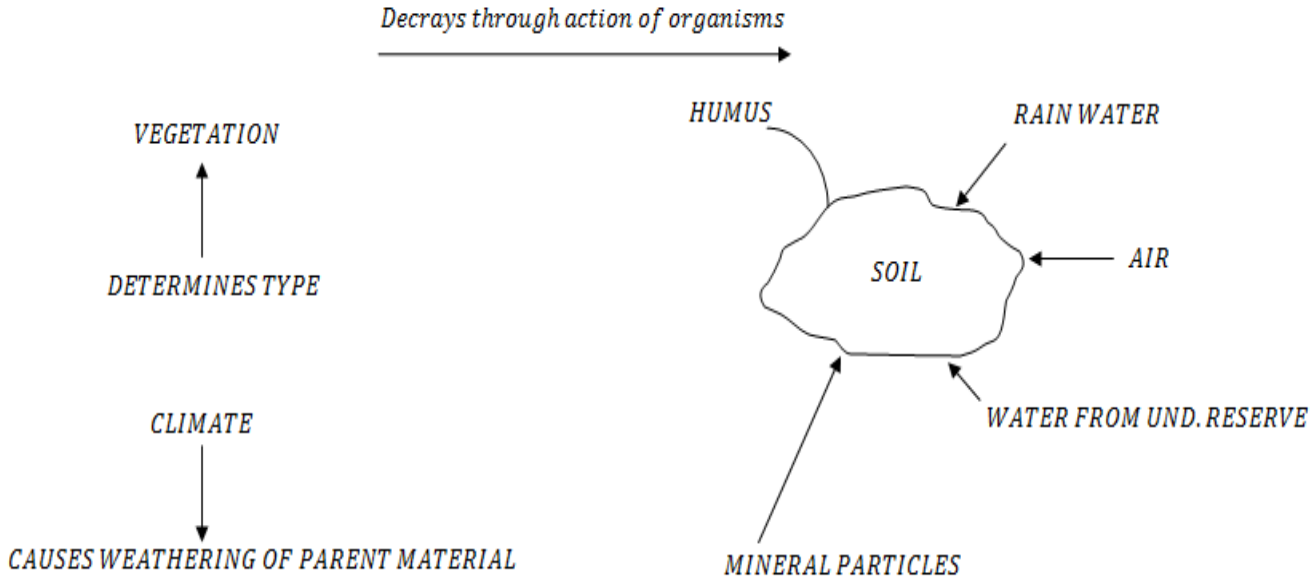
· v) They secrete enzymes from their bodies which break down the organic compounds.

· vi) The soil living organisms respire out carbon dioxide gas which dissolves in water to form weak carbonic acids. The acids lead to decomposition of both organic and inorganic materials.

5. Time

The longer the time, the more the soil is matured. Soil usually takes long time to form. It perhaps up to 400 years for 10mm and it can take 3,000 – 12,000 years to produce a sufficient depth of matured soil for farming.





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SOIL PROFILE

If a soil body is cut vertically, several horizontal layers from the top to the bottom of underlying bedrocks are observed. The individual horizontal layer is called horizon as the layers are horizontally arranged. The entire section of the soil body from the top to bottom with a number of horizons **is called soil profile.**

Usually the horizontal layers differ from one to another in physical, chemical and biological properties. With regards to the consideration, soil profile is defined as the vertical section of the soil body from its top part to the bottom where there is underlying bedrocks mostly characterized by having varied horizontal layers.

The hypothetical matured soil profile has the following horizontal layers of O, A, B, C, and horizons.

- O – Horizon; (Organic horizon)
- A – Horizon; (Horizon of eluviations)
- B – Horizon; (Horizon of illuviation)
- C – Horizon (Regolith horizon)
- D – Horizon (Bed rock horizon)

O – Horizon (Organic horizon)

It is the upper most layer of soil body formed by the accumulation of materials derived from plants and animals. It is highly consisting of organic materials and it is the most productive part of the soil body.

Organic horizon sub divided into O_1, O_2 and O_3

- O_1 – It is recognizable to the unaided eyes. It is mainly consisting of organic materials, which have not been properly decomposed.
- O_2 – It is organic horizon with materials which have been well decomposed. It is not so easily identifiable, and it is termed as humus.
- O_3 – it is a sub part grading to A – horizon.

A – Horizon (Eluviation horizon)

It is a zone of depletion and that is why, it is called eluviations horizon. It develops following the removal of materials to the underlying horizons by leaching.

The zone also consists of organic matters by being laid immediately after O- horizon.

It is sub divided into the following sections.

- A_1 – A layer, which is still with organic matters. It is an organically rich layer and dark colored.
- A_2 – Proper eluvial horizon and it is light colored.
- A_3 – A layer grading into B- Horizon.

B - HORIZON (ILLUVATION HORIZON)

It lies in between of A and C – Horizons. It consists of very little organic matters. It is the layer of accumulation by receiving all materials eluviated from O and A horizons and that is why, it is referred to a layer of illuviation.

It is sub divided into B_1, B_2, B_3

- B_1 – Upper illuvial horizon and it is considered as the transitional horizon having properties of both A and B horizons.
- B_2 – The main depositional layer and it is the part of the soil body where maximum accumulation of the materials takes place.
- B_3 Illuvial horizon grading into C horizon.

C – Horizon (Regolith horizon)

Consists of weathered parent materials at which soil starts to develop. It may also consist of materials accumulated by the transporting agents. There is no any organic activity taking place in this part of soil body.

The upper part of it has some properties of B horizon and recognized as C_1. The rest part is recognized as C_2 being the main (clear) regolith horizon.

D – Horizon (bed rock horizon)

It is largely consisting of bed rocks.

Note:

O, A and B horizons together form a proper soil, while C – horizon forms sub soil.

SOIL CANTENA :- Is where soils are related to the topography of a hillside a sequence of soil type down slope.

DEVELOPMENT OF SOIL PROFILE

The development of a soil profile in any environment area greatly influenced by climate especially precipitation and temperature.

The over lying regolith get further broken down into more simpler materials of mineral substrates which then mix with other materials mostly water, air and organic matter to form the top true soil. Hence; part of regolith changed into true soil.

Percolation of water into the soil makes the true proper soil to change into varied appearances popularly known as A and B horizons. A – Horizon develops as materials eluviated from the most overlying part of the proper true soil; while B horizon develops as materials eluviat ed from the overlying part to become illuviated in the overlying part of the soil. Both eluviations and illuviation are made by the leaching process.

The surface of the soil supports the life of numerous organisms. This makes the most overlying part of the soil constantly supplied with organic materials and develops into O – horizon.

CLIMATE AND SOIL PROFILE

With regards to the general view, the development of a soil profile is greatly influenced by climate. The factor influences the occurrence of varied soil profiles as follow.

Soil profiles have varied appearance of surface soils. For instance; some environmental areas whose surface soils have calcite deposits, while others ash - grey colored. It is thus; soil profiles are extremely varied depending on the variation in environment conditions and gives to different types of it.

The most of outstanding environmental condition among the several is of climate. Hence; the type of climate produces a certain type of soil profile. This is justified by looking the following climatic regions:-

a. Cool humid climate

The climate produces a podzolic soil profile with remarkable O – horizon. In areas with such climatic pattern, the decomposition of organic matter is gradual enough due to the prevailing cool condition, as a result, most of the organic materials remains nearly the surface and make a soil body to have a well defined O –horizon.

The process involved in the development of podzolic soil profile is known as Podzolization.

b. Humid tropical and subtropical climate

The climatic pattern produces a soil profile with lateric top soil. Hence the geographical areas which experience the climatic pattern are made to have lateral soil profile. The prevailing high temperature condition speeds up the rate of organic and inorganic matters decomposition as a result, most of the decomposed organic materials are eluviated down wards leaving the soil with little content of organic matter nearly the surface forming the lateric soil which mostly reddish in colour.

A process, which is involved in the occurrence of lateric soil profile, is called Laterization (ferralization)

c. Hot desert climate

Desert climate has higher rate of evaporation than precipitation. The climate results into upwards movement of water (capillary action) to the surface and makes saline materials drawn up to the surface to produce a profile with saline top soil.

The process involved in the occurrence of such soil body is called **Salinization**.

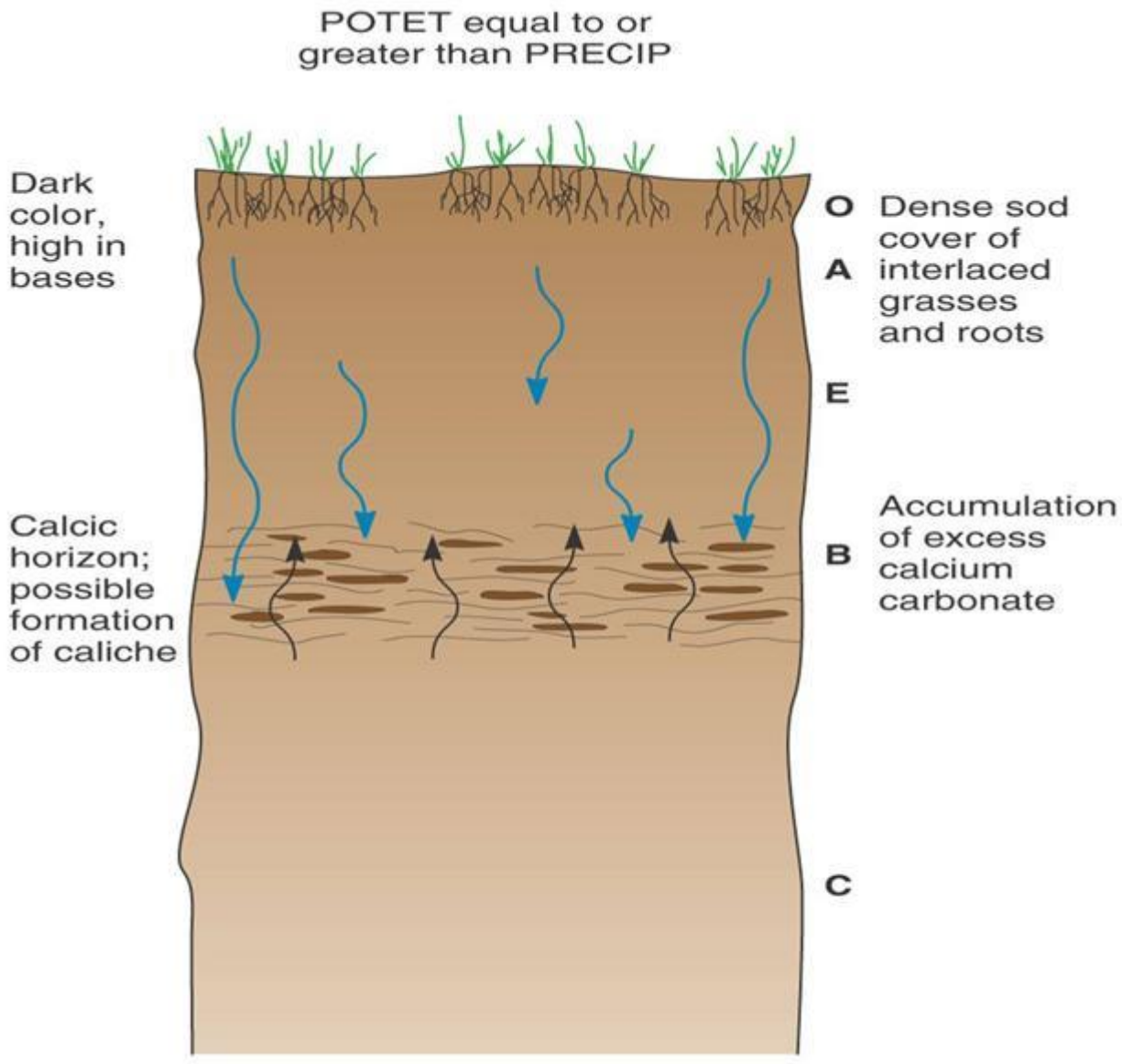
d. Polar climate

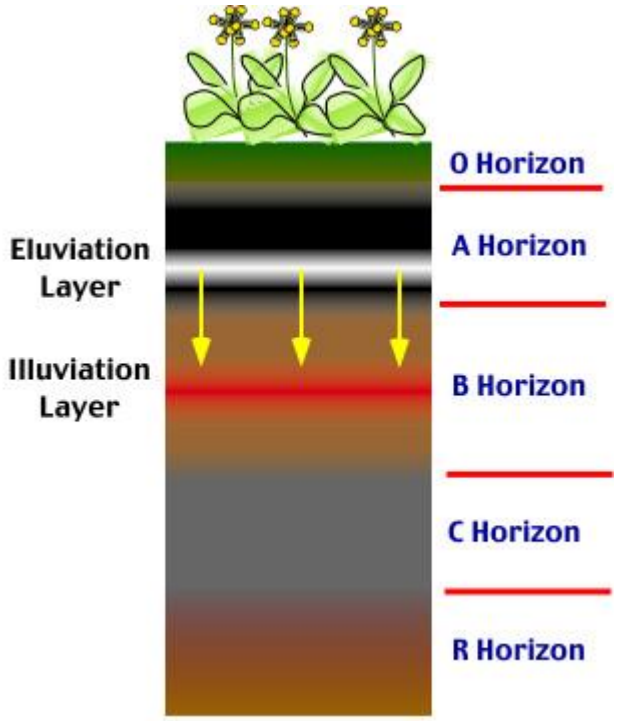
The climate makes poor drainage and permanent frost action as a result the organic and inorganic matters become incompletely decomposed. This produces a profile of **Glei soil** which has no well defined characteristics. E.g. peat soil.

The process for the occurrence of gelid soil occurrence is called Gleization.

e. Dry and semi-arid climate

In the regions, evaporate-transpiration exceeds precipitation, and therefore, characterized by the removal of bases from A – horizon by precipitation. It is followed by the accumulation of calcite deposit at or nearly the surface called calcareous (calcify) soil. The process involved in the development of such soil profile is called **calcification**.





Importance of soil profile

- The depth of the top soil is important in agriculture because, plants normally grow in the top soil. In addition to this, various micro – organisms live in the top soil.

- In connection to the point, soil profile (depth of the soil) determines the penetration of plant roots. If the profile is shallow the roots have limited chances to penetrate as it can be compared on where the soil is deep, the roots may penetrate more into the soil.

- Influences drainage in the soil. Deep profile makes good drainage of the soil as more water easily percolate into the soil.

- Influences aeration in the soil body. Deep profile has more air compared to shallow profile.

- Determine water holding capacity. Deep profile holds more water compared to shallow profile.

- Has ideal influence on soil fertility. Deep soil has a lot of nutrients, water and air than can be taken by plants to maintain their growth.

SOIL PROPERTIES

Soil has a wide range of varied nature and these are generally recognized as soil properties .Soil properties are so varied and broadly categorized into three group of the following: .

a. Physical soil properties

b. Chemical soil properties

c. Biological soil properties

A. PHYSICAL SOIL PROPERTIES

Physical soil properties include ; texture , structure , colour , temperature , porosity ,density ,depth , and other .

1. SOIL TEXTURE;- Soil texture is defined as the feebleness or fineness or coarseness of a soil determined by relative proportional of soil particles of different diameters.

The size of particles can make the soil course textured, medium textured, and fine textured.

Texture of the soil can be assessed by the following methods.

- Sense of feel
- Particles size analysis

Sense of feel method

The method is done in the field in which a soil sample is rubbed preferably in wet condition between the finger and the thumb , and may give any the following result :

- Gritty feel: - Implies the soil is of course texture as whose particles large in size and recognize being sandy soil.
- Flour feel:-The soil is slightly fine or medium texture as whose particles medium in size and it is recognized as silt soil.
- Plastic soil:-The soil is of fine texture as whose particles quite small and it is confirmed as clay soil.

Particles analysis method

The particles size analysis is the most accurate method and it is done in the laboratory

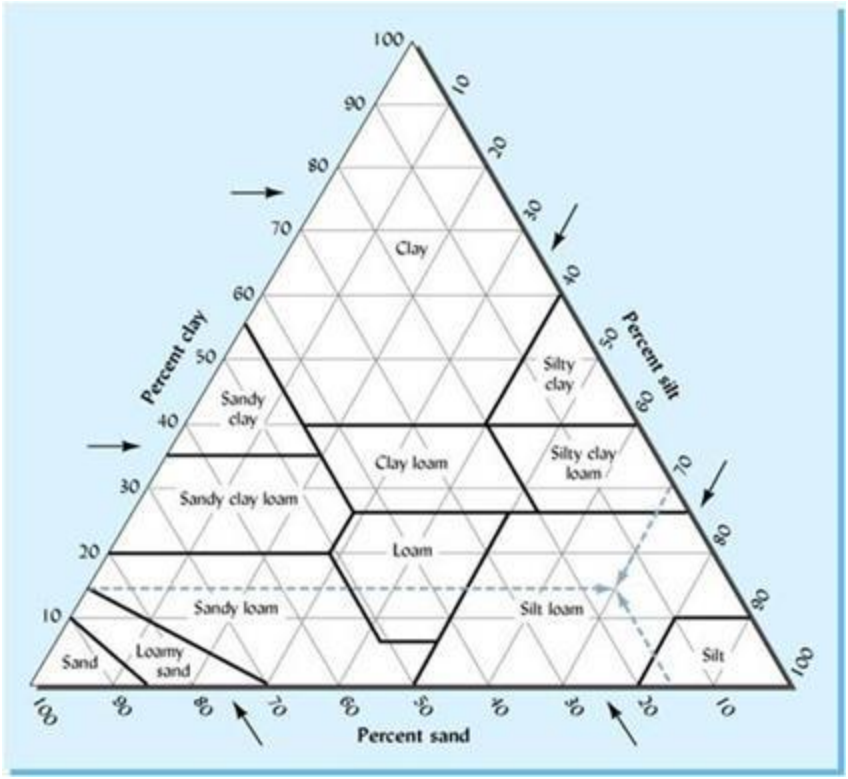
I.e. texture of the soil recognized by their size. The following is proper arrangement of soil type according to texture by particles size analysis.

Diameter of particles (mm)	Name of the soil
Less than 0.002	Clay
0.002 – 0.02	Silt

0.02 – 0.2	Fine sandy
0.2-2	Course sandy
2 – 20	Fine gravel
20 – 200	Gravel

IMPORTANCE OF SOIL TEXTURE.

- Determines the relative resistance penetration to plants root into the soil. Where the soil particles are large, roots can penetrate more easily than they do on fine grained soils which are usually compact.
- Determines the infiltration rate of water into soil. Infiltration rate is easier to the coarse textured soils compared to fine textured soil as whose particles lie so compacted
- Influence soil resistance to erosion. Erosion is easier to soil which are coursed textured as particles lie so loosely.
- Influence soil fertility as it determines the ability of soil to hold nutrient and water for plant use.
- Influence other physical soil properties of like; soil permeability, compaction, structure, porosity, and water retention capacity.



2. SOIL STRUCTURE

Soil structure refers to the arrangement (aggregation) of individual particles according to their size into soil shapes.

Or

The way in which soil particles are grouped or bound to form soil shape.

Structure of the soil is of two kinds and includes; single grained and massive structure.

- The single grained structure, each particle lies independently i.e. not cemented to other particles and forms its own structure. A good example of soil with single grained structure is that of sandy.
- The massive soil structure, particles are cemented to one another to form crumps (lumps).

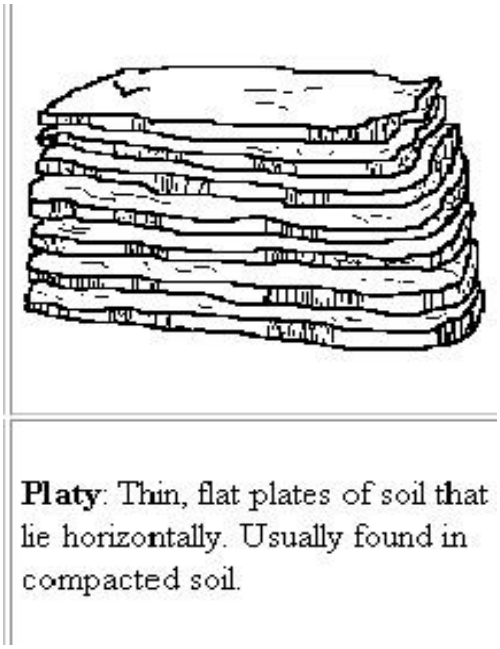
The formed crumps (lumps) can be large or small in size. The larger crumps (lumps) are called aggregates, while the smaller crumps are called peds.

The ability of a soil to form aggregates or peds largely depends on its texture. Whether course or fine. Usually the fine texture soil has higher ability to form aggregates than the course textured soil.

Soil aggregates produced as the particles cemented, are best explained in basis of their shape and include the following:

Platy Aggregates:

The aggregates have more developed horizontally than the vertical dimension



Platy: Thin, flat plates of soil that lie horizontally. Usually found in compacted soil.

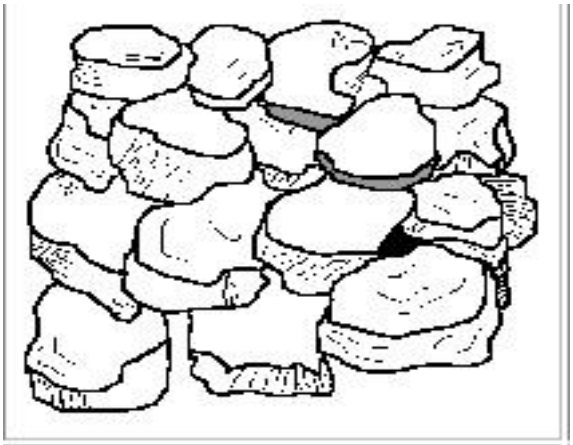
Prism Aggregate:

The aggregate is more vertical developed than the horizontal dimension.

Prismatic: Vertical columns of soil that might be a number of cm long. Usually found in lower horizons.

Brocky Aggregate:

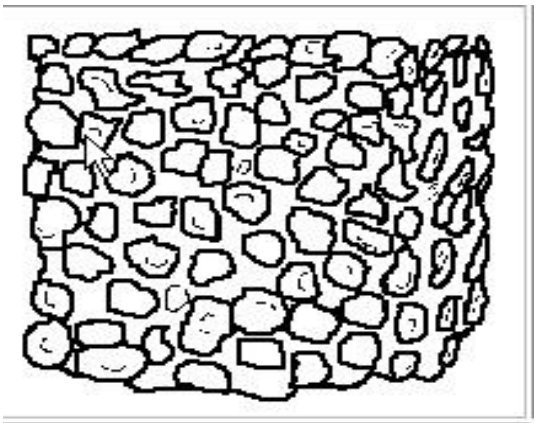
All dimensions of the aggregate are nearly equal in size.



Blocky: Irregular blocks that are usually 1.5 - 5.0 cm in diameter.

Sphere Aggregate:

The soil aggregate is nearly (roughly) round.



Granular: Resembles cookie crumbs and is usually less than 0.5 cm in diameter. Commonly found in surface horizons where roots have been growing.

IMPORTANCE OF SOIL STRUCTURE

- It has an influence on soil aeration. High degree of aeration is to a soil which less compacted compared to soil which is well aggregated.
- It has an influence on soil drainage. Compacted soils like clay poorly drained compared to less compacted soils like sandy which is well drained.
- It is an influence on seed emergence .Young plants easily emerge out where the soil is less compacted.
- It has an influence on plant growth by influencing root penetration and water retention.
- It has an influence on cultivation process .Soil is readily cultivated if is less compacted like sandy
- It is good indicator of soil fertility. Compacted soil is assessed fertile as it has higher ability to retain much water and nutrient for the growth of plants.

3. SOIL COLOR

Soil colour understood as an appearance of the soil relatively to the influencing factors, Soils have varied colours .Soil have all colour expert pure blue and pure green The common colours of soil include ;white , red , brown, red -brown ,grey ,yellow , and black. However some greenish and bluish may occur.

Causes of soil color

- The amount of organic matters present in the soil body. Always high content of organic matters gives dark colored soil or dark blown soil.
- **Mineralogical composition of soil**.

Minerals give soil colours. For example; the presence of hydrated iron minerals gives to the reddish colored soils. Presence of salt minerals makes the soil be lighter colored; manganese oxide makes black colored soil, glauconite makes the soil greenish, calcite makes the soil white.

- **Leaching process**

This makes the removal and accumulation of materials through eluviations and illuviation respectively. Eluviation gives to a lighter colored soil, while illuviation gives to dark colored soil.

- **Climate**

This has considerable influence on a soil colours. The humid tropical climate makes soils become reddish in colour .While colour humid climate cause soils to be grey in colour.

Significance of soil colours.

1· Soil colours tell the productivity of a soil for crops cultivation; for example, the dark colours soils gives an impression that, the soil is rich on organic materials (matters) and it is more productive. Lighter colored soil indicates poor fertility. Hence soil colour is considerably important in soil fertility assessment and may direct people on how soil fertility can be improved.

2· Soil colour tells about the relative amount of moisture present in the soil. Commonly moistured soils have distinctive appearance as it can be compared to less moistured soils.

3· Soil colours tell about the pattern of climate in place .For instance; Reddish colored soil indicates warm climate as such soil is formed by such climatic pattern. A grey soil indicates the cool humid climate so long such soil is formed under the climate.

4· Tells about the kinds of minerals present in the soil body. e.g. Red colored soil, gives an impression (indication) that the soil has hydrated iron minerals. It is so as such soils partly result following the presence of such minerals.

4. SOIL POROSITY

Soil porosity refers to the sum total space not occupied by solid matters in the soil body. Or sum of empty space in between of the particles.

The space are commonly known as pore space and usually filled with water and air.

There are two types of pore space basing on their size and include the following

Macro pores (non capillary pores)

They are large in size and usually allow free air and water movement within the soil body. They do not make capillary action readily.

Micro pores (capillary pores)

They are quite small in size. Soils with such pores hold much water.

Soil porosity is influenced by the following factors:-

a) Size of the particles

Small sized particles easily bound and thus, make the soil to have micro pores. In contrast to large sized particles, make a soil to have micro pores.

b) Organic matters present in the soil body organic.

Matters may make soils to have micro pores as particles easily bound together.

Importance of soil porosity

- Soil porosity has an ideal effect on drainage and water holding capacity.
- Influence aeration in the soil body. Macro pores make soil to hold more air compared to micro pored soil.
- Influences soil fertility as it determines the ability of a soil in holding water and nutrients for plants use. Micro pored soils are fertile as retain much water and nutrients for plant growth.

5. SOIL TEMPERATURE

It is a degree of heat of a soil body. This physical soil nature is created as a body of soil warmed by heat radiated from the sun.

Soil temperature tends to vary considerably from places to places or even time to times due to certain determinant factor. The factors include the following:-

- Amount of heat energy supplied to the soil surface. High amount of heat energy, makes soil warm. It is unlike if there is low amount of heat supplied to a soil surface.

- Soil properties relatively to heat energy absorption. For instance the dark colored soils absorb more heat than the lighter colored soil. Thus the Dark colored soils are comparatively warm than the lighter colored soils.

- Ground covers, soil that are covered with vegetation are generally cooler than exposed soils.

Significance of soil temperature.

- Soil temperature determines the existence of soil living organism. For instance, in extremely hot or cold conditions, the micro organism may not exist.
- In connection to the above point, soil temperature controls the bio- chemical process taking places in soil body.
- It controls the amount of moisture in the soil body. Where there is high temperature, soil moisture is low due to excessive evaporation.
- Influence the occurrence of some horizon in the soil body like horizons of calcite deposit and salt crystals. However, this is attained if the temperature is considerably higher to exceed the amount of precipitation in the environment area.
- Soil temperature influences the growth of plants. In common plants make proper growth under the optimum temperature range. Where temperature is extremely low or high, plants do not make proper growth.

6. SOIL DENSITY

Soil density refers to a weight per unit volume of soil. The density of the soil is expressed as follows:-

(i) Particle density

It is the weight per unit volume of soil solids. This is expressed as follow.

$$\frac{weight\ of\ the\ soil\ solids}{volume\ of\ the\ soil\ solids} = gm/cc$$

(ii) Bulk density

It is the weight per unit volume of the whole soil by considering soil sample. Or the ratio of soil weight to soil volume. Bulk density is expressed as follow.

$$\frac{weight\ of\ soil}{volume\ of\ soil} = gm/cc$$

Bulk density of the soil is affected by the following factors.

- Organic matter content.

- Granulation.
- Compactness of the soil.
- Cultural practice

Note

The other physical soil properties include:-

- Aeration
- Soil water
- Soil depth

B. CHEMICAL SOIL PROPERTIES

Soil has considerable chemical properties. The pronounced chemical soil properties include the following:-

- Soil reaction
- Leaching
- Cation exchange.
- Soil colloids.
- Soil nutrients

1. SOIL REACTION

Soil body contains diverse of material .They include mineral water, gases and organic matters. The material are of varied chemical nature and their proportional amount in the soil, mostly make soils be in varied chemical condition like acidity, alkalinity, and neutrality. The chemical condition created by the material understood as soil reaction.

It is therefore soil reaction can be defined as the degree of alkalinity , acidity and neutrality of the soil relatively to the proportion amount of hydrogen (H+) and hydroxyl ions (-OH)

The soil to be in acidity, alkalinity, or neutrality depends on the concentration of hydrogen ions (H+) and hydroxyl ions (-OH) present in the soil body.

- The soil solution with more hydrogen ions (H+) is made to be in acidic condition.
- The soil with more hydroxyl ions (OH-) is in alkaline condition.
- If the amount of hydrogen and hydroxyl ions present in a balanced ratio, the soil is made to be in neutral condition.

Soil reaction is expressed in terms of PH. **PH of the soil is defined as the negative logarithm of hydrogen ions concentration of the soil solution.**

Assessments of soil PH

The PH value of the soil is assessed by finding out, the concentration of the hydrogen ions (H+) in the soil solution. This can be done by using one of the following methods.

- The electrometric method.
- The colorimetric method.

The electrometric method

By the electrometric method, the soil reaction is determined by means of PH meter, the hydrogen ions concentration of the soil solution is balanced against a standard hydrogen electrode then a reading is made.

- If a reading is about below 7, the soil is in acidic condition i.e. (1 _6.9).
- If a reading is above 7, the soil is in alkaline condition. i.e. (7.1 _ 14).
- If a reading is 7, the soil is in neutrality.

The PH meter runs from 1 – 14, but most of soils have the PH values that range from 3.5 to 11.

PH range	Description
3.5 – 4.0	Very strongly acidic
4.1 – 5.0	Strongly acidic

5.1 - 6.0	Moderately acidic
6.1 – 6.9	Slightly acidic
7	Neutral
7.1 – 8.0	Slightly alkaline
8.1 – 9.0	Moderately alkaline
9.1 – 10.0	
10.1 – 11.0	Strongly alkaline
	Very strongly alkaline

The colorimetric method;

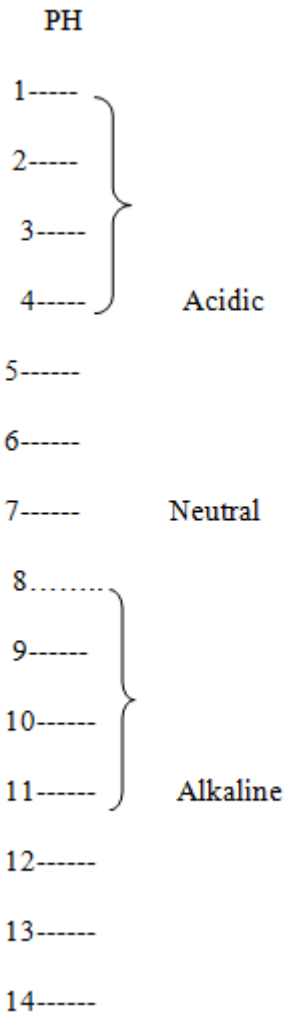
It is done in the laboratory by using dyes. A dye is poured into a container with a soil solution.

Dyes sink slowly into the soil solution, then develop a certain colour depending on the state of soil solution .The colour developed is by then compared to a standard colour chart with PH description.

The following are the common colours in standard colour chart and their interpretation.

- Red – The soil is very acid
- Pink –The soil is slightly acidic
- Green – The soil is neutral
- Blue – The soil is slightly alkaline.
- Purple- The soil is very alkaline.

Less than 5	**Red**	**Very acidic**
5.6	**Pink**	**Slightly acidic**
7	**Green**	**Neutral**
8.9	**Blue**	**Slightly alkaline**
Over 9	**Purple**	**Very alkaline**
Test soil water for its Ph		



Causes of soil acidity

- Leaching of bases (basic oxides) of calcium, magnesium, potassium and sodium. The basic oxide causes a soil being in alkaline. It is therefore, if removed as water percolate downward may cause the overlying soils become acidic. Leaching of the basic oxide may result from heavy rainfall and excessive irrigation.

- Microbial activities and decomposition of organic matters. These commonly produce organic acids and commonly intensified acidity.

- The use of the acidic forming fertilizers like that of ammonium sulphate.

Cause of soil alkalinity.

- Soil alkalinity is mostly caused by the presence of the basic oxides in the soil.

· Insufficient amount of rains, the conditions which do not cause the severe removal of bases .Hence basic oxides steadily concentrate to make the soil alkaline.

Agronomical significance of soil PH

· Determines the suitability of the medium for plants growth and micro organisms in the soil. The most favorable range for the prosperity of the majority plants is from slightly acidic to slightly alkaline as plants may not be capable to tolerate the excess stress.

- Determines the extent of organic in the soil body. The degree of organic matter decomposition is slow under extremely acidic or alkaline soil condition due to the decrease in microbial activities.
- Plants vary in their tolerance levels to acidity and alkalinity. Therefore soil PH help in the selection of crops to be grown depending on their level of tolerance. For instance; if the soil is assessed acidic, the crops of sweet potatoes, groundnuts, millet, cotton and tea can be grown as they require acidic soils.
- Soil reaction affects the availability of plants nutrients e.g. nitrogen calcium, phosphorus and potassium are mostly available at PH range value from 6.5 to 7.5 as PH range favors a lot the decomposition of organic matter.
- Soil PH being an indicator of degree of acidity and alkalinity gives an estimate amount of amendments to be done to a soil so as to bring favorable condition for plants growth.

AMENDMENTS OF SOIL PH

The growth of plants and decomposition of materials in the soil body by micro organisms, largely depend on acidic or alkaline, does not pave a way for good plants growth or decomposition of material in soil body. It is therefore important for good methods to be taken to correct soil PH, if is too acidic or too alkaline.

The methods would be taken, depends on the prevailing PH condition.

LOWERING THE SOIL ACIDITY

Since soil acidity results from the scarcity of exchangeable captions, the best thing to be done is to add to the soil materials which contain **metallic captions.** The materials are known as limes and the process is called liming.

The common materials for liming are of oxides and carbonates of calcium and magnesium. When these substances added to the soil, they add the amount of the exchangeable bases as a result the soil acidity reduced.

ACIDIFICATION OF THE SOIL

If the soil is too alkaline, something has to be done to raise acidity. This can be done by using the methods of eradication and conversion.

- **Eradiction**. It is a process of removing the sodium salts and other basic oxides from the overlying soils by passing a lot of water to cause leaching.
- **Conversion.** It is a process of adding materials to the soil which may cause acidity as they react with the basic oxides. These materials can be of like **gypsum** and **sulphate.** As for example when sulpher added to the soil reacts with water to form sulphuric acid. Then the resultant sulphuric acid reacts with calcium carbonate to form water, carbon dioxide and sodium sulphate. The sodium sulphate is soluble then leached away easily.

2. LEACHING

Leaching is a washing out of materials more particularly the minerals in solution or suspension down wards the soil body when water is percolating.

The process is of most dominant in humid regions for most of time like that of equatorial and other wet tropical and temperate areas. Leaching process is influenced by the following factors:-

i) Size of Soil Particles:-

The size of the particles has relative influence to the coarseness and compactness of a soil. This then influence the leaching. Always the rate of leaching is higher to course

textured soil like sandy than fine textured soil like clay. The course textured soil as whose particles larger have larger pore spaces and allow free percolation of water.

ii) Climate:-

It is considerably to the occurrence of precipitation. Higher rains cause severe leaching as a lot of water supplied by rains may percolate.

iii) Slope:-

Leaching process is severe on flat topographical nature as water may remain stagnant for longer. It is unlike on sloped land over which water run freely causing little percolation.

iv) Vegetation

Plant covers block runoff of water and thus a lot may percolate into the soil to cause leaching.

EFFECT OF SOIL LEACHING:-

- Causes the decline of soil fertility due to the fact that most of the plant nutrients are washed away in solution from the plant roots zone. This causes the plants to get very little to absorb.
- Increases soil acidity as the exchangeable bases which would cause the soil be alkaline, leached away from the overlying soils.
- Influences soil colour. This occurs as the materials influencing the soil colour might be removed in water percolation down wards.
- Causes the occurrence of horizons in the soil body by the processes of eluviations and illuviation. Eluviations make the occurrence of a horizon as materials removed: while illuviation makes the B horizon as the materials accumulate.
- Decreases microbial activities due to the increase of soil acidity.
- Affects proper plant growth due to the increase of soil acidity, decrease of microbial activities and depletion of nutrients.

3. CATION EXCHANGE

It is a process in which the cations (positively charge particles) of like calcium (Ca) magnesium (Mg) potassium (K) and sodium (Na) replace hydrogen ions in the soil. Or Replacement of mineral materials between the parts of the soil.

The Cation exchange can be between soil particles and soil solution and plant roots. Usually the Cation exchange in the soil body is influenced by the following factors.

- Concentration of ions i.e. ions move from high concentration to low concentration.
- Reactivity of ions. More reactive ions usually displace less reactive ions.

4. SOIL COLLOIDS

These are minute substances, which when dissolved remain dispersed in liquid. They include both mineral based colloids and organic based colloids.

PROPERTIES OF SOIL COLLOIDS;

- They are negatively charged. This makes many positively charged ions called cations be attracted and adsorbed around each colloid particles.

- They exhibit ion exchange

  Ion exchange is a reversible process whereby cations or anions are exchanged between solid and solid or between solid and liquid phases.

5. SOIL NUTRIENTS:-

These are the chemical elements found in the soil which are essential for plants growth and the maintenance of the soil fertility.

The sources of nutrients in the soil include the following:-

- The weathering of rocks from which minerals derived.
- The decomposition of organic matters in the soil. As organic matters decomposed the minerals nutrients released into the soil from the broken tissues. The process for this is known as mineralization.
- Application of the artificial fertilizers to the soil.
- Rain water of rainfall may react with certain gases to from **nutrients.**

C. BIOLOGICAL SOIL PROPERTIES

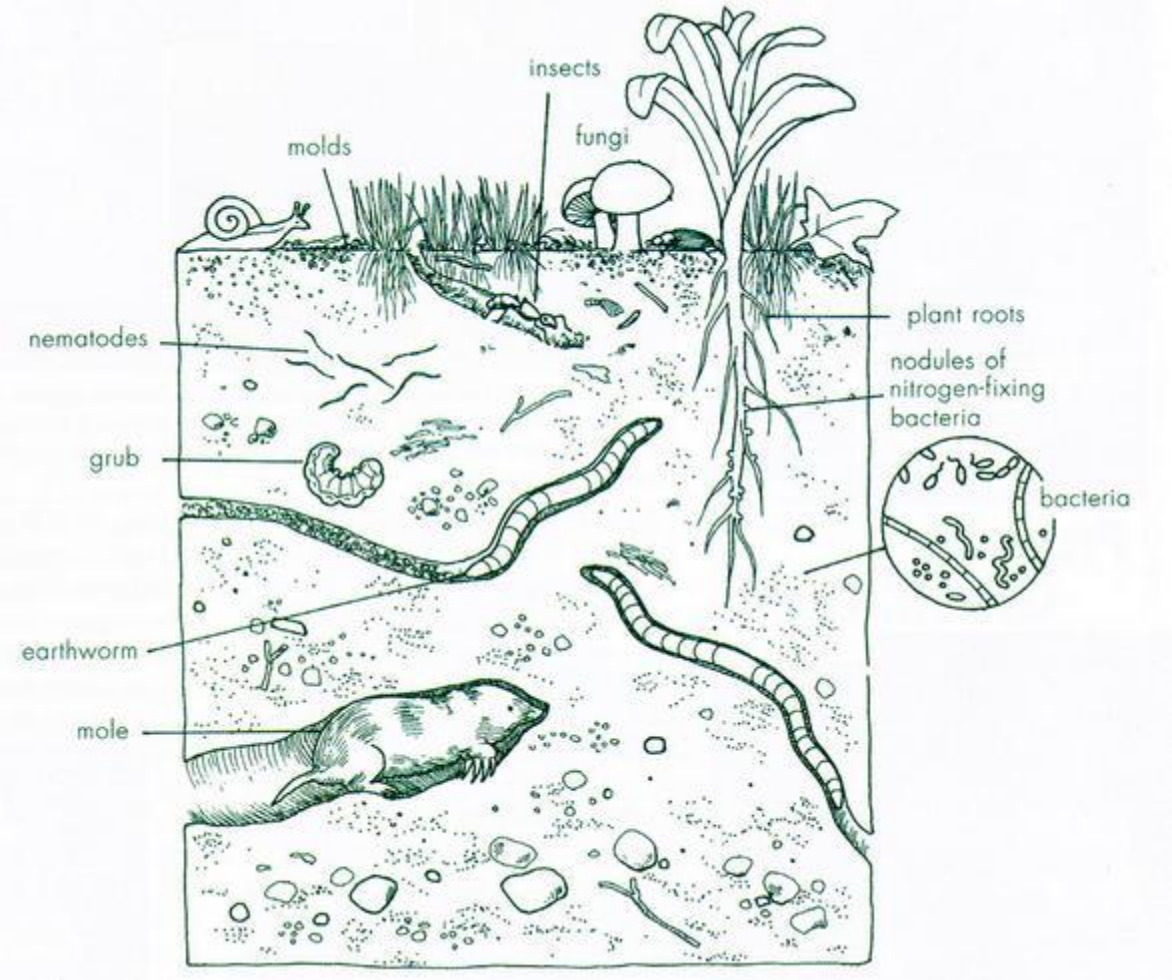
Biological soil properties widely include the following;

- Soil living organisms
- Organic matter

1. SOIL ORGANISMS

Soil body has habitable system which supports the life of organisms in the soil vary in size from smaller ones to larger ones and all these inhabitants find their food in the soil. They carry out a number of biochemical activities. The name of plant kingdom is known flora, while that of animal kingdom is known fauna.Both plants and animals are categorized into micro and macro-organisms depending on their varied size.Microorganisms include: **bacteria, algae, protozoa, fungi, virus, and eelworms: while macro organisms include; millipede, earth worms, tile, ants, slugs etc.**

Life in the soil an example below



IMPORTANCE OF MICROBIAL ACTIVITIES;

Microbial activities in the soil have the following potential significance.

- **Nutrients supply**. Microbial activities break down the tissues of died plants and animals to release mineral nutrients which were absorbed into their body. The process for mineral nutrients be supplied from died plant and animal tissues by being broken down due to microbial activities **is called mineralization**.

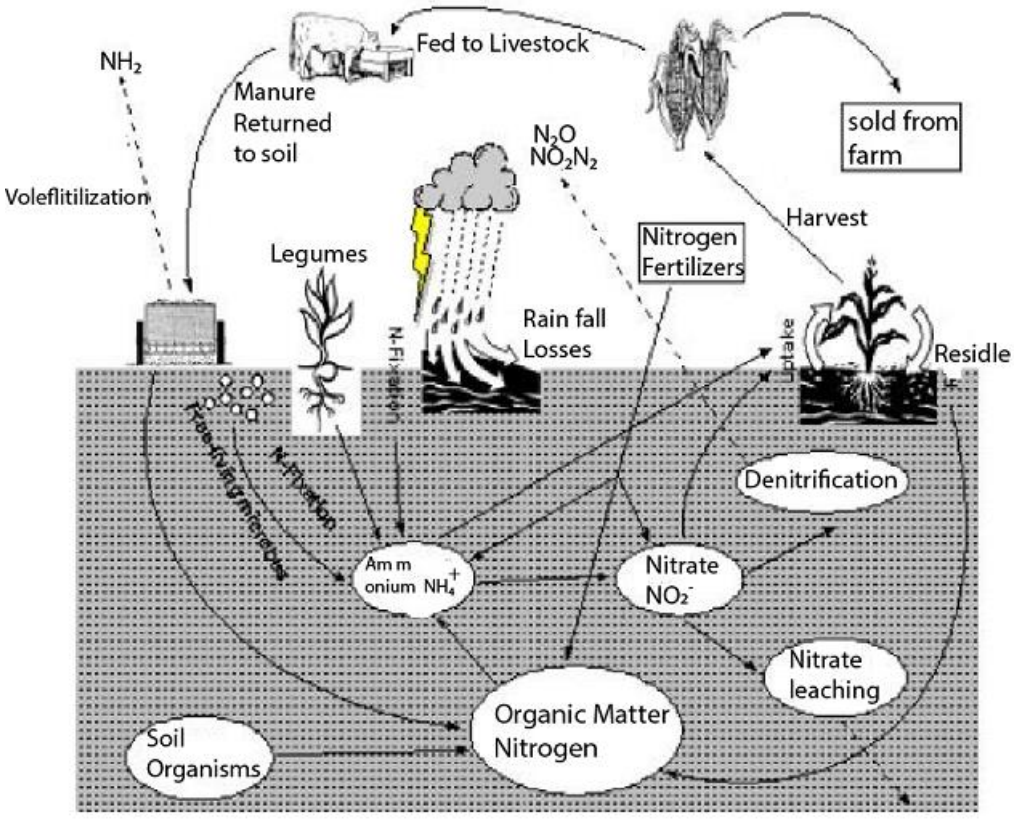
- **Nitrogen balances in the soil**, some organisms such as nitrogen bacteria, blue algae, have a lot of nitrogen in their bodies; with their presence in the soil body helps much to supply more nitrogen. The supplied nitrogen makes significant balance to the amount absorbed by plants.

- **Supply more organic matter by breaking down the residues**.

- **Improvement of soil structure**. The organic by products released in the process of organic materials, decomposition by micro organisms, help to bind soil particles together.

- **They make symbioses with higher organisms**. Some micro organisms live within plants and animal tissues and benefit their host with symbioses e.g. the legume bacteria which live in the tissues of legume plants supply more nitrogen to a plant by nitrogen fixation.

Nitrogen cycle example;



2. ORGANIC MATTERS

Organic matters refers to the remains of died plants and animals which have been fully or partially decomposed and mixed with soil.

SOURCES OF ORGANIC MATTERS

Organic matters present in a soil derived from the following origin sources.

a) Organic manures applied to a soil through the agronomical practices. Organic manures include

- **Compost manure**
- **Farm yard manure**

b) **Plant remains.** Plant remains of tree roots, shoots and grasses are important origin sources of organic matter in the soil.

c) Industrial waste products, industrial waste products if added to a soil, undergo rapid decomposition. But it is basically to organic industrial waste products.

d) Died animals, these normally undergo decomposition and mix with the soil mass.

FACTORS THAT INFLUENCE ORGANIC CONTENT IN THE SOIL;

The quantity of organic matter in the soil, and its rate of accumulation and decomposition are determined by numerous factors, and include the following;

i) The degree oh Aeration

The greater the soil aeration, the faster and more complete is the decomposition of organic materials

ii) Soil Moisture and Temperature

Combination of adequate moisture and reasonable temperature condition ranging from 20 $^{\circ}C$ to 29 $^{\circ}C$ favours a lot the decomposition of organic matters.

iii) Topography

Usually level soils are rich in organic matter content than those on sloppy land. In most cases, on sloppy land; much of organic matter content is lost by erosion, due to the action of the running agents like water and wind. Also organic matter may get lost by mass wasting as a result of the force of gravity. The depressed lands have high content of organic matter as in them, remain of plants readily accumulate.

iv) Fertility Status of the Soil

More organic content is to soil of high fertility degree and vice versa is true. This is because, a fertile soil supported greatly the growth of plants and then the plants release organic materials.

v) Soil Reaction

High organic matter content is to soils with PH ranging from slightly alkaline to slightly acidic due to the fact that, such the soil PH range supports greatly the microbial activities in the soil.

vi) Ecological System

It is considered on the nature of an area like that of grass land or forestland. For instance; in tropical region forest litter add more organic matter in the soil. It is the same in the temperate grassland; grasses add more organic matter in the soil.

IMPORTANCE OF ORGANIC MATTER IN SOIL

- Organic matter influence moisture in the soil. i.e. retain moisture in the soil body. This is by reducing evaporation and by limiting the rates of water percolation e.g. mulch mostly reduces the rate of evaporation.

- Organic matters help the process of soil aggregation to bind soil particles together. The remains of died organisms act as a glue to bind soil particles together to form aggregates. Hence organic matter mostly influences the building of soil structure.
- Organic matters reducing the plasticity of the soil.
- The remains of died organisms provide habitable environment for the life of the soil organisms.
- Add more plant nutrients to a soil body released from broken tissues of died plants for examples nitrogen sulphur, magnesium can be supplied.

2.3 SOILS CLASSIFICATION

Soil classification is a science or an art of grouping soils into different types according to specific properties and factors.

Or

It is a systematic categorization of soils based on distinguished characteristics as well as criteria that dictate their choices in use.

In classification soil, there are several criteria used such as texture, time, fertility, drainage, colour and orders. However; some of the systems have been employed by the pedologists to make soils classification. The most outstanding criteria include:

EMPIRICAL SYSTEMS:-

It is the system in which soil is classified according to their properties like; texture, colour, depth and other however; texture of soil mostly used.

Integrated classification systems:-

It is the system which considers all aspects related to soil development especially the factors which have influenced their varied characteristics. It potentially considers the orders of soils.

A. SOIL CLASSIFICATION ACCORDING TO TEXTURE:-

Classification of soil according to texture has been devised by engineers according to their consideration on soil nature that needed to sustain structures. The most common engineering classification system for soil in North America is known as **unified soil classification system (USCS)**

Soils according to textures considered on the relative size of the particles which greatly make the soil with respect to this soil are classified into the following types:-

I) SANDY SOILS:-

These are the soils whose particles are large in diameter ranging from 0.02 to 0.2mm. The soils which in a greater proportional contain larger particles, sandy have the following properties.

- Easy for being cultivated.
- well drained
- well aerated
- Vulnerable to erosion as particle loosely to one another.
- Contain limited amount of organic matter.

II) SILT SOILS:-

These are the soils of which over 70% contain the particles whose diameter size range from 0.002 to 0.02mm

Silt soils have the following properties.

- Retain more amount of moisture
- It is also vulnerable to erosion.
- It may cement in time of heavy rain

III) CLAY SOIL:-

These are the soils of the over 70% contain the particles whose diameter size are less than 0.002mm.

Clay soils are distinctive by having the following properties.

- Have high – level of nutrients and organic matter
- Difficult to plough.
- Prone to water logging
- Difficult for plant roots penetration
- Expand when wet and shrink when dry.

IV) LOAM SOILS:-

These are the soils which have 20% of clay to hold water, 40% of sand to prevent water logging and well aerated 40% of silt to act as adhesive holding sand and clay together.

B. SOIL CLASSIFICATION ACCORDING TO ORDER:-

Soil classification by order, it considers the outstanding factors which have determined the characteristics of soils. This has been devised by the USDA and put soils into different types by considering the most outstanding factors which influenced the nature and occurrence of soils.

World wide soils according to order grouped into the following types.

- Zonal soils
- Intrazonal soils.
- Azonal soils

I. ZONAL SOILS:-

Zonal soils are the ones whose characteristics have been principally influenced by climate than other factors and occur over wider areas with similar climate and vegetation patterns. These are also known as climatic soils.

Zonal soils have the following properties.

- They are matured enough in exception of the tundra soils.
- They result from maximum effect of climate and vegetation up on parent rocks.
- Had enough time to develop distinctive profiles and usually clear horizons
- They occur over a wider area under similar climatic condition.

Zonal soils broadly divided **into tropical, temperature and tundra soils.**

a. Tropical Soils

Tropical soils include the following:-

(i) **Ferralitic (Lato) soils:-**

These are soils with thin layers of humus result from the high annual temperature and rainfall in equatorial region and tropical eastern margin, where organic matters and bed rocks rapidly weathered chemically.

Lato soils have the following profound nature:-

- Whose parent materials almost completely decomposed
- Silica has been entirely removed (leached) from the top soil.
- Sesquioxides of iron and aluminum have accumulated in the soil as abundant and permanent residual materials.
- Humus is almost or entirely lacking because of rapid decomposition and leaching of organic matters.
- The soil is distinctively reddish because of the presence of iron sesquioxides.
- Have great depth due to rapid weathering of the underlying rocks.

(ii**) Ferruginous soil: -**

Ferruginous are also known as Lateric soils. They are zonal soils with thin dark –brown layer of humus found in regions of tropical continental and monsoon climate where rains occur seasonally. The nature of soil is made by the rapid decomposition and leaching of grasses and bed rocks in which silica easily removed and the sesquioxides of iron and aluminum left behind.

Ferruginous soil has the following profound nature.

- Like Lato soils, whose parent materials completely decomposed
- They tend to be soft, but once exposed wet and dry seasons, they can harden to form a cemented crust known as lateric.
- They are dark-brown colored.
- They have thin layer of humus.

(iii**) Desert soils**.

These are the alkaline thin grey colored soil lacking moisture and humus. They are unproductive and formed under dry climate

b.Temperature Soils

Temperate soils include the following:-

Podzols grey soils:-

They are grey acidic soils, occurring in areas of high latitude with cold climate and coniferous forest. The needle shaped leaves, of coniferous forest fall to the ground and leads to the acidity.

Brown earths soils (brown Podzols soils).

The soils are very rich in organic matter content and mostly found in regions of deciduous woodland of temperate cool climate. High organic matter content is derives from the accumulation and decay of leaves. They are much superior to the grey Podzols.

Grey brown Podzols.

The soils which are in transitional from grey Podzols to brown earth's soil. They are widely found in Western Europe.

Brown forest soils.

They are brown soils formed in areas of warm wet temperate climate with deciduous forest. The soil is produced as leaf litter rapidly decomposed and leached leaving behind sequoisides of iron and aluminum.

Chernozem soils.

These are also known as black earth's soil. They are rich in humus due to insufficient of rain to carry grass derived humus deeper. The soils are widely formed in areas of cool temperate continental climate with grasslands vegetation pattern. ie it is formed in area where the climate is moderately cool and moderately wet. Such soils are widely found in Eastern Canada where wheat is cultivated.

Prairies soils.

The soil is in transactional state between chernozems of sub humid warm temperate areas. The soils are dark brown. They are formed in area where the rains totals are moderately high.

Chestnut soils.

They are alkaline soils found in areas of arid and semi arid temperate climate. Alkalinity of the soil is caused by capillary action as the rate evaporation is greater than precipitation.

c.Tundra soils

These are the soil with little humus in areas of very cold climate throughout the year with tundra vegetation.

II. INTRAZONAL SOILS:-

These are the soils whose characteristics reflect the dominance of a single local factor such as parent rocks or extremely drainage. ie soils which develop in a particular environment irrespective of climatic conditions.

Intrazonal soils have the following profound characteristics.

- They are not related to general climatic control.
- They are not found in zones
- The soils occurred at a place where special material and relief condition have exerted strongly influence on soil formation and characteristics than the climate i.e. the characteristics of the soil depend much on the parent materials and relief condition.

Intrazonal soils include the following;

A) Calcareous (Calcimorphic) soil.

The soils which have developed up on limestone parent rocks i.e. soil formed from the accumulation of materials derived from disintegration of limestone rocks. They include the following;

Rendzina; This develops up on softer limestone rocks or chalks as the parent materials and grasses form surface vegetation.

Terra Rosa; It is a red colored soil found in areas of heavy seasonal reasons where calcium carbonate as parent materials chemically weathered by carbonation and silicates are leached out of the soil to leave a residue deposit rich in iron hydroxides.

B) Hydrormorphic soils

These are the soils formed in water logged areas like marshes and have constantly high water content. The soils formed in local areas of general level topography making high water accumulation. They include the following;

- Glei soil: Formed in saturated soils when the pore spaces become filled with water to the exclusion of air. The lack of oxygen leads to anaerobic condition.

- Peat: Occur where a soil is water logged and the climate is too cold for organism to break down vegetation completely as a result layers of peat accumulate.

(C) Halomorphic soils.

- These are the soils which contain high level of soluble salts because of being derived from rocks that contained much salt minerals and have developed through the process of Salinization. The soils widely occur in hot desert. Halomorphic soils include the following:-

- Solonchak soils: These have high salts accumulation on the surface.

- Solonetz soils: These have more salt accumulation in B- horizon.

III. AZONAL SOILS:-

These are the soil without well developed characteristics. They do not have a well developed soil profile and they are young soils. Most of these soils formed over steep slopes which do not offer enough time for the materials forming soil to become matured enough.

Azonal soils include the following:-

- Litho soils (stony soils)

- Rego soils- Including sandy dunes and gravely deposits

- Mountain soils which are mostly shallow
- Volcanic soils formed by lava deposition.

SOIL EROSION

Soil erosion is the wearing, detachment and removal of soil from one place to another by the action of running agents like water, wind and ice.

Or

Is the process by which the top soil is detached and carried away by various agents at a rate that is faster than it is being produced by the soil forming processes.

It is the detrimental process that causes the decline of land value and mostly results into low crop yield. It is one of the major global environmental problems affection agriculture and environment.

TYPES OF SOIL EROSION.

Soil erosion is classified according to its nature of occurrence, type of eroding agents and the appearance of the affected land. With respect to the varied consideration, soil erosion include the following types.

According to the nature of occurrence, soil erosion is broadly categorized into **geological and accelerated erosion**. While according to the nature of eroding agents it is divided into **wind and water erosion.**

Geological erosion

It is the erosion that takes place before the land has been cleared for any human activity like farming, mining and others. It is the smoothing downhill and counteracting great upheavals of the earth's crust caused mainly by the movement of water, ice and wind.

Accelerated erosion.

It is type of erosion according to nature of occurrence which results by being aided through human activities of like deforestation, overgrazing and mining all of which weaken the stability of materials and pave a way for the running agents to operate fully.

Wind erosion

It is the removal of top soil mainly caused by the blow of wind in dry areas in which, the dry unconsolidated materials are easily removed by wind force.

Water erosion.

It is the removal of materials by the water action it is sub divided according to the appearance of the affected land and includes the following diverse forms.

i) **Splash erosion: -** It is the type of erosion, by which the fine textured soil are easily dislodged by the impact of raindrops. The erosion is more significant to bare land than the soil protected with vegetation.

ii) **Sheet erosion:-** The type of erosion involves the uniform removal of the upper layer of the earth's surface. Such erosion occurs after the beating action of raindrops combining with the surface flow rainwater.

iii) **Rill erosion:-** It is the type of erosion by water action which causes the land to be developed with small channels called rills formed by high, concentration of the surface flow of rain water i.e. The erosion occurs because run off is faster:

iv) **Gully erosion: -** Gully erosion is the continuation of rill erosion. As the volume of water runoff increases, the rills change into gullies by being more widened and deepened

FACTORS INFLUENCING SOIL EROSION:-

The nature and rate of erosion is largely influenced by the following factor

NATURAL FACTORS

1. Climate

Climate influences erosion through precipitation and wind.

-Precipitation of rain and snow is forceful factor causing soil erosion through splash, sheet, rill and gullies. Heavy down pour of rains, causes severe soil erosion compared to slow drizzles. This is very common in humid areas.

-The blow of winds causes the removal of soil by deflation, abrasion and attrition processes especially in dry areas.

2. Ground covers

Ground covers of vegetation (grasses and forests) retard soil erosion in a number of ways as proved to provide protection of soil than the cultivated crops.

-Ground covers vegetation reduces the impacts of rain drops and water surface runoff.

-The vegetation of big trees acts as windbreakers.

Hence the hazard of soil erosion is minimum to soil protected with vegetation and very severe to soils less protected with vegetation cover.

3. Topography

It is considered on the degree of slope steepness of the land. The slope of land affects the extent and the rate of soil erosion particularly by the action of runoff water. The greater the slope, the greater velocity of flowing water. Therefore soil erosion is more severe to steep sloped land compared to gentle sloped land by water action.

4. Soil characteristics (nature)

Soil characteristics such as texture, structure, organic matter content and others, influence soil erosion. For instance soil erosion is more severe to course textured soils, than the fine textured soils. It is so because the course textured soils whose particles lie so loosely to one another and

more susceptible to be removed by the running agents.

MAN MADE FACTORS

Overgrazing

Overgrazing is a practice of keeping large number of animals than the range land carrying capacity. This causes severe destruction of vegetation and exposes the soil to the hazard of erosion.

Monoculture

The practice of growing a single crop continuously is referred to as monoculture. The growth of the same crop over a number of years increases the hazard of soil it is therefore, advised to practice crops rotation.

Burning

Some people have the tendency of burning vegetation for several reasons. The practices of burning vegetation expose a soil to the hazard of erosion.

Deforestation

It is practice of removing the trees without replacement. Vegetation provides considerable protection to soil against erosion in the following ways.

- The leaf cover helps to reduce the force of raindrops which would otherwise loosen and remove soil particles if their force not checked.
- The rate of infiltration of rain water into the soil is increased by plant covers and thus, reduces (decreases) runoff water.
- The plant roots hold the soil more firmly.
- Plant covers act as winder breakers to block the force of wind flow.

- Reduce the impact of raindrops that would cause splash erosion.
- The decayed vegetative matters provide humus which binds the soil particles together.

Hence; if the forests depleted the potential significance offered cannot be realized as a result, brings about the problem of soil erosion.

GROWING OF CROPS IN AREAS THAT RECEIVE LITTLE RAINFALL

If people cultivate crops in areas that receive little rainfall, after harvest the field is not likely to be covered with vegetation and gets more exposed to erosion hazard. Therefore it is advised to practice irrigation farming in areas that receive little rains.

PLOUGHING TO FOLLOW THE SLOPE

This practice accelerates much soil erosion to occur because soil erosion hazard is more severe on sloped land. It is therefore advised to practice contour farming on sloped potential agricultural land.

MINING

Mining activities also expose the soil to a danger of being eroded in a number of ways and some include the following.

- It is associated with removals of ground covers.
- It weakens the earth's materials and makes them easily removed by the running agents.

ENGINEERING WORKS

Engineering works of like roads construction also weaken the stability of the earth's materials and pave a considerable way for erosion to take place.

EFFECTS OF SOIL EROSION:-

i) Loss of soil fertility:-

The top soil is most productive part as it contains over 90% of plant nutrient such as phosphorus, nitrogen etc. the subsoil is infertile. Therefore, soil erosion removes the most productive.

ii) **Low crop yields:-**

With the loss of soil fertility causes low crop yield. This results as the soil is with little moisture, nutrients and air to support reasonable growth of plants.

iii) **Shallow soils.**

The pedological phenomenon causes the eroded land to have sallow soil as a lot of the top soil washed away.

iv) **Decrease forestland.**

Soil left behind is thin and cannot hold plants firmly in the ground. The plants are easily uprooted and blown away by wind.

v) **Destruction of houses:-**

Erosion may cause destruction of houses and other structures this happen when the soil around them is eroded and thus weakening their foundations.

vi) **Difficult to cultivate the land: -**

Gully erosion renders the land to be cultivated. Deep gullies prevent the movement of farm machines something which causes great inconveniences and less efficiency in farm operation.

vii) **Hinders navigation:-**

Soil erosion proved to hinder navigation. The eroded soils and other materials may be deposited into streams, harbors lakes etc and reduce their depth. Hence the mentioned likely to have shallow water something which is not convenient for navigation.

viii) **Floods:-**

Soil erosion increases the hazard of flood as the eroded materials deposited into streams.

ix) Water borne diseases.

Soil erosion causes the water borne diseases to occur after stored water in the reservoirs to be contaminated with the harmful materials that have been deposited into them by stream water.

CONTROL OF SOIL EROSION

Erosion seriously affects soil productivity and the land value. Therefore it is important that good methods of conserving the soil to be introduced. The main methods of controlling soil erosion include the following

- Crop rotation
- Contour farming
- Terracing.
- Planting trees and grasses
- Mulching
- Hill side ditching
- Cover cropping
- Green manuring
- Controlled grazing.

2.4 SOIL FERTILITY

Soil fertility refers to the ability of a soil to support the growth of plants by supplying all plant nutrients, water and air in a sufficient and balanced ratio. The soil that supports the growth of plants by having nutrients, water and air is described as **fertile soil**.

FACTORS INFLUENCING SOIL FERTILITY

Soils are considerably varied in the degree of fertility. Some are fertile enough, while others are less fertile. The variation in the degree of soil fertility is by certain factors which determine the sufficient supply of water, air and nutrients to be taken by the plants. The main factors include the following:-

SOIL TEXTURE

Soil texture bears importantly on soil fertility due to its influence on water and plant nutrients holding capacity and aeration. The fine textured soil as whose particles quite small and lie so closely, retain reasonably water and nutrients for plants. The course textured soils as whose particles large and lie loosely to one another, allow free percolation of water and the nutrients easily leached from the plant roots zone. For instance; sandy soil have good aeration, but mostly infertile because of being poor in water and nutrients holding capacity. Conversely to a clay soil which retains reasonably water, air and nutrients.

DEPTH OF THE SOIL PROFILE.

The depth of the soil profile determines the extent of plant roots penetration and more supply of nutrients, water and air. Deep soil increases the volume through which plant roots can spread to take water and nutrients. Therefore shallow soils are infertile because of being with little nutrients, water and air and suffer from drought very quickly.

THE POSITION OF GROUND WATER TABLE:-

High water table interfere the profile of the soil and thus results into poor drainage which causes exclusion of air from the soil. Hence plants lack air from the soil in exception of the plants that are adaptive to such edaphic condition.

SOIL STRUCTURE

Soil structure affects moisture and aeration in the soil body. Hence; it has similar significant role to soil texture.

SOIL REACTION

This bears importantly in influencing soil fertility as determines the rate of organic matter decomposition in the soil. Soil that is slightly acidic or slightly alkaline is more fertile because of having great extent of plant nutrients as organic matters greatly decomposed.

ORGANIC MATTER

Organic matter acts as a soil conditioner by influencing soil moisture, aeration and structure. Beside it is an important source of plant nutrients supply. It is thus, soils with a lot of nutrients are reasonably fertile.

The composition of parent materials:-

The composition of parent materials influences the natural supply of inorganic nutrients. The nutrients that released from the parent materials include; potassium, calcium and magnesium

2.5 LOSS OF SOIL FERTILITY:

The level of soil fertility may not remain the same all the time. It may decline because of some causal factors.

Soil degradation

Soil degradation refers to the deterioration or destruction of the quality of the soil.Soil degradation take place through the loss of fertility,pollution and erosion.

Soil degradation renders the soil useless for human development,agricultural activities.It is the result of human failure to understand and manage soil.

NOTE:

⇒Loss of soil fertility;- refers to the decline in the soil ability to support plant growth through the failure to provide necessary nutrients for plant growth.

⇒ Pollution of soil;- :refers to the introduction of any foreign material to the soil which due to either its chemical composition or quality affects the soil negatively.

⇒Soil erosion;- refers to the washing away of the top soil.

The most outstanding causal factors for a soil to lose its fertility or Soil degradation include the following

1. Soil erosion:

Soil erosion is a removal of the soil by the action of the running agents like water and wind. The process tends to wash away the top most part of the soil which contains over 90% of all plant nutrients. What remains is the infertile subsoil.

2. Leaching:-

It is a process by which nutrients are dissolved and they carried down wards in solution away from the plants roots zone through soil profile. When this happens plants fail to get sufficient nutrients as their roots do not reach to the sub soils

3. Water logging:-

This occurs when all the pore space in the soil, filled up with water. This causes air to be driven out as a result, plant fail to get sufficient air from the soil land eventually die.

4. Flooding:-

This causes the nutrients to be carried away in water. It is so severe on a sloped land

5. Burning:-

The practice of burning vegetation kills the soil living organisms which are very important to cause the decomposition of organic matters. More importantly, burning exposes the soil to the hazard of soil erosion. In addition to this, the nutrients present in vegetation are destroyed and only and few remains in which can be easily removed.

6. Weeding

It is a practice of removing the unwanted plants (weeds) from the field when this is done all nutrients that have been taken by them from the soil lost in weeds as thrown away.

7. Harvesting

It is a removal of crops from the field after maturity. It plays the same role to that of weeding as far as the issue of soil fertility loose is concerned.

8. Mass Wasting

Mass wasting causes the top soil layer to be washed down the slope in response to the force of the gravity making the subsoil exposed out. This is also causes a soil to loose its fertility so long the exposed sub soil has very little materials necessary for plants growth.

EFFECTS OF SOIL DEGRADATION

Soil degradation may have a great effect ranging from an individual to the entire country such effects include;

threat on marginal areas: Soil degradation may prompt people to encroach on the marginal areas like forests wetland.This is because such areas maybe believed to be more fertile compared to the degraded areas.On the other hand it will create antagonism between the environmentalists and the encroachers.

Lower productivity:Since degradation deprives the soil of the fertility ,the crops grown can not get sufficient nutrients.Therefore further agricultural practices yield less output discouraging the farmer s.For instance the northern regions of south Africa are part of dry climate zone from where maize has proved to be unprofitable.This may have a multiple effect like decline of agro-based economics.According to the skeptical Environmentalist Bjorn Lombrg (2001 Damm,2002),Soil degradation in form of soil erosion was under mining the productivity of approximately 35%of all cropland in the United states.

High costs of agriculture: Soil degradation compels farmers to use more input like fertilizers in order to have more yields.This is done to enhance the yield level of agriculture.for that case

therefore agriculture becomes more expensive for the local farmer.

Land conflict :Most of the developing countries depend on land as are source such that it is regarded to be more valuable.Therefore any encroachment on one's land land made may spark off a conflict.

Down Stream flooding : In cases where degradation is associated to erosion degradation in water quality may be one of the most propable effect .This can be brought about by sedimentation in river,lakes and siltation of reservoirs as surface run-off dispose off the load to the nearby water bodies.This may eventually induce flooding.

Slump of economy:Soil Degradation slumps the agro-based economies since their export will decline due to the deficit int he output.

Over Cultivation of the available land: Soil degradation will prompt the over cultivation of the prevailing fertile areas which will later affect them negatively.

Terrestrial Biodiversity:Since all plants depend on soil,the distortion in the quality of soil will automatic affect the quality of the resulting vegetation.Therefore given that vegetation is a habitat as well as a vital component of the food chain effect a full ecosystem will be affected negatively in case of any tamper with vegetation.

METHODS OF MAINTAINING SOIL FERTILITY

Soil fertility is not constant with time due to some influencing factors. To maintain steady use of soil it is most appropriate if the fertility of a soil is maintained .There are four broad methods which may help to maintain soil fertility. These include the following:

- •The use of agronomical practices
- • Addition of materials containing organic matters

- Addition of inorganic measures (artificial fertilizers)
- The control of soil erosion

THE USE OF AGRONOMIC PRACTICES:

The farmer can improve and maintain the fertility of soil by adopting good farming methods. Usually agronomic practices maintaining reasonable level of organic matter in the soil

The main agronomical practices include:

CROP ROTATION

It is a practice of growing different types of crops in different seasons. The practice helps the maintenance of nutrients to be exchanged in the soil as mostly, the shallow rooted crops are rooted crops throughout the year. More importantly if the nitrogen bearing crops are involved, the nitrogen supply is maintained.

MULCHING

It is a practice of covering the soil with the vegetative materials.

The vegetative material used to cover the soil is called mulch. Mulching helps to add organic matter in the soil. Alongside this mulching provides a protection to a soil from the hazard of erosion by the eroding agents of water, wind and others.

GREEN MANURING

Green manuring is a practices where by a crop is grown on a piece of land then incorporated into the soil while it is still green and tender. In most cases legumes are used for this purpose. Green manuring also helps to increase organic matter content. More importantly, supply a lot of nitrogen in the soil.

COVER CROPPING

It is a practices which involves the use or growing of cover crops. Crop is the one that grown in the empty spaces between the rows of plants specifically to cover the spaces. In most cases the legumes are used for this purpose such as beans and cow beans. Cover crops help much to maintain soil moisture and organic matter content.

ADDITION OF MATERIALS CONTAINING ORGANIC MATTER

Materials containing organic matter are **called organic manures**. When such substances are added to soil, the organic matter content is improved. Also organic manures add more plant nutrients.

Organic manures include the following:

- Farm yard manures. Manures made of animals dung such as cattle and goats.
- Compost manure. The manure made from mixture of many things and supplied to the field. This also helps to add more nutrients.

Addition of inorganic manures In organic are also known as artificial fertilizers. If inorganic manures added to soil, help to add more plant nutrients. Inorganic manures include the following;

- Ø Sulphate of Ammonia (NH_4)SO4.
- Ø Ammonium sulphate nitrate.
- Ø Calcium ammonium nitrate.
- Ø Urea.
- Ø NPK

2.6 SOIL CONSERVATION AND MANAGEMENT

Soil conservation is a positive strategy of maintenance, enhancement and wise management of soil from being naturally or culturally depleted through the adaptation of both curative and preventive measures.

Or

v The measures that are taken to protect the soil from destruction.

Or

The process of controlling the processes and activities that would cause deterioration of the soil depending on the condition of the soil.

Soil conservation entails the proper utilization of a soil resource by adopting sound management practices aimed at controlling any apparent depletion by agents of erosion to achieve sustainable development. i.e. to maintain maximum productivity for the present and future development.

Mostly, soil conservation is practiced so as to prevent the occurrence of soil erosion and the maintenance of soil fertility.

SOIL CONSERVATION TECHNIQUES;

1. CROP ROTATION;

Crop rotation is a practice of growing a different type of crop on each piece of land each year or each growing season. This is done in a cycle so that after several years, the circle is repeated.

PRINCIPLES OF PRACTICING CROP ROTATION

· A crop of different kind should be grown in each plot during each year or growing season e.g. legume should be rotated with non – legume crop

- Shallow rooted crop should be rotated with the deep rooted crop.
- Crops which included in the programmed should be of different families.
- Valuable crop should if possible, follow legumes in the programmer in order for it to have good harvest.
- A follow period can be included in the rotation for instance grasses can be grown on it.
- The programmed should involve only the annual crops.

SEASON1.

Cotton	Beans
Maize	Cassava

SEASON2.

Maize	Cotton
Cassava	Beans

SEASON3.

Cassava	Maize
Beans	Cotton

SEASON4.

Beans	Cassava
Cotton	Maize

SEASON5.

Cotton	Beans

Maize	Cassava

ADVANTAGES OF CROP ROTATION.

The system of crop rotation offers the following agronomical advantages.

- The land is protected from being eroded by any agent. This is because a wide range of crops is grown and therefore land is not left bare in any season.

- Helps to maintain soil fertility. This is because the system involves the growing of the nitrogen bearing crops and more importantly, the shallow rooted crops are rotated with, the deep rooted crops something which offer a reasonable exchange of plant nutrients.

- Crop rotation is a good way of controlling weeds. Some weeds grow more easily when a certain crop is cultivated, and therefore, if a different crop is grown, such a weed is difficult to grow.

- Crop rotation is a good way of controlling plant pests and diseases. Usually similar diseases and pests attack plants of the same family. But if a crop of different family is grown, pests and diseases may not attack it.

- Crop rotation provides a diversification of crops something which is of more advantageous commercially.

§ Some plants take a lot of nutrients from the soil and are called heavy feeders. While others take in only a little amount of nutrients and are called light feeders by rotating such crops on the field the level of nutrients in the soil is maintained at a reasonable level.

2. CONTOUR FARMING.

Contour farming is a system of cultivation in which planting, ploughing and other practices of related done in ridges or rows across a slope from the top to the bottom following the system of contours.

With the contour ridges made across a slope offers the following advantages.

ü Helps much to check the speed of runoff water and thus reduces the hazards of erosion.

ü Soil moisture is retained in the furrows between the ridges and got absorbed by the plants.

ü The practice is general improved much the soil condition which in turn gives to high productivity.

The practice has a disadvantage of involving heavy work in making the ridges across the slope from the top to the bottom.

3. TERRACING.

v Terracing is a practice of making terraces across a slope. A terrace is an embankment of earth's stones or any suitable materials or combination of these made across a slope for a purpose of controlling runoff.

The system has advantages of checking soil wash out.

It has also disadvantages of involving heavy work in making the terraces.

4. MULCHING.

o Mulching is the process of covering the soil particularly the cultivated ground with vegetative litter (plant remains).The main vegetative materials commonly used includes; maize stalks, grasses, banana leaves and others.

o The practice is mainly used in the tree plantation, vegetable gardens, and pineapple plantations and others of strongly like.

Mulching being an agronomic practice for soil conservation offers the following advantages.

- Mulching helps to conserve moisture in the soil by reducing evaporation from the soil.
- Mulching helps to reduce loss of soil by erosion.
- When mulch rots add more organic matter in the soil.
- When a litter decomposes supply more plant nutrients in the soil and hence improve soil fertility.
- Improves soil structure.
- Helps to control weeds mulch suppress the weeds likely to grow.

Disadvantages (Problems of mulching)

v Heavy work is involved in carrying and spreading of the mulch.

v Mulching materials may uncertainly catch fire and leads to crops damage.

v If the soil is deficient in nitrogen most of the soil nitrogen is used by organisms which break down the mulching materials, hence the soil organisms compete with plants for nitrogen as a result the growing plants gets little of it.

v In order to get more mulch you need more land to grow them and it is so as some of the mulching materials are grown.

5. DESTOCKING.

Ø Destocking is the practice of reducing the number of livestock to be grazed to meet the range of the land carrying capacity. This is done because overgrazing has been one of the longstanding causal factors of soil degradation in areas where rain is only sufficient for the growth of pasture;

hence in order to alleviate the advance of soil erosion hazards it is mostly appropriate to control grazing.

6. AFFORESTATION AND REFORESTATION.

A forestation is a practice of planting trees in areas that had no vegetation while reforestation is a practice of growing trees to replace those which have been exploited.

The practice offers the following advantages.

v Prevent unnecessary floods that would occur after the clearance of forests

v Forests slow rate the clearance of runoff.

7. FERTILIZATION.

ü It is a practice of improving soil fertility by adding either organic or inorganic manures.

ü Fertilization helps an area to be occupied with good plant covers and in turn reduces the hazard of erosion which might be caused by the running agents.

Organics measure for fertilization purpose includes the following:

Farm yard manures: Manures made of animals dung such as cattle, goats, pigs as well as poultry

Compost manure: The manure made from mixture of many things and applied to the fail

ADVANTAGES OF ORGANIC MANURES

· They add more nitrogen and other elements from the broken tissues.

· They improve soil structures through the formation of humus.

· Assist the conversation of the organic matter

· Encourages, the microbial activities

THE LIMITATION OF THE ORGANIC MANURES

ü They have high content of organic matter and these gives difficult in storage and transport.

ü They do not have a well defined chemicals composition hence its nutrients content is not guaranteed.

ü The nutrients elements are not in a balanced ratio hence may not render high crop yield.

In organic manures for fertilization purposes include the following.

v Sulphate of ammonia

v Ammonium nitrate

v Urea

v Single super phosphates

v Potassium sulphate

v NPK

The use of the artificial fertilizers has the following limitations.

Ø Do not assist the conservation and build up of soil organic matters.

Ø Do not contribute to the improvement of soil structure.

Ø Do not encourage the microbial activities.

8. ADOPTATION OF IRRIGATION TECHNOLOGY.

Irrigation practices have many advantages to soil:

- Makes a soil to have enough moisture for most of time.
- Makes the land to be renewed with vegetation which in turn reduces the hazard of erosion.

9. COVER CROPING

Covers cropping is a practice of growing cover crops. A cover crop is the one that grown in the empty space between the rows of plants specifically to cover such space. In most cases the legumes are used for this purpose.

QUALITIES OF A GOOD COVER PLANTS (CROPS)

- It should not compete with the crops plants for nutrients, water, rooting space or light.
- It should be able to grow well even on poor soil.
- It should be drought resistance crop.

It should be not an alternate host of insects, pests or diseases causing organisms.

ADVANTAGES OF COVER CROPS

§ They protect the soil from evaporation and erosion and therefore improve the infiltration of water into the soil.

§ Covers crop help to control weeds i.e. they usually suppress the weeds likely to grow.

§ Because most covers are legumes, they help to improve the nitrogen content in the soil.

§ When they rot more organic matter is added to a soil.

PROBLEMS OF COVER CROPS

- Cover crops may compete with the plant crops for water especially during dry season. This makes the grown crop plants which are in a target to get insufficient water.

- They may act as alternate host of insects, pests and disease causing organisms.

- They may compete with the crop plants for nutrients and root spacing.

10. STRIP CROPPING.

· It is a practice of planting crops and trees in alternative strips parallel to one another. Usually different plants and crops are planted in each strip and them ripe at different time and harvested at varying interval.

· The practice prevents the entire field from being left bare at any time which would lead to sheet erosion or wind erosion.

11. FALLOWING

ü Fallowing is a practice of which the field is left to rest for some years after intensive use.

ü Is the process of cultivating the land for a period and then allowing it to stay idle without cultivation for a number of years

ü Fallow period helps the soil to restore its fertility during the period of rest. However the practice is only possible to regions where population density is not a problem i.e. It is largely practiced in regions of low population density.

12. GREEN MANURING.

Green manuring is a practice where by a crop is grown on a piece of land and then incorporated into the soil while it is still green and rotten. In most cases the legumes are used for this purpose.

QUALITIES OF GREEN MANURING CROPS

- It should be able to grow on poor soil.
- It should be a drought resistance crop.
- It should be able to grow quickly and produce large quantity of vegetative materials.

ADVANTAGES OF GREEN MANURING

-It helps to improve the fertility of the soil by improving the organic matters, nitrogen, and other elements into the soil.

-Roots of the green manuring crops absorb nutrients from the sub soil and bring them to the surface.

PROBLEM OF GREEN MANURING

If annual rainfall is low almost all the water is used up by the green manuring crops as the result the crops suffer from the shortage of water.

LAND CULTIVATION BEFORE RAIN SEASON.

The practice of ploughing the land before the rain season helps to check the effect of running water on the surface of soil. The rain water sinks into the soil when it has been already ploughed.

The practice offers the following advantages.

-Minimize the hazard of soil erosion

-Maintain soil moisture by preventing its loss through runoff.

14. HILLSIDE DITCHING.

It is a practice of making hill side ditches. A hillside ditch is a small ditch made with a gradient of a half to one percent, with the earth removed from the ditch placed on the lower side to form a bund or ridge. The ditches are usually 30 centimeters deep and are dug along the

contour line about 20 to 30 meters apart. Crops are grown on the strip of land between the ditches but not on the binds.

The technique offers the following advantages,

-It is good way for controlling erosion as a speed of water runoff is checked.

-It is also a good way of maintaining moisture for plants as water retained in the furrows between the bunds (ridges)The method has a disadvantage of involving heavy work in making the bunds.

15. INTER CROPPING :

This is because certain crops and plants especially leguminous species such as peas,beans which are capable of fixing atmospheric nitrogen to soil,thus improving its quality.

16. AGRO-FORESTRY:

Whereby trees are planted within a farm to act as windbreaker and shelter belts.This reduces the risk of wind erosion as soil will be protected and the strength of wind will be minimized.

17. GOVERNMENT POLICY:

The government should formulate policies which advocate community participation,proper use of land,induce following of the restrictions.

SPACE DYNAMIC

WEATHER AND CLIMATE

(a) Difference between weather and climate

There is a slight difference between weather and climate. Weather refers to as the actual state of atmosphere and climate refers to the average state of atmosphere.

By definition:

Weather is the condition of the atmosphere with regard to its elements for a certain place and at specific moment. It is the daily atmospheric condition of a place at particular time. It is the condition of being hot, windy, cold, foggy, or cloudy. Weather changes from time to time and from place to place. The condition of the atmosphere is determined by the elements of weather which are:

- Temperature
- Humidity
- Atmospheric pressure
- Clouds
- Precipitation and
- Winds

Climate is the average atmospheric condition over a long period of time over 30 to 40 years within a specific geographical area.

Factors that influence weather and climate

Weather and climate are influenced by the factors like;

-Temperature
-Precipitation
-Humidity
-Pressure
-Winds
-Cloud cover
-Sunshine
-Altitude and
-Ocean currents.

Measuring and recording the elements of weather and climate is done at a weather station.

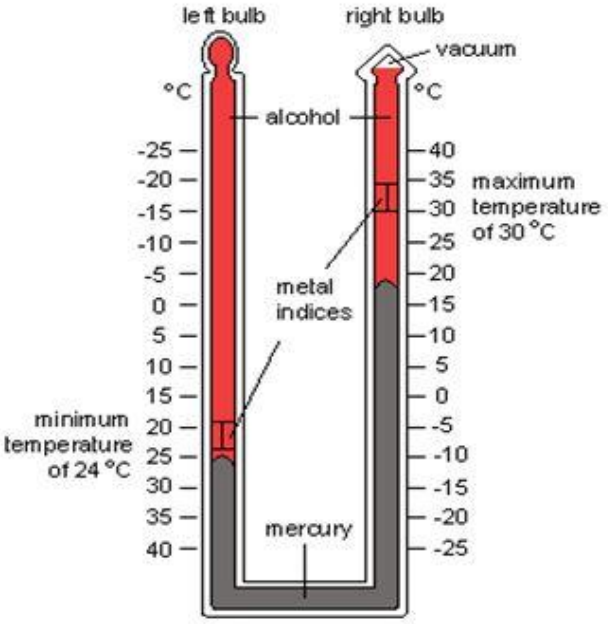
WEATHER STATION is a place that is set aside for the purpose of observing measuring and recording weather elements.

Element of weather

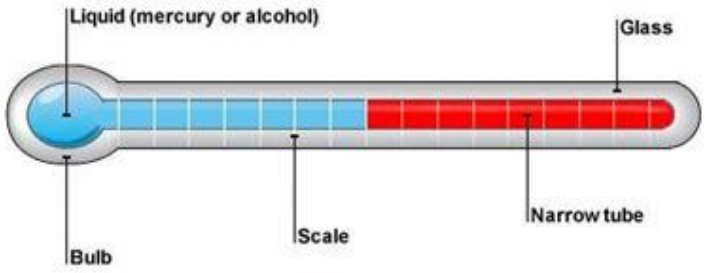
1. TEMPERATURE

Temperature is the degree of a heat of a body. It is a measure or degree of hotness of an object or place .Temperature is measured by an instrument called thermometer. The lines joining all places

with equal temperature are called isothems



Six's thermometer



Minimum thrmometer

RECORDING TEMPERATURE

1. The mean (or overage) daily temperature is obtained by adding the daily maximum and the daily minimum temperature and dividing the sum by two.

$$\frac{\text{max temperature} + \text{min temperature}}{2}$$

2. The daily range of temperature is obtained by substracting the daily maximum temperature by the daily minimum temperature which is,
daily max temp – daily minimum temperature

3. The mean (or average) monthly temperature is obtained by dividing the sum of daily mean temperature of a month by the number of days in that particular month

4. The monthly range of temperature is obtained by subtracting the lowest daily temperature of a month from the highest mean daily temperature of that particular month.

5. The mean(or average) annual temperature is obtained by dividing the sum of the monthly mean temperatures of the particular year by 12.

6. The mean annual range of temperature is obtained by substracting the lowest mean monthly temperature of a year from the highest mean monthy temperature of that same year.

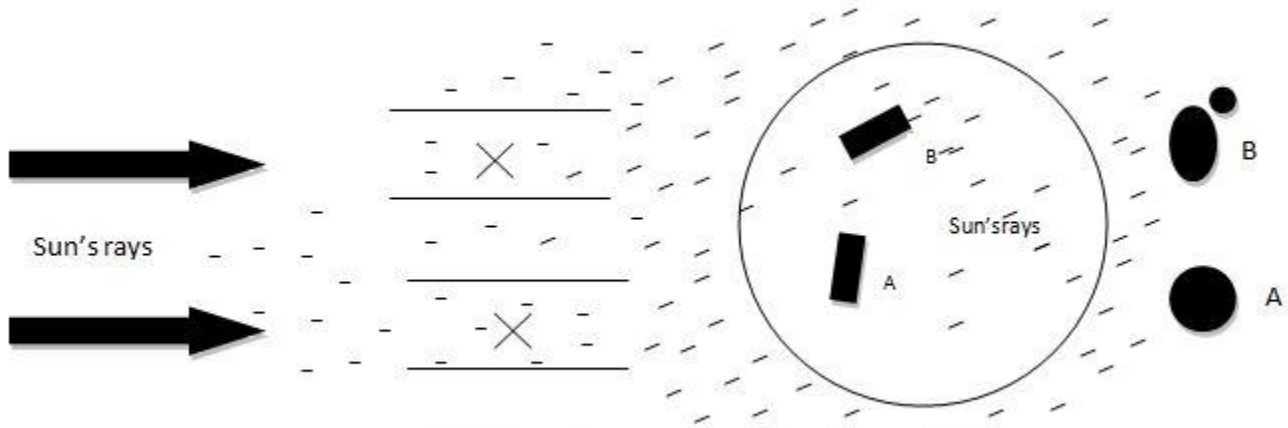
FACTORS AFFECTING INSOLATION OR TEMPERATURE OF A PLACE

Factors that influence the amount of insolation received any point and therefore its radiation balance and heat budget vary considerably over time and space.They include the following.

(a) Seasons and angle of incidence

The earth as a planet moves along its orbit throughout the year under this movement inclination of the earth varies and the angle of which the sun rays strikes the earth's surface changes with seasons.

Also the distance of the earth from the sun varies from month to month.At spring and autumn equinoxes.(21th March and 23rd September) the angle of incidence at the equator is 90^{o} making an area to have high temperature throughout the year.Temperature is distributed equally in both hemispheres.At the summer and winter solsctice (21th June and 22nd December) due to earth tilting the sun is overhead at the tropics where the hemisphere experience summer will receive maximum insolation.The angle of incidence is the most important factor which influences the amount of insolation of a place on the earth's surface.



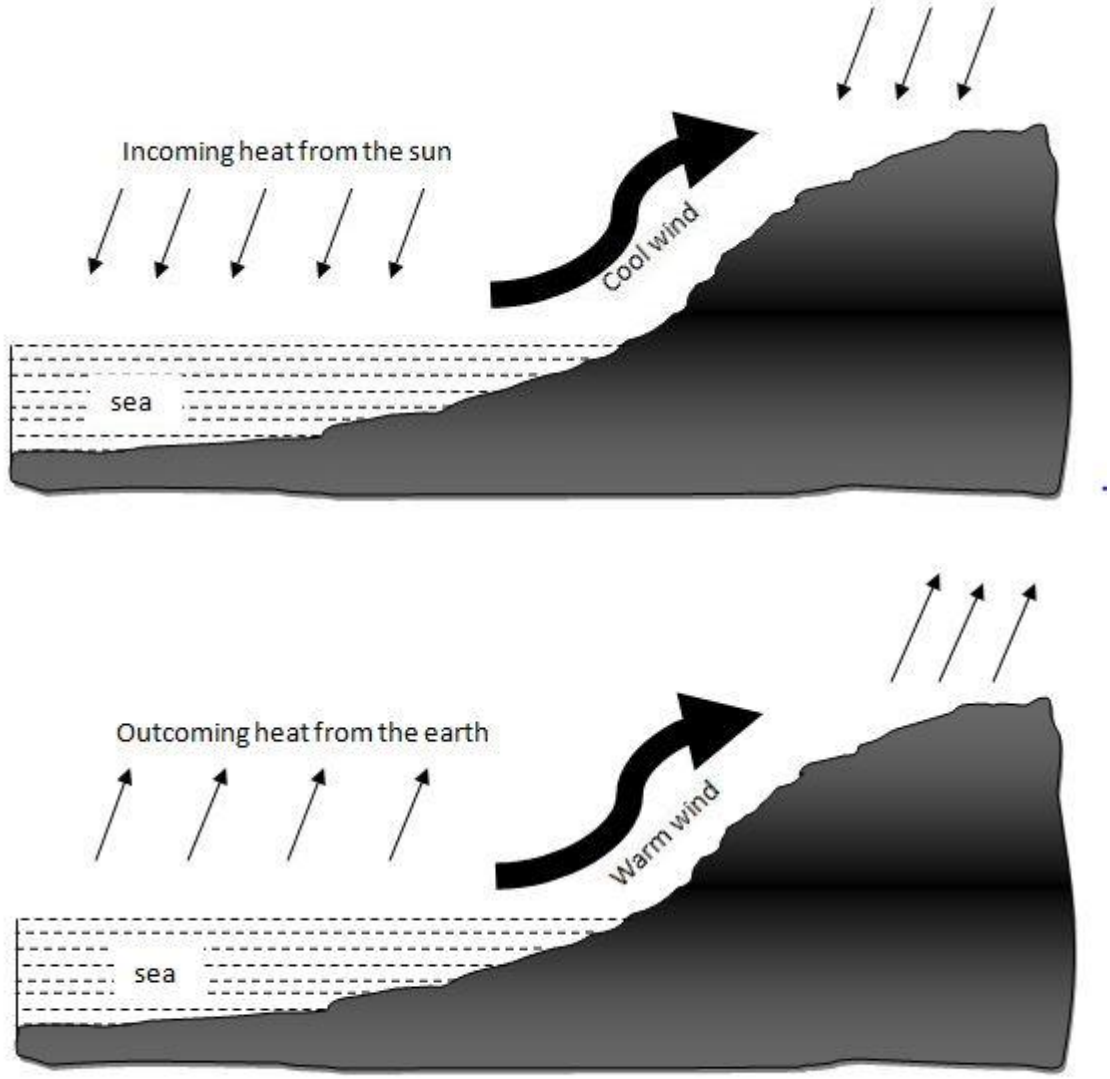
Point A receives more insulations than point B

(b)Distance from the sea

There is often a considerable differences between temperature of land and water surface. The reason for this is that land surface heats and cool more slowly than the sea.

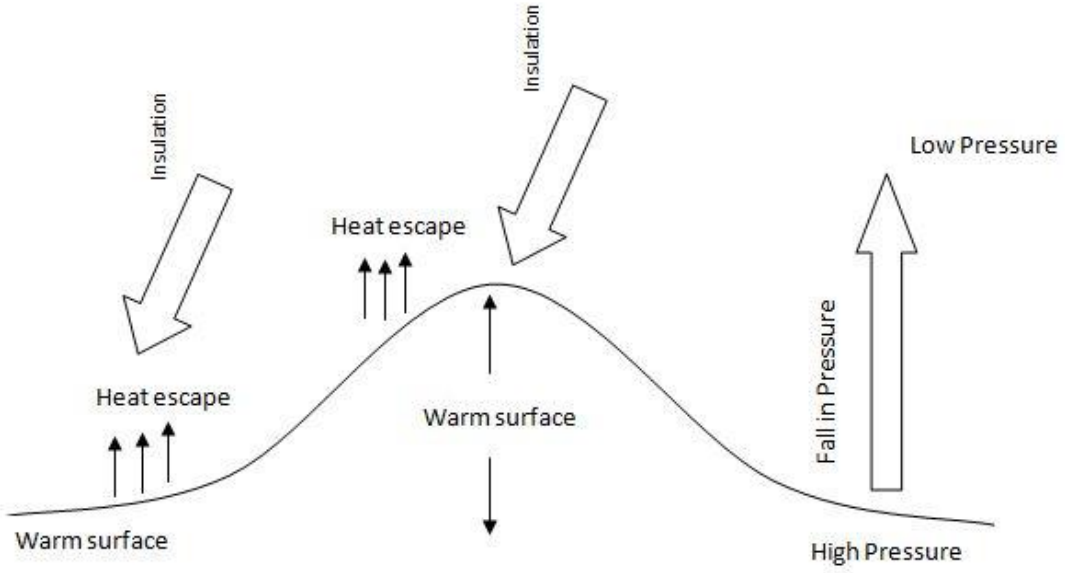
Due to this summer temperature in coastal areas are lower than in continental interior. Likewise winter temperature will be higher in coastal areas than in continental interior if the winds blow towards the shore

During the day and during night the situation is related to land and sea breeze. Areas whose temperatures are greatly affected by the sea are reffered to as maritime .The greater distance from the sea the colder the winter it will be and the warmer the summer develops.



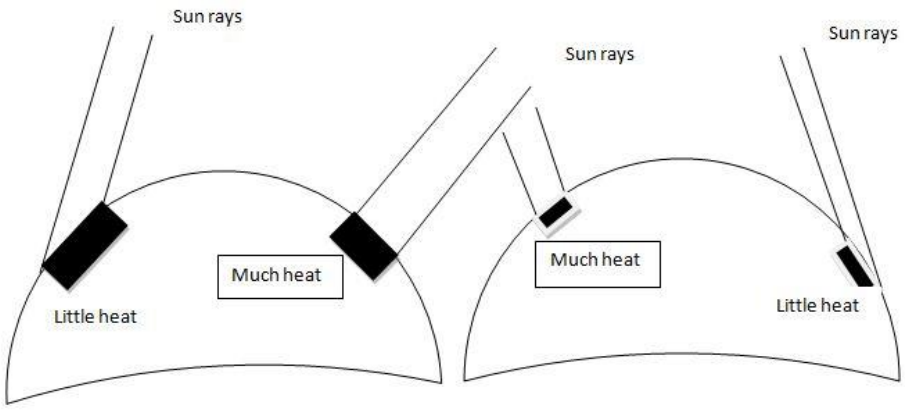
(c)Altitude

The rate at which temperature decreases with increasing altitude is called lapse rate. Normally air temperature decreases with increasing height at a rate of 0.6ºc R.r 100 meters.This is because when earth surface is heated it passes its heat on air making atmosphere being heated from below and not directly from the sun.This affect temperature because the higher you go the cooler it becomes. Altitude explains why highlands in the tropics are ever cold e.g Mt. Kilimanjaro in Tanzania.



(d) Aspect

This refers to the direction in which a slope falls.Some slopes are exposed to the sun than others.The atmosphere of the north facing slopes of highlands in the northern hemisphere also called ubac are cooler than the slopes facing south adret.The same thing appears in the southern hemisphere

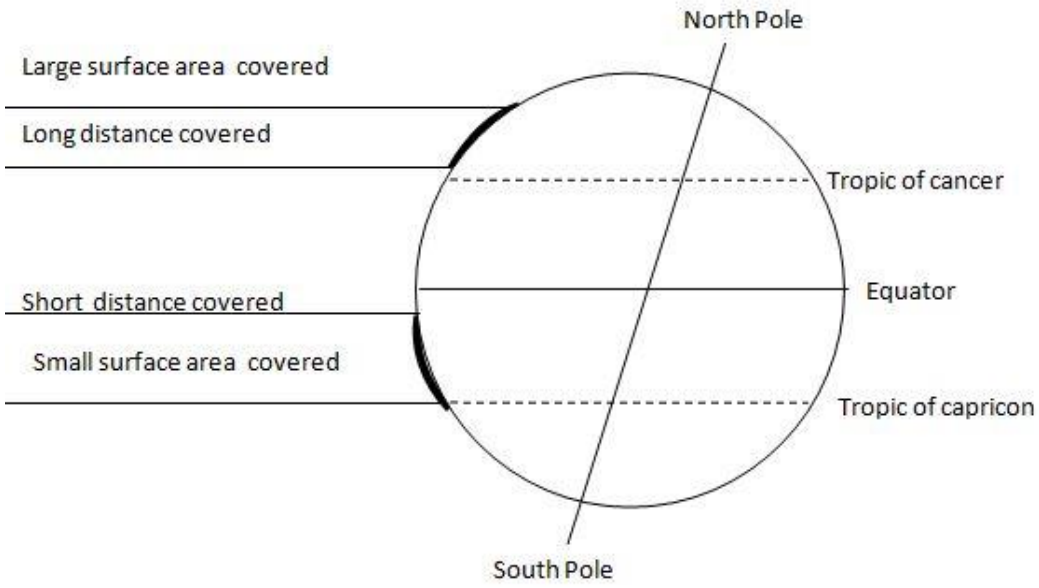


(e) Latitude

It is the angular distance from the equator to the poles. It determines both the length of day throughout the year and the intensity and possible duration of sunlight received.

As one moves pole wards from the equator he experiences gradual progressive decrease in temperature. This is because the sun strikes the equator more intensity than it does in the poles two observations can explain this phenomenon.
(i)At the equator the beam of light strike the earth's surface covering a smaller surface area than in the poles where the same beam of light covers a larger surface area.

(ii)At the equator the beam of light strike travels a short distance hence experiencing less atmospheric effects like absorption reflection and scattering.At the poles the beam of light travels a longer distance and it experiences more effects in the atmosphere.



(f) Cloud cover

The atmosphere of areas covered with heavy clouds is cooler than that of areas with clear skies.This is because clouds prevent insolation to reach sand sea surface.

(g) Length of day and night

Insolation is only received during day light hours and reaches its peak at noon .The longer the period of solar insolation the greater the quantity of radiation received at a given place on the earth's surface.There are no seasonal variations at the equator where days and nights are of equal length throughout the year.In contrast polar regions receive no insolation during part of winter when there is continuous darkness but may received up to 24 hours of insolation during parts of the summer when the sun never sinks below the horizon .This occurs in the lands of the midnight sun

(f) Prevailing winds.

Temperature of the wind is affected by the temperature of it's area of origin and of the surface over which it blows normal winds blowing from the sea during winter warms the atmosphere of the land near the sea while winds blowing from the sea during summer cools the atmosphere of the coast

(g)Ocean currents
Warm ocean currents carry warm water pole wards and rise the air temperature of the maritime environments where they follow while cold ocean currents carry cold water to the equator and so lower the temperature of the coast areas.

Factors affecting the flow of ocean Currents

Ocean currents – this is the horizontal movement of mass water in a defined direction .The movement is due to density variation at various depths governent by the temperature and salinity .The meeting of two currents converging upon one another causes sinking of water which counter balances with ascending masses.

- Salinity differences

Density of ocean water is caused by amount of salts the more salt in an ocean the denser the water will be.Denser water sinks in water with low density which causes the formation of ocean currents.

- Temperature

Temperature causes differences in water density which causes ocean water to move. The cold water is denser than warm water, this tends to make polar cold water sink to the bottom then flow downwards towards the equator while the warmer less denser water at the tropic moves on the surface towards the poles .After being cooled it sinks again and moves towards the equator hence the ocean current.

- Prevailing winds

When wind blows over ocean surface it pushes water surface and forms the ocean current .Prevailing winds therefore cause the water to move to the direction they blowing to winds cause drift currents. An example of drift currents is the north Atlantic drift which is caused by the westerly winds in the Atlantic ocean.

- Rotation of the earth

This causes the current flow to be affected as they are deflected or pushed according to Ferrell's law. Ferrell's law slates that"Anything moving freely in the northern hemisphere will be deflected to its right while in the southern hemisphere it will be indirectly though the winds

where in the northern hemisphere ocean current are deflected to their right while in the southern hemisphere to their left ".

- Shape of landmasses

The flow of ocean water can also be directed by the landmass.The ocean currents are turned from their straight course by the shape of adjacent landmass or coast line.

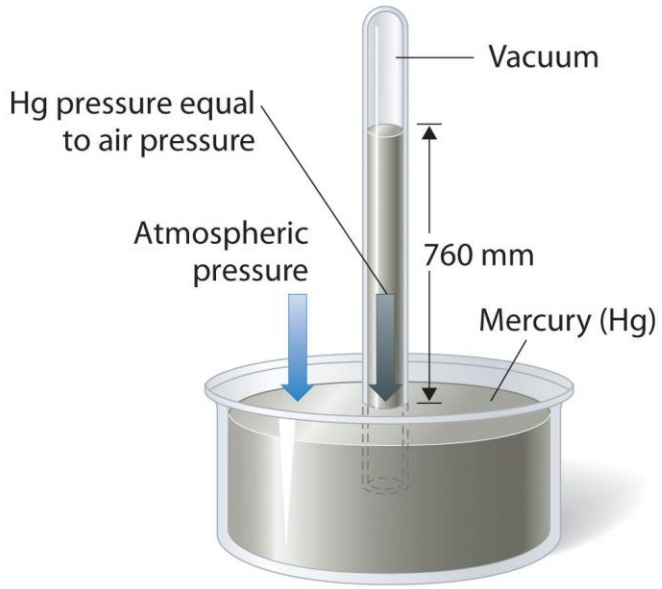
What is a temperature anomaly ?
The term temperature anomaly is used specifically to describe temperature differences from a mean .It shows the difference between the mean temperature of a place and the mean temperature of other places with the same latitude in the same month.
For example:An area which has a mean January temperature of 4ºc, which is 20ºc higher than the average for other location laying at 58 degree latitude north.such anomalies result primary from the ueven heating and cooling rates of land and sea and are intensified by the horizontal transfer of energy by ocean currents and prevailing winds.

2. ATMOSPHERIC PRESSURE

Air has weight and therefore it exerts the pressure called atmospheric pressure on the earth surface.Pressure varies with the temperature and altitude, and an instrument which measure pressure is called barometer.

There are two types of mercury barometer
(i)barometer
(ii)aneroid barometer

The lines which join all places with equal pressure are called bars.Thus pressure varies from one place to another it is not the same in one or all the regions.



FACTOR INFLUENCING VARIATION IN ATMOSPHERIC PRESSURE

- Temperature

As temperature decrease pressure rises at the same height due to low temperature cold air tend to sink, thus inducing high pressure to develop But as temperature increases hot air tends to rise making it possible for low pressure to develop over the area.

- Altitude

Usually pressure of the atmosphere decrease with increasing height. Pressure is therefore lower at the mountain top than at the sea level.This is because at the sea level air has to support a greater height than it does on the top of mountain.Thus there is less force or weight of air at the mountain top than at the sea level.

- Revoluation of the Earth

The earth revolution causes seasons where some seasons are warm while others are cold .Revolution of the earth affects the position of the low pressure belt i.e doldrum. Normally doldrum moves northwards and southwards of the equator depending on the seasons.

Earth rotation as a ball causes formation of subtropical high-pressure belt around 35º north and south of the equator where air sinks down and gets compressed .Due to this compression the sinking of air is heated up and rises again. The same situation takes place around circumpolar or temperature belt around 60º north and south of the equator.These are the areas where the warm subtropical air rises over the cold polar air expands and gets cooler.This situation result into Depression cyclonic or frontal.

PLANETARY PRESSURE BELTS

THE WORLD PRESSURE BELTS

These can be analyzed according to temperatures:

(i)Equatorial low pressure belt / equatorinally trough

This is called doldrum it is located around 5º north and south of the equator.The air here rises due to high temperature it is a wind a convergence zone. This means winds meet there and it is called intertropical convergence zone (ITCZ)

(ii)Subtropic high pressure belt (Horse latitudes)

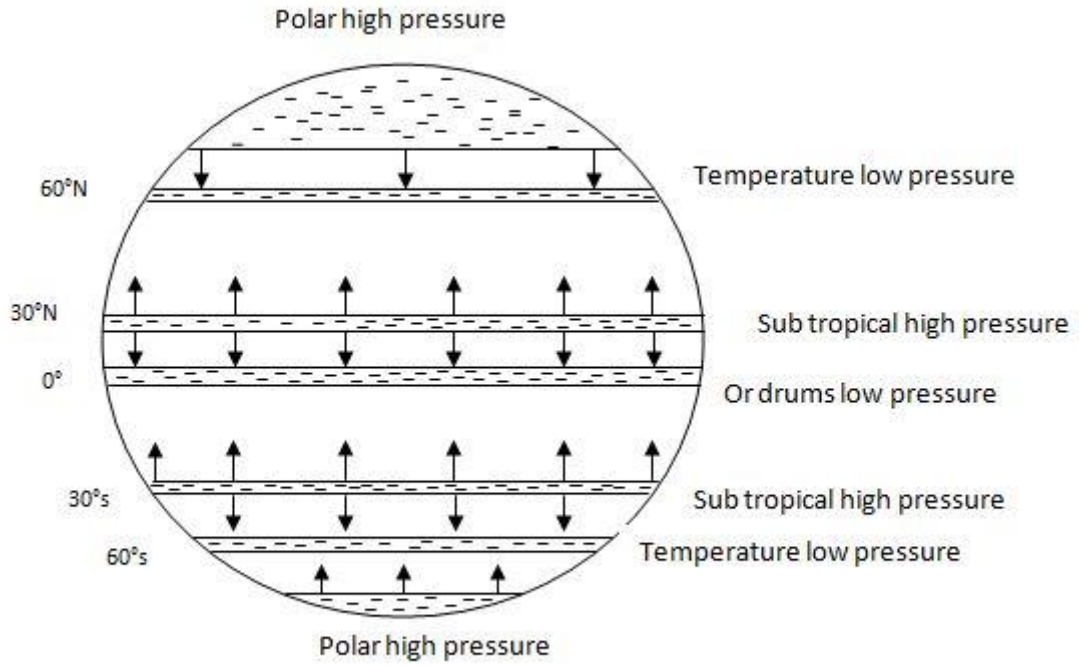
This is located at 30º north and south of the equator with descending air current due to heat of temperature. High pressure is attributed by accumulation of cold air which moves from the equator towards poles.This belt is also referred to as the "horse belt".

(iii)Temperature low pressure belt (sub polar low temperature belts)

This is found at 60º north and south of the equator. It is also known as cyclonic activities zone or zone of convergence. Existance of low pressure is mainly dynamic rather than a result of temperature change.

(iv) Polar high-pressure belt

This is confined at 90º north and south of the equator. Pressure is permanently high due to low temperature attributed by a dense descending air from the temperature low pressure belt.



Pressure and wind pattern on the uniform earth surface

3. SUNSHINE

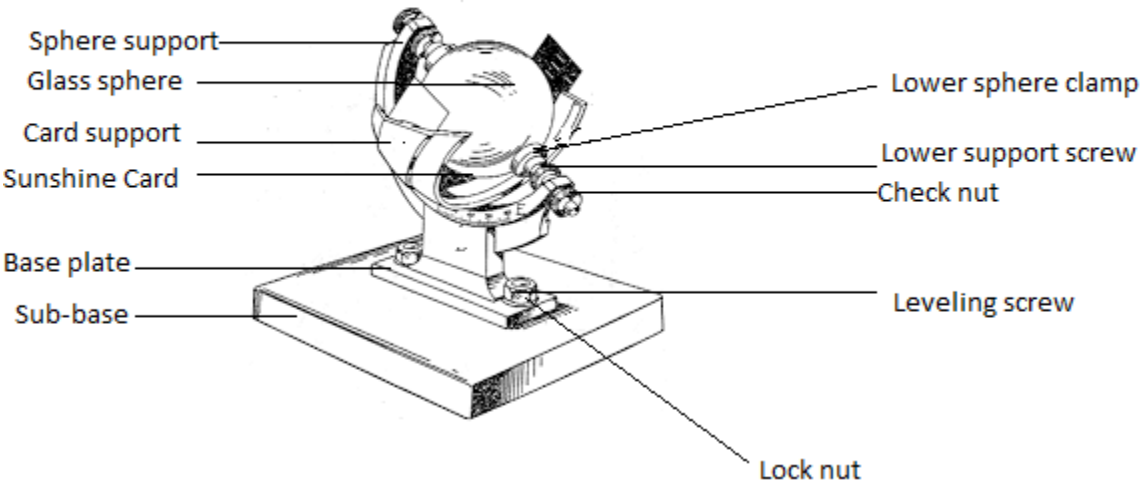
This is another element of weather. The duration of sunshine is party of a function of latitude. For the hours of light (that is possible sunshine) vary with these season in different latitudes.It is also a function of daytime cloudiness .

MEASUREMENT AND RECORDING OF SUNSHINE

The duration of bright sunshine is measured by means of campbell stokes recorder, a solid sphere of glass 10cm in diameter. This form the rays of sunshine onto a sensitized card graduated in hours and so burn a line during the time the sun is shinning .Faint sun,light sun, near dawn or

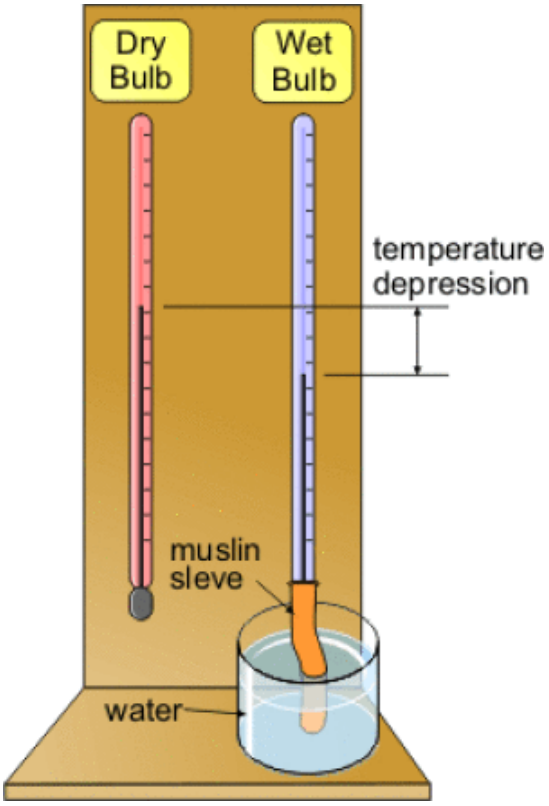
dusk or when the sun is partially abscured is not recorded .Tables of sunshine data are prepared from these record, in the form of either absolute solution in hours per day or as percentage of possible sunshine per day or month. When means figures has been obtained over the requisite number of years, the value for each state can be plotted, and lines of equal mean duration of sunshine isohels can be interpolated.

SunShine recorder



4. HUMIDITY

This is refered to as the atmospheric moister .The moister is obtained from various sources such as oceans, lakes,seas, dams,ponds and rivers. It is of high importance as far as weather as climate is concerned. Air absorbs water through the process of evaparation which result in water changing from its liquid state to gaseous state,the gaseous state is called water vapour. The amount of water vapour in the air is called humidity and it is measured by an instrument called hydrometer placed in the Stevenson screen.



FACTOR INFLUENCING HUMIDITY

-Air pressure

When air is compressed, it warms up and its density becomes lower .Thus at low altitude where pressure is high air will absorb more moister. At high altitude where pressure is lower air expands and cools and its capacity to absorb moister is reduced.

-Latitude

Humidity higher in lower latitudes than in higher latitude because there is greater rate of evaporation at lower latitudes due to high temperature.Likewise the mount of moister in the air is higher in summer .

-Temperature

Arise in temperature lowers relative humidity if the amount of moister remains constant because when air is heated it expands .The volume increase and therefore distribution of water vapour per unit.Volume became less.The air will have a greater capacity of holding more water vapour if air is cooled it contracts and decrease in volume making the space which moister can occupy become less .That is why if air continues to cool it will reach saturation and it gets rid of excess water vapour through condensation .

-Moisture supply

If the supply of moisture increases the air will have more of it ,they making absolute humidity to be higher .If the temperature if the air increases it will absorb even more moisture .This situation makes all places which are near large water bodies to be humid especially if the temperature is high causing a lot of evaporation. Areas that are far away from large water bodies such as deserts center has little water vapour the air has high capacity of holding moisture.

IMPORTANCE OF WATER VAPOUR IN THE ATMOSPHERE

- Evaporation forms precipitation ,which provides fresh water plants and animals.
- It absorbs both incoming and radiated energy from the sun.
- It conveys Latent heat into the atmosphere

The amount of water vapour the atmosphere can hold depends upon the temperature of the air the higher the temperature of the air the higher the capacity of it to hold water .

COMMON WAYS OF STATING WATER VAPOUR (HUMIDITY)

(I) Absolute humidity

This is the actual amount of water vapour in a specific volume of atmosphere i.e the mass of water vapour per cubic unit of air and it is normally expressed in g/m^3

(II) Relative humidity

This is the proportion of water vapour present in the air compared to the maximum amount of water vapour, possible at the same temperature and it is usually expressed in percentage.Normally saturated air has relative humidity 100%.

5. PRECIPITATION

This refers to water that falls on the earth in liquid or solid forms.Some common forms of precipitation are rain, snow, sleet and hail.

Rain

This is most common form of precipitation spread every where and it is liquid form.It forms when tiny water droplets merge together around the nuclei to form rain drops.After becoming heavy enough they fall down to the earth surface as rain.Rainfall is measured by an instrument called rain gauge and the lines which join all places with equal rainfall are called isohyets.

Snow

This is refered to as solid precipitation, which forms when air cools to below the dew point or freezing point and fall down as ice while falling the ice crystals may join together to form snow flake.

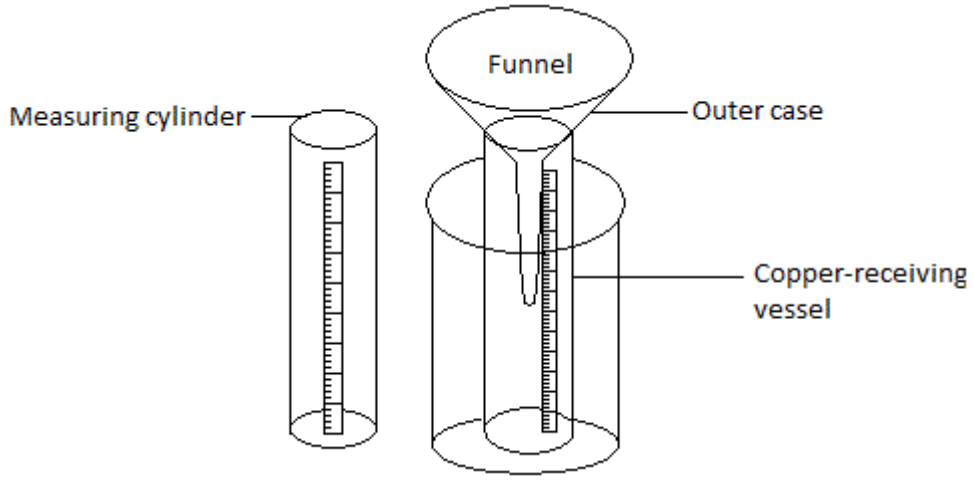
Sleet

This is a frozen or partly frozen rain droplet; it so often referred to as frozen rain. It is hazardous as it may destroy crops, bring down power lines and tree branches

Hail

This is caused by super cooling of water particles in a convectional up shaft .This super cooling forms the hail stones .These stone vary in size depending on the intensity of cooling by that convectional cewent. It is more hazardous than sleet. Hail can cause coderable damage to property and plants some hail stones weight up to 2.5 Kilogram which may hit the ground at speed of up to 160 km/hr.

All forms of precipitation result from rising and cooling of air to below the dew point where condensation begins.The visible effect here is clouds in order for precipitation to occur the small droplets of water in clouds must join together in drops too large to remain or be sustained in the atmosphere thus they prefer to fall down on the earth surface as precipitation.



CAUSES OF RISING OF AIR

When air rises there is less pressure on it at the new altitude.As a result the temperature of the rising air is lowered and cools causing that air to descend and become warm. The rate of cooling or heating that results from this vertical movement of air (ascending deslending) is called adiabatic rate.

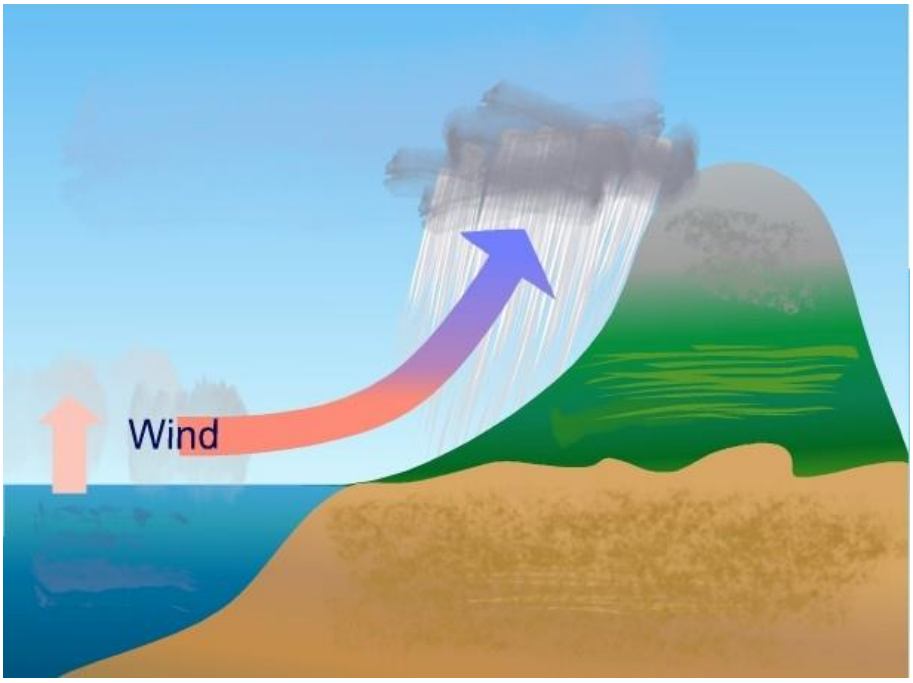
For saturated air the rate of temperature change is 0.6ºc per 100 meters, which forms unsaturated air rate is 1ºc per 100 meters and it is called dry adiabatic rate.

CAUSES OF AIR RISING FOR PRECIPITATION

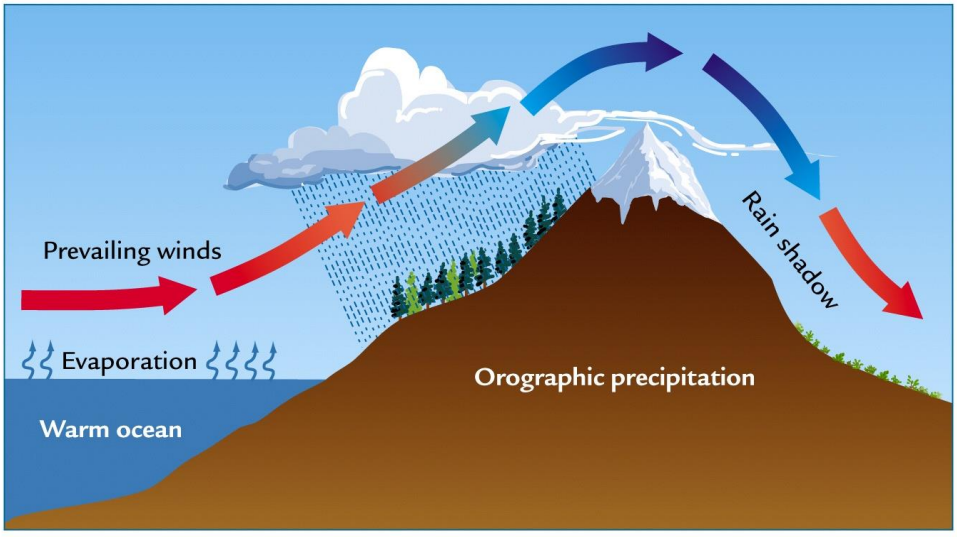
The causes of air rising are also known as the types of rainfall or the factors that influence rainfall. The factors include relief convection and the water bodies.

(i) Orographic or relief cause

Orographic cause of air rising forms orographic or relief rainfall.It forms when air is forced to ascend as a result of relief features such as mountains or plateaus. Where moist air reaches the mountain precipitation forms and it is called windward side while the other pass away from windward form the leeward side or rain shadow.

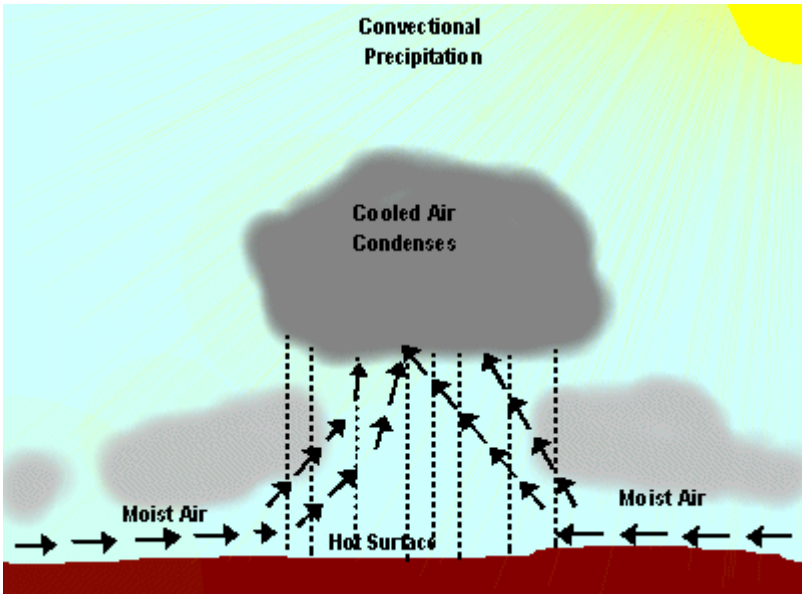


When moist air is forced to rise over a mountain range,clouds and rain often occur.



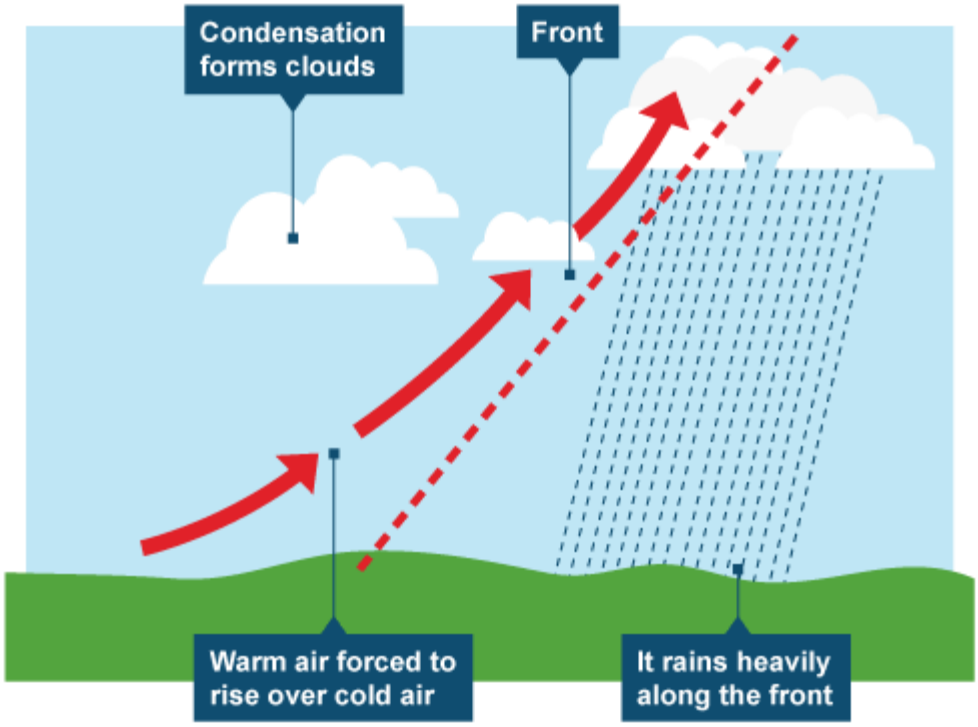
(ii) convectional cause

Here air is forced to rise as a result of intense heating the surface air is heated and vertical upshaft to air occur this process is called convection and it forms convectional rains it is common in summer or hot seasons.



(iii) Frontal or cyclonic cause

Where two bodies of air masses coming from different directions and with different characteristics in terms of temperature and moisture content meet, the warmer air will be forced to rise and condense to form precipitation. The point where these two winds or air meet is called front hence frontal of cyclonic rainfall.



Warm air is forced to rise when it is under cut by colder air,clouds and sometimes Rain.

Importance of precipitation

i. It may lower temperature

ii. It supplies water to streams and rivers

iii. It is a source of water watering crops

iv. It absorbs solar radiations

IMPACTS OF PRECIPITATION.

Impacts of precipitation can be categorized into positive and negative.

(i) Development of water bodies: precipitation encourages the development of water bodies such as rivers and lakes. These are important for irrigation, hydroelectric power generation ,transport, supply of H_2O for domestic and industrial use and fishing.

(ii) Cleaning the atmosphere. The falling drops collect the dust particles and deposit them on the surface, keeping the atmosphere clean or less polluted.

(iii) Temperature regulation: -precipitation especially rainfall, regulates the temperature such that the atmosphere attains moderate weather condition rather than extremes.

(iv) Soil development precipitation also plays an instrumental role in soil development. It encourages the weathering of rocks and the decomposition of organic matter. Where there is high precipitation chemical decomposition takes place effectively.

(v) Encouraging plant growth: precipitation supplies water the surface, which used by plant for growth. This has advantage in the development of Agriculture since where is effective plant growth there is positive agricultural development.

(vi)Soil erosion:this takes place when rainfall is very heavy. Erosion is more pronounced in the areas where the surface is bare and sloppy Erosion destroys vegetation, houses, transport systems etc.

(vii) Outbreak of diseases :when there is precipitation water born disease such as dysentery. Typhoid, diarrhea and cholera, as well malaria are very common

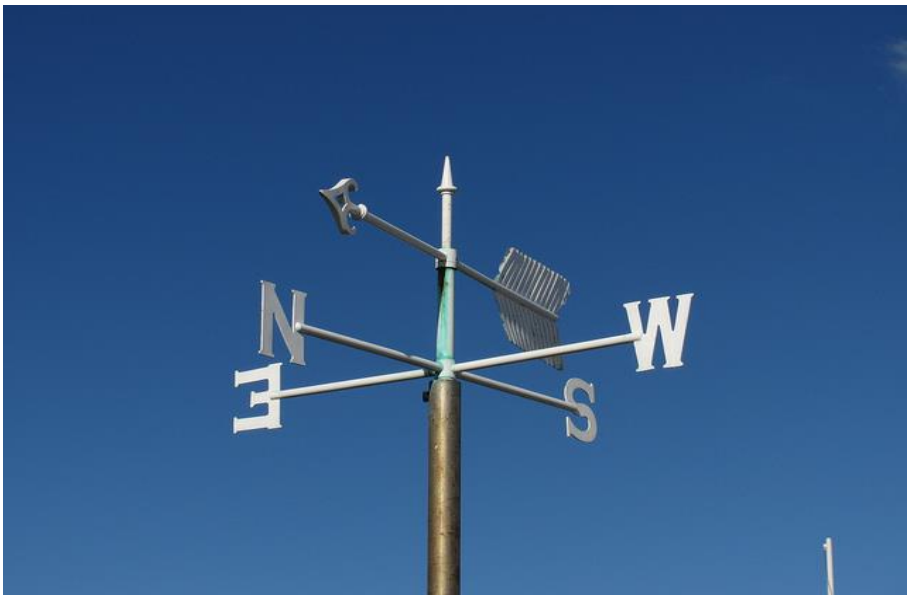
(viii) Floods: Heavy precipitation leads to the occurrence of floods, which in turn destroy crops, houses,kill animals and people etc.

(ix) Mass – wasting (mass movement) takes place as result of the disturbances caused by precipitation on the weathered rock particles. Mass movement can destroy crops, kill people and animals and destroy electricity supply networks as well as causing a lot of damage.

(x) Water pollution is caused by surface run – off cover land Flow and foods, which collect various waste materials and empty them in the water bodies like rivers. Dams and natural lakes. Some of the pollutants are deleterious charmatul to human health.

6. WINDS

A wind is air in motion which always move from high pressure to low pressure belts.Wind speed is measured by an instrument called anemometer while wind direction is measured by wind vane. During wind movement it causes some balances such as temperature balance, humidity balance and pressure balance.



FACTORS WHICH ACCOUNT FOR DIRECTION AND STRENGTH OF WIND

1. Pressure gradient

Variation of pressure from one place to another due to variation in pressure causes wind to develop and move from high – pressure belt to low- pressure belt: the larger the pressure gradient the greater the winds speed.

2. Coriolis force
This is the force due to earth rotation: It obeys the Ferrell's law which state that"Any object moving freely in the northern hemisphere is deflected to its right while southern hemisphere is deflected to its left". This force is called Coriolis force and the resultant wind is called geostrophic wind.

3. Friction

This is common especially up to 900 meters above the sea level due to mountains and big valleys, which may reduce the speed and change the direction of winds. The influence of friction stronger on sand surface than on water.

4. centrifugal force

This is the force due to earth curvature and this force acts outward when an air stream moves on a curved course as in a pressure system with closed or curved isobars is subjected to centrifugal force acting outwards from the center of curvature.

WIND SYSTEMS

Wind systems are related to pressure belts these winds are called prevailing winds and they are deflected according to ferrell's law prevailing winds are those which blow more frequently than other wind in a particular region. Among these winds are trade winds westerly and polar.

(i)Trade winds

These winds meet at the doldrum they are noted for their constancy of force and direction.They are terrible tropical storms which occur at certain season. At the equatorial belt the air is heated and rises to be replaced by air moving in (winds) from north and south.These form north east trade winds and south east trade winds which obey ferrell's law.

(ii)Westerly winds

These blow across latitude 35º and 60º to the polar front these winds are characterized by constant strength and direction in the southern hemisphere while in the northern hemisphere and masses disrupt much of their strength .These winds include north west and south west westerly

(iii)Polar winds

These winds are of solid air they are more pronounced in the southern hemisphere and irregular in the northern hemisphere due to interruption by mountains.

(iv)Monsoon winds

These are seasonal winds if the pressure of a large continent is high the wind will blow out of it to the sea where pressure is low These are called "offshore winds".

These winds are common during winter in Asia as inland temperature is very low while sea temperature is still warm and less dense.If the pressure over a large continent is low than winds blow into it from the sea where pressure is higher.These winds are called "onshare winds" and they are common in Asia during summer.

(v)The upper air movement

Prevailing winds are normally surface winds not very far from the earth's surface. These systems of wind are of high speed and high altitude approximately 1000 to 12000 meters above the sea level within these winds are narrow bands of extremely fast moving air known as "jet streams"

JET STREAMS

Evidences of strong winds in the upper troposphere first came when first world war, several interwar ballons blown off- course were observed travelling at speed in eccess of 200 km per hour. Pilots in the second world war, flying at height above 8km found east ward flights much faster and their return westward journey much slower than expected. The explanation was to and to be a belt of upper air westernizes the Rossby wave which form a compute pattern around the globe.

FIVE MAIN JET STREAMS ARE

There are five recognizable jet streams, two are particularly significant with a third having seasonal importance

i. Polar front jet stream (PEJS)

This occurs in middle latitudes between 40 and 60 degrees and a height of 9000 – 12000 meter more or less at the tropopause in the hemisphere. The winds form the division between the ferrell's and polar cells which is the boundary between warm tropical and cold polar air these winds are responsible for giving fine or wet weather on the earth's surface.

ii) Sub tropical set stream (STJS)
This occurs at about 12000 meters and 25 to 30 degrees from the equator and form the boundary between the Hadley and Ferrell cell in effect vortex associated with the mid-latitude cell. They have lower velocity compared to PFJS but follow the west-east pattern.

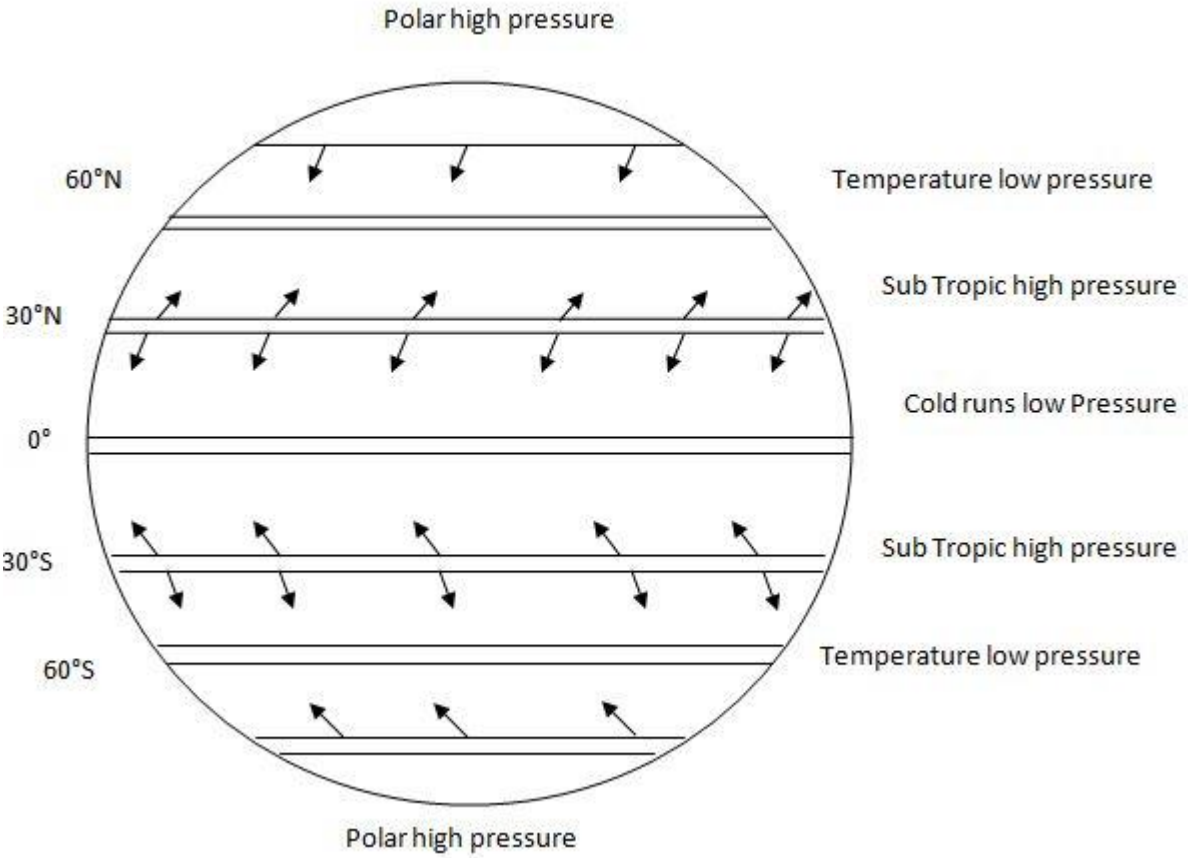
iii) Equatorial Easterlies set stream (EEJS)

This is more seasonal being associated with the summer monsoon of the Indian sub continent.

iv) Arctic set streams (AJS)

This has been traced across Alaska and Canada at about 7600 meters.

v) Polar night set stream (PNJS).
This is recently discovered above the Aretic circle in the lower Stratosphere.



LOCAL WINDS.

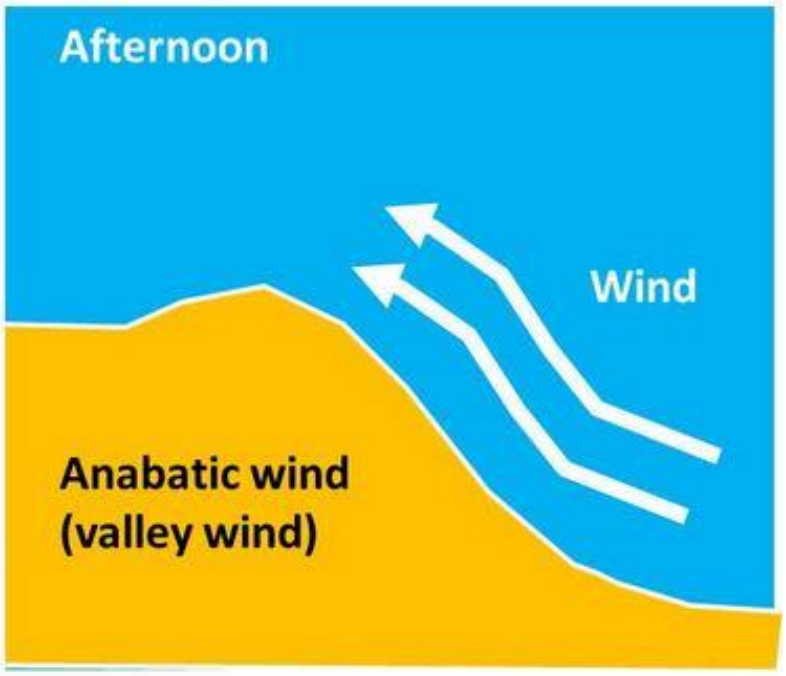
Local winds are controlled by the surrounded"terrain"or environment they are not controlled by planetary system of the winds they are rather diurnal than seasonal. There winds do affect animals, plants and movement of industrial pollutants.

LOCAL WINDS INCLUDE THE FOLLOWING

1) Anabatic and Katabatic

i) Anabatatic winds

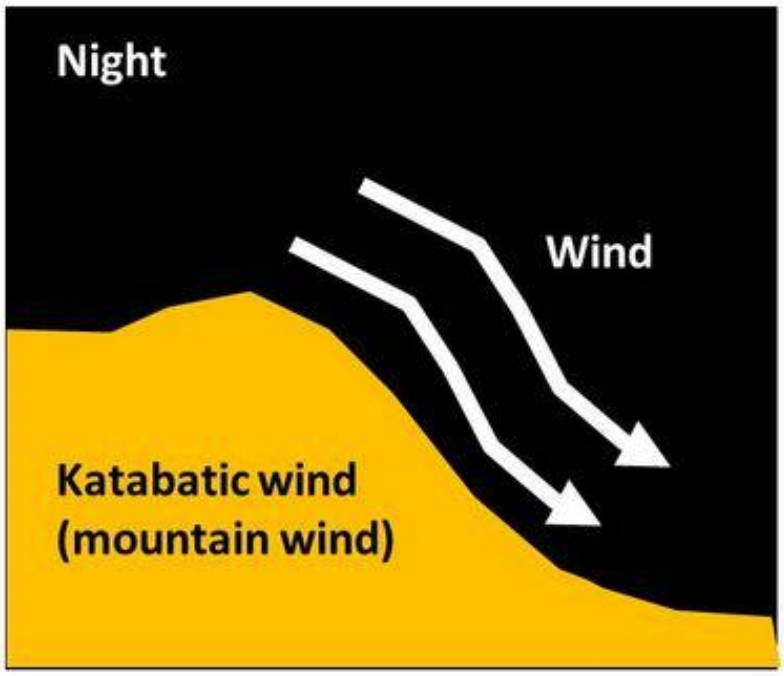
These are cold local winds which blow from, the valley button up to the hilltops. They blow in the afternoon especially in summer. During the day the slopes exruince. Low pressure due to direct sun rays which make them hot and winds move from button upwards. They further condense and come down causing the become foggy**. There winds are called Anabatic winds.**



The sun warms the mountain,
the aire is lighter and ascends

ii)Katabatic winds.

These are cold local winds which blow down from hilltops they occur during the night where air is rapidly cooled by terrestrial radiation on the upper slopes. During the night the valley slopes become very cold as they lose the heat rapidly, hence high pressure on them. Due to convectional currents the valley buttom becomes warm creating low pressure. Winds sink down through the valley slopes and rise up from the valley buttom . These winds are called Katabolic winds.



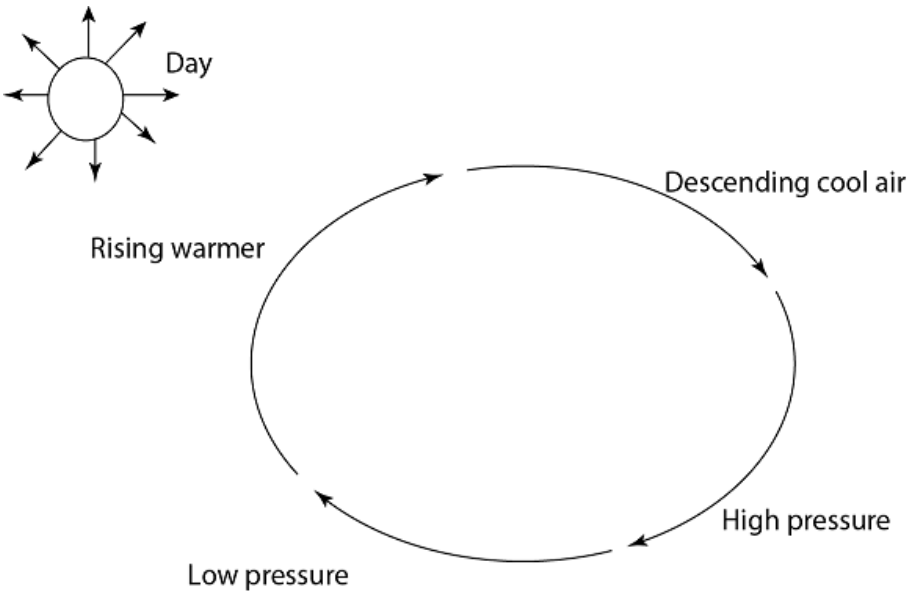
The mountain cools down, the air becomes heavier so it descends.

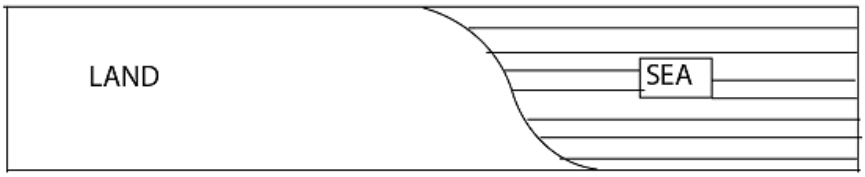
2) Land and sea braze.

During the day land becomes warm more rapidly than the sea. Thus winds tend to move from the sea breeze.

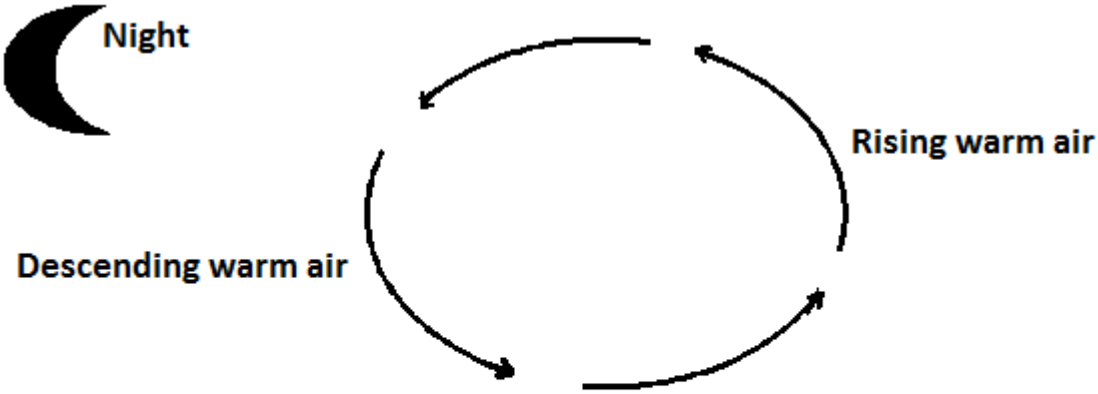
During the night the land cools more rapidly than sea. Thus wind tends to move from land to the sea this action is called land breeze.

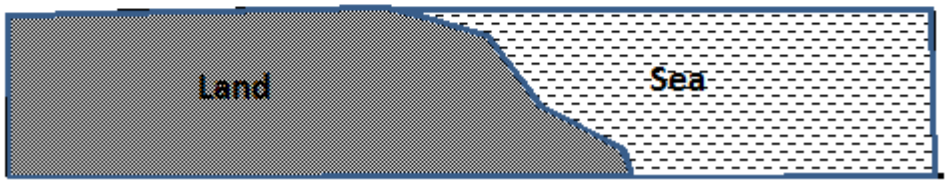
Day





SEA BREEZE



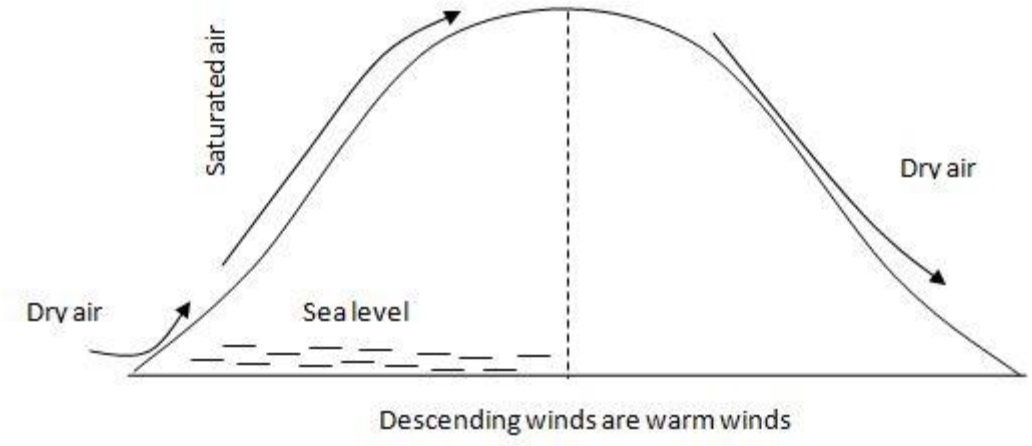


Land breeze

3) Descending winds:
These winds are mostly warm and they are called Fohn. The name Fohn is common in Alps

Mountains of Switzerland.Where during winter the Fohn winds descend from the Swiss Alps into Switzerland.

- During the same period cold winds blow from France south ward torwards Mediterranean Sea. These winds are called "Mistral" but in USA the same winds are called "chinook". This situation occurs mostly in the leeward side of the mountain. Some local winds blow from the high pressure over the Sahara during spring. These winds are warm, dusty and dry because they originate from the desert which is dry.



The Harmattan.

These are NE winds which blow from the Sahara across West Africa between November and March. These winds are dry and dusty because they originate from the desert. The winds blow during winter towards the Gulf of Guinea where the land is cold while over Mediterranean sea pressure is low because the sea is much warmer than the land.

Berg winds:

These are the winds which originate from the plateau of South Africa during winter. At this time the high pressure lies over the plateau and it is a region of descending air the winds blow out toward the South SE and SW.Those winds are warmer

4) **Adiabatic cooling and warming:**

This is the change of heat per unit area. It occurs when air is heated on the ground which makes it to rise as it raises it becomes cool and sinks down. This is adiabatic cooling and heating.

AIR MASSES

Air mass is a large volume .of air whose temperature and humidity are fairly uniform and covers all extensive areas such as desert and ocean surfaces moving horizontally at different levels.

- Characteristics of air mass normally come from the region where the air masses were formed. These characteristics are retained by the air mass may be warm, dry or moist.

CLASSIFICATION OF AIR MASSES.

Air masses are classified on the basis of the source regions trajectry and characteristics of both temperature and humidity. On the basis of temperature they can be categorized as polar and tropical air masses. By combining temperature and humidity four main categories can be distinguished as follows.

i)Tropical continental.(Tc or CT).

They originate over the continents in the low latitudes such as in the desert. They tend to be warm and dry. But near the equatorial there is tropical equatorial continental air mass, which consists reasonable amount of moisture. Enough to cause precipitation. A good example is tropical continental air mass over the Sahara desert, which is called the Harmattan.

ii) **Tropical maritime (Tm or mT).**
These originate in the trade wind belts and subtropical oceans near the equator they are refered to as Equatorial air masses (E) these are warm and moist such that they to yield heavy precipitation, thunderstorms etc because of being unstable. A good example is tropical maritime air masses which originate from Atlantic

iii)**Polar continental (Pc or cP):**
These originate from the cold land surface like the Arctic and Antarctic regions, including central Asia,northern Canada where they develop in winter. These air masses are very cold, dry and stable such that they prevent the formation of rain showers.

iv)Polar maritime (Pm or mP).
These originate over the oceans 50º North and south of the equator they are cool, moist and unstable. They yield heavy precipitation as they move in land in middle latitudes and high latitudes.

CYCLONES, ANTICYCLONES AND DEPRESSIONS

i) What are weather cyclones, anticyclones and depressions?

ii) Explain the Formation of these aspects

iii) Explain the weather associated with them.

CYCLONES

These are areas of Low- pressure system, which originates on temperature Latitude between 20^{0} - 60^{0} north and south of the equator cyclones occur all over the oceans except in northern Atlantic ocean. The isobars that represent a cyclone on a map are closely spaced and they form a circular shape. Strong wind spirals or tends to move towards the center clockwise in the southern hemisphere and anticlockwise in the northern hemisphere. They also tend to rush upward with strong force called vortex which surround the center of the cynodes.

IMPORTANCE OF CYCLONES:

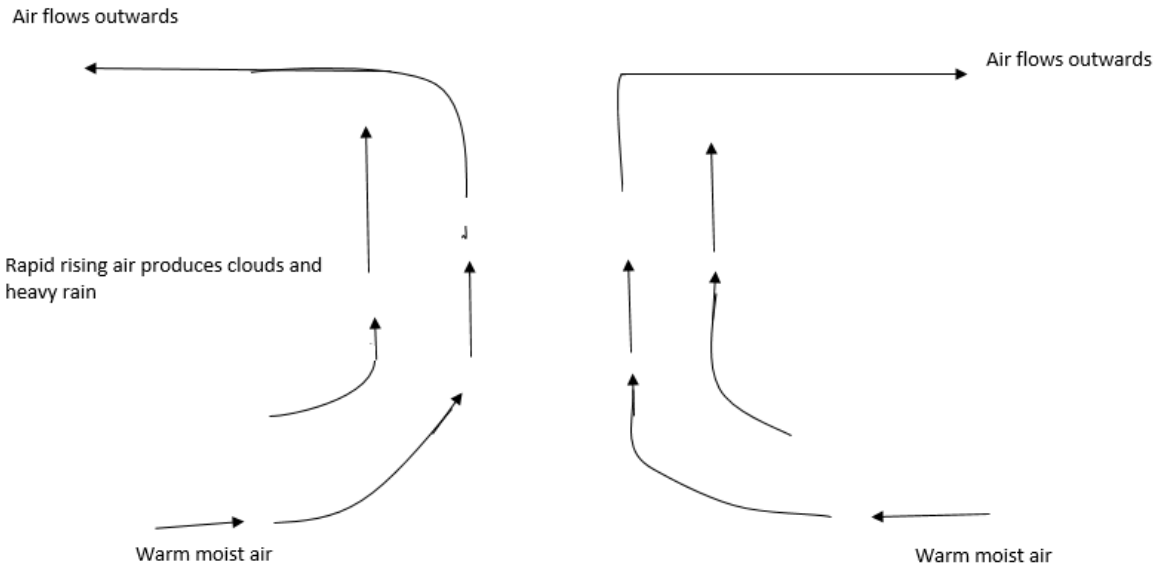
The rapid rising air gives to torrential rainfall and the strong blowing wind causes considerable damage to property such as crops and buildings.

FORMATION OF CYCLONES. (Required conditions)

i) Abundant source of warm moist air of temperature about 27ºc to the sea surface

ii) Air must blow in ward and rise rapidly to great height to give clouds of great vertical extent, capable of providing torrential rainfall.

- A Tropical cyclone develops where the air mass brought by to northern and southern trade winds meet that is along the inter – tropical front. They form; over the oceans as the air masses which have traveled over the oceans have warm moist lower air while the upper layer of air masses tends to be cool and dry. When two such air masses meet one is lifted up over the other the rising air cools its moisture condenses to provide rainfall (torrential). Tropical cyclones move in a westerly direction on reaching laid they gradually die act because the supply of warm moist air is cut off.



Warm sea surface of temperature 27°c

WEATHER ASSOCIATED WITH TROPICAL CYCLONES

Before the tropical cyclones arrive

i)Air becomes very still

ii) Temperature and humidity rises.

iii) Thick clouds appear or develop

iv) Winds blow violently

v) Dense clouds and torrential rainfall reduces visibility to a few meters

Examples of tropical Cyclones are tornadoes, Hurricanes and typhoons.

TORNADO

This is a small cyclone that appears as a black funnel cloud, hanging from high clouds. Its color is a result of the moisture and debris being carried by wind at a speed of up to 400km/ hr on the ground. It covers a small area of about 90 – 500 meters in diameters

- The origin mechanism of tornadoes is not properly understood however they are commonly and mostly associated with the condition provided by the meeting of cold, dry and hot moist air.

- Thus they are associated with cold front originated where turbulence along there fronts is greatest. Most occur in the USA and are concentrated in the central state of OKLAHOMA.

HURRICANES

These occur in West Indies islands in the Caribbean. The wind is generally very slow.

They have similar characteristics with typhoons but the only difference is intensity duration and locality

- Weather associated with hurricanes:

.Calm dense clouds and stormy weather

. Rainless/ dry weather.

TYPHOONS:

Typhoons occur in China. They are most frequent from July to October and violence is common.

They have very steep gradient and cover an area of 30 to 300 kilometers in diameter. They occur around 20^{o}- 60^{o} north and south of the equator.

- Weather associated with typhoons

- Over cast sky
- Torrential rain accompanied by thunder and lighting
- Very destructive to both human and property. For example 50000 people were killed in 1922 on the coast of china.

ANTICYCLONE

This is an area of high pressure which when shown on the isoline map, has an oval circular shape of closed isobar.

Note that, the highest pressure is near the centre. An anticyclone develops in a region where the air is descending and the winds associated with it blow outwards in a clockwise direction in the Northern hemisphere and anticlockwise in the southern hemisphere in West Africa during the dry season anticyclone cover the Sahara and they are associated with the Harmattan.

WEATHER CONDITION ASSOCIATED WITH ANTICYCLONES.

Anticyclones are associated with the fire weather, calm air and high temperature in summer but low in winter and clear skies. During winter intense cooling of the lower atmosphere may results in thick Fog.

DEPRESSION

These are large areas of low pressure due to meeting of warm equatorial and cold polar air. They are oval or circular shared on maps with closed isobars. Air of depression circulates anticlockwise direction in the Northern hemisphere and a clockwise in the southern hemisphere where they blow towards the center.

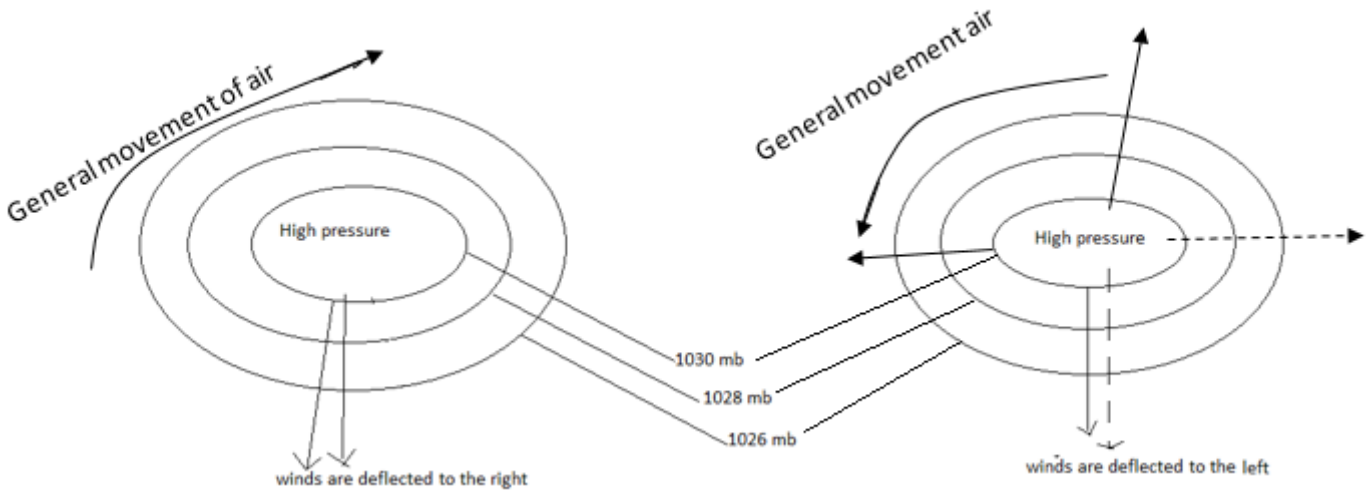
- Depressions mainly develop in temperature latitudes when humid tropical air meets with cold polar air especially around; latitude 60º north and south of the equator where westerly winds meet with polar winds. The zone or boundary where these winds meet or converge is called "polar front" it is in this zone where depressions form.

- Depression are rarely stationary and they move in a general e.g. sterly direction. Some are small: others are large, but all of them are associated with unsettled weather usually with overcast skies and periods of continuous rain.

- The rain is caused by the uplifting of the warm moist tropical air by the cool drier polar air, as they meet or converge at the polar front. Such rain is called "depression Rain" and it is generally lighter than convectional rain and has longer duration up to several days.

WEATHER ASSOCIATED WITH DEPRESSION.

Depressions are associated with clear sky except the circus clouds which are little bit high, winds blow from the south east, after a definite time, a clouds cover develops and heavy rain occurs and the warm front then passes, when the rain stops wind direction changes and start blowing from south west. Temperature rises and there occurs more humid air.

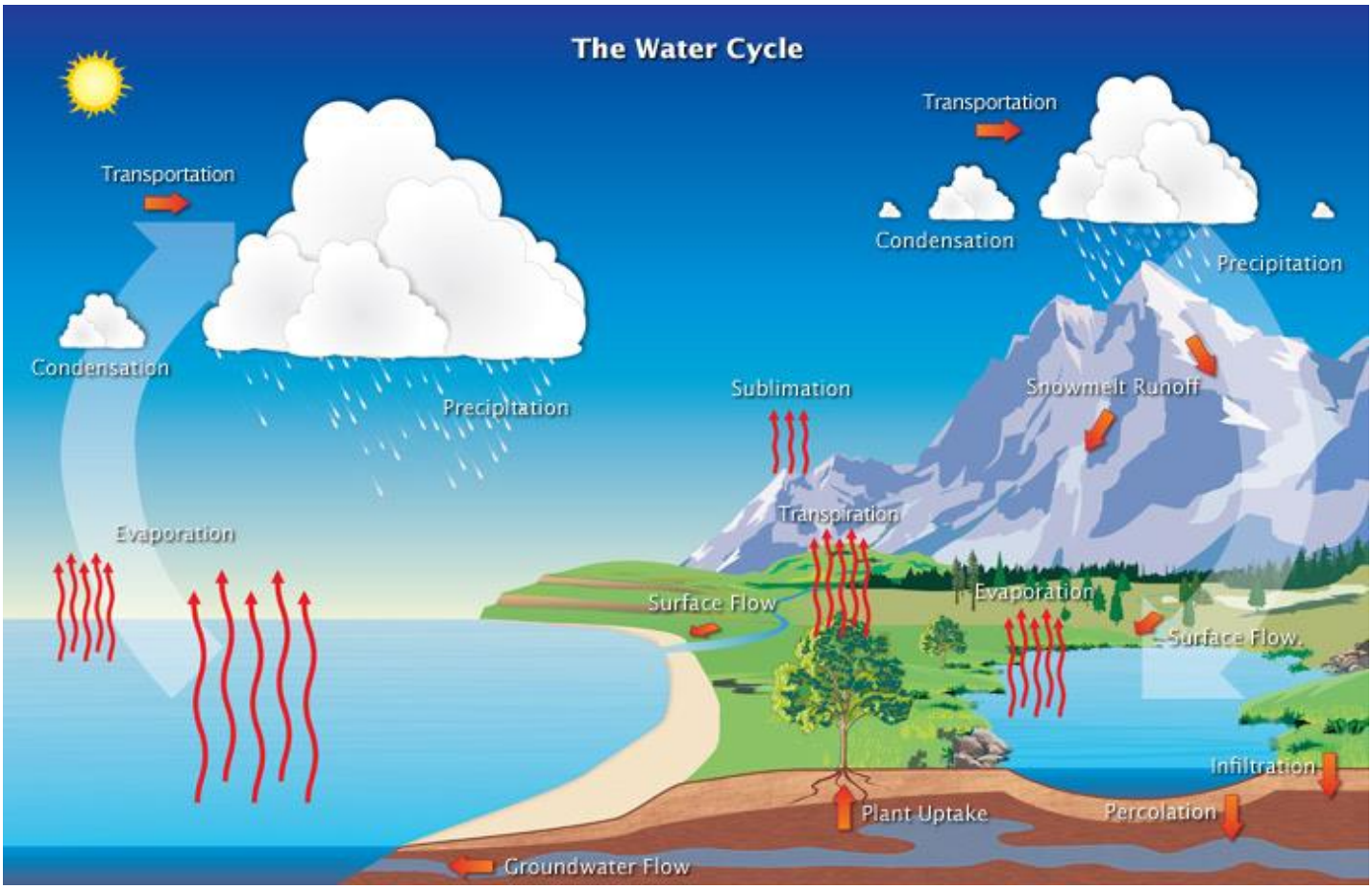


HYDROLOGICAL CYCLE (WATER CYCLE)

Hydrological cycle (water cycle) refers to the endless circulation of water from the surface (rivers, lakes, oceans and vegetation) into the atmosphere through evaporation or transpiration and then back to the surface as rain, snow, hail or another form of precipitation. The processes involved in hydrological include evaporation or transpiration condensation after cooling and later precipitation the combined process of evaporation and transpiration is known as evapo – transportation

At first water, gets into the atmosphere as water vapour through evaporation from the surface or transpiration from parts.

Later as most air rises, it cools through expansion, leading to condunsation through condensation water droplets or drops are formed which later fall onto the surface as precipitation. As waterfalls onto the surface, some of the water in filtrates and percolates into the ground to form underground water. Some flow on the surface as surface run – off (overland flow) or stream flow into the oceans or lakes. Some is evaporated back into the atmosphere to drive forth the process of hydrological cycle. In the process of hydrological cycle ,insolation is very important since it provides the energy that facilitates evaporation process.



The diagram above shows the process which lead to the formation of precipitation which are part and parcel of the hydrological cycle. These processes include evaporation or evapo-transpiration cooling condensation and precipitation

CONDENSATION.

Condensation is the process through which the atmospheric water vapor is converted into liquid as a result of cooling. If the temperature is below the freezing point condensation can be skipped.The process in which water vapor changes directly into solid state without passing through liquid state is called "sublimation". The term also applied when the change takes place from solid state to water vapor without passing through the liquid state when the temperature are extremely high.

WAYS IN WHICH AIR COOLS:

There are several ways through which cooling in the air takes place and these can be identified as follows.

i)Direction radiation of heat energy from the surface leads to the cooling of the air, since heat energy is lost into the atmosphere. The loss of heat energy makes the surface become cold hence influences the temperature of air above it.

ii)Horizontal air movement over the cold surface (advection) may also lead to the cooling effect.

iii) Also cooling can take place when warm air mass meets with cold air mass on mixing along the the front,the temperature of warm air declines, leading to cooling.

iv)Another way through which air tends to cool is by the ascent.The ascending air cools adiabatically as result air mass expension.

CONDITION FOR CONDENSATION TO OCCUR

Condensation is determined by several factors that include cooling, presence of microscopic particles and presence of water vapor.

i)Atmospheric cooling.

The cooling of the atmosphere occurs through various ways which include contact with the cold surfaces mixing of air masses or through mechanical uplift.

ii)Existence of water vapor

When the air saturated, any additional moisture in the atmosphere leads to Condensation.

iii)Presence e of microscopic particles in the atmosphere. These act as condensation nuclei which provide the starting point for condensation. Water vapor molecules tend to collect around the particles to form water droplets when the particles are absent, condensation takes place with difficulty unless the atmosphere is super saturated.

COMMON FORMS OF CONDENSATION.

Condensation manifests in various form namely

- Dew
- Frost
- Clouds
- Fog.

Dew

Dew consists of water droplets condensed and deposited on the cold solid surfaces. It usually

Forms during long nights with clear skies having little or no wind when the atmosphere is relatively moist.When the sky is clear there occurs high rate of outgoing radiation, which in turn leads to the cooling of surface.

Frost

Is the term used of mean dew that becomes frozen. The condition that favor its formation are the same those. For formation of dew except the condensation occurs under freezing point.Desert and semi-deserts are places where dew and frost common occurs at night, since these areas can sometimes experience low night temperature as low below O^0C.

Log and mist, Haze.

Fog and mist are clouds at ground level, which result from moisture condensation and they may extend far in the atmosphere.Fof and Mist differ in visibility.

Mist forms where moist air cools below dew point. Condensation takes place but the resultant water droplets remain suspended in kilometers. On the other hand Fog is like mist and forms in the same way but it is much denser as it reduces visibility to less than a kilometer. There are various types of fog depending on their mode of formation.

TYPES OF FOG

i)**Advection Fog**:
Refers to Fog caused by the cooling of warm moist air. Transported over the cold surface. Also, advection Fog can be caused by the cold air passing over a warmer sea surface than mixes with the warm air prevailing there.

ii)**Radiation Fog**
This occurs when land surface is suddenly cooled by radiation where the air upon it becomes chilled which results into condensation. It common in hilly areas.

iii)**Frontal Fog**
This forms due to passage of warm air over cold air. The warm air is therefore chilled to form Fog.It forms at the Front of depression.

iv)**Upslope or expansion Fog chill Fog**
Refers to the Fog formed when the air-mass moves upslope leading to adiabatic cooling due to air mass expansion. It forms simple low sheet cloud which may envelop the hills like, what happens on the hills of western. Britain when moist air is moving on land

v) **Steam Fog**
Is the type advection Fog formed when a cold air- mass passes over much warmer water surface such that water appears to "steam" In latitude it is referred to as ice-Fog. Where the moisture in the air is converted into ice crystals, steam Fog is rare and does not last for a long period of time.

vi)**Sea Fog**
Is formed when the sea air cools over the cold ocean currents. It differs from the steam Fog,in

that the sea Fog does not appear as steam but just as normal Fog. Also in steam Fog, the moving air is cold and stable and warms over the warm water surface.

vii)**Smog** **Fog**
This is Fog plus smoke and industrial pollutant like CO_2, CO and SO_2 it is usually yellowish in color and acidic in smell,smog is common in big cities e.g. Ruhr industrial area in Germany. Fog has major environmental hazards particularly on transportation.

viii)**Rime**
When a Fog composed of super cooled droplets is driven by slight wind against prominent objects such as telegraph poles, wires and trees the drops freeze on them as rime. The temperature of both droplets and the objects is below freezing point. The rime has the white, opaque appearance. This is a common feature on the mountains of Britain.

CLOUDS AND CLOUDS FORMATION

Cloud is another element of weather. It is defined as a mass of water vapour which hangs in the sky. Clouds are a form of condensation which consists of water droplets or of tiny ice bar tides floating at various levels from the ground to the very high altitudes. At 12000m above the sea level.

- Mist and Fog are made of water droplets and in this repast they are types of cloud, but they form near the surface.

- The clouds give hint on the type of weather that is likely to occur through their shape, height and and nature of movement. Thus they are carefully studied by meteorologists in order to prepare weather forecast and various precautionary information on the impeding weather phenomena. On the map cloud cover can be represented by using the lines.

CLASSIFICATION OF CLOUDS

There are many different types of clouds, but they are often difficult to distinguish as they form constantly changes. The general classification of clouds was proposed by LUKE HOWARD in 1803 this classification is based on form appearance and height and he used four Latin words *cirrus, cumulus, stratus* and *nimbus.*

- High clouds (6,000 to 12,000m)

- Middle clouds (2,100 to 6,000m)

- Low clouds (below 2,100m)

a) High clouds 6,000 – 1,200m (consists of cirrus which start with cirro.)

i) Cirrus is composed of small ice crystals, wispy, fibrous or feather. Its a appearance is min bands or patches.

ii) Cirrocumulus – is composed of ice crystals:" globular or ripple like in appearance looks like ripples or wavy structures in the sand on a sea shore) Forming a thin cloud.

iii) Cirrostratus- it looks like a thin white, almost transparent sheet that gives the sun and moon haloes.

b) Middle clouds below 2,100 - 6,000m (consists of clouds whose names start wish acto)

i) Altocumulus – is composed of water droplets in layers or patches globular or bumpy. Looking with Flattened based arranged in line or waves. This indicates fair weather.

ii) Altostratus – is composed of water droplets forming sheets of grey or water looking clouds, partly or totally covering the sky.

c) Low clouds below 2100m.

i) Stratocumulus: is a large globular mass: bumpy – looking soft and grey in appearance forming pronounces regular patten. It is in fact darker, lower and a heavier type of actocumulus cloud. It always allows the penetration of some our rays called crepuscular rays.

ii) Stratus – is fog- like low cloud forming a uniform layer: brings dull weather and often carom paled by drizzle.

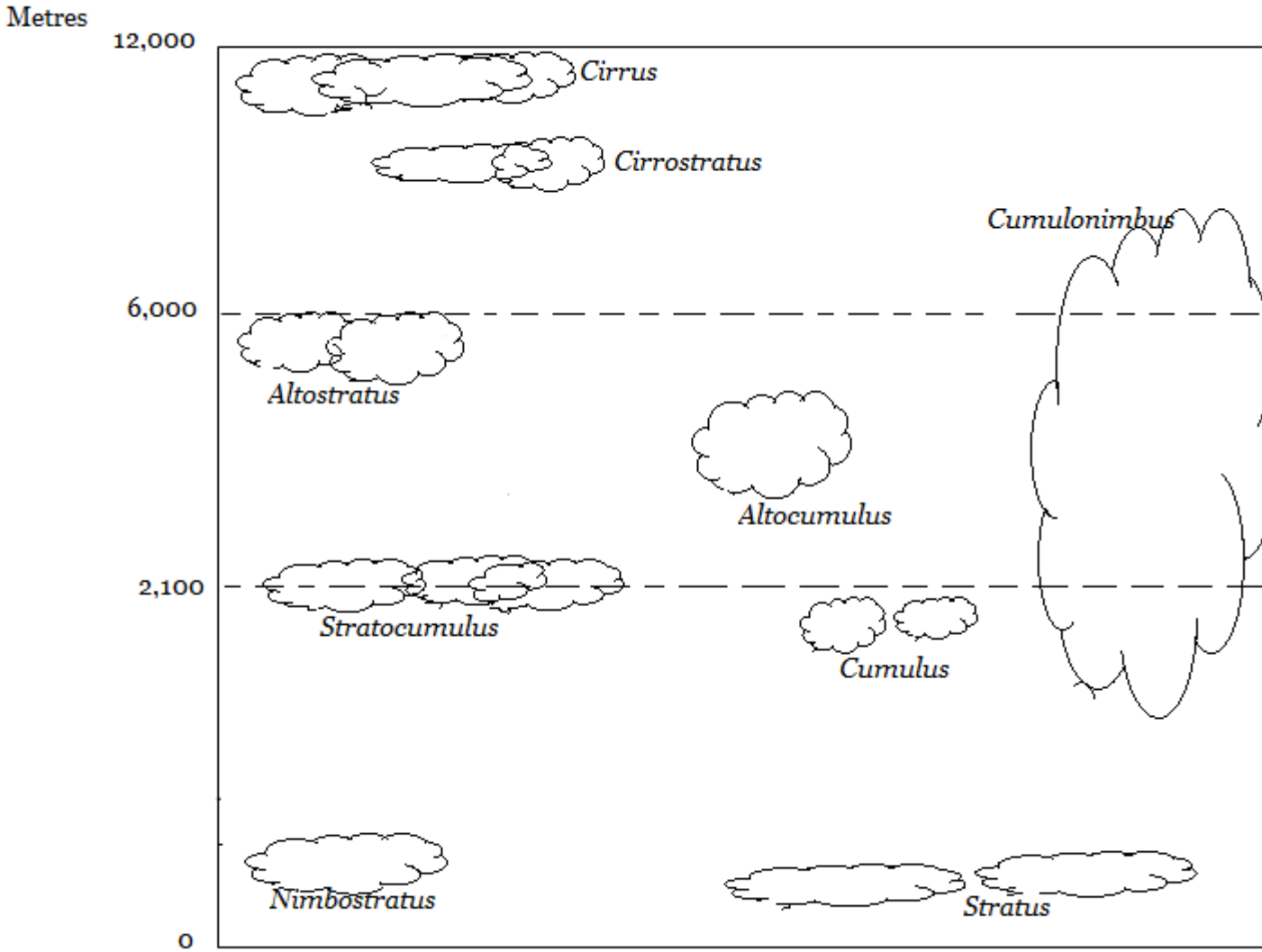
iii) Nimbostratus – Dark grey and rainy – looking dense and shape less often gives continuous rain clouds of great vertical extent.

iv) Cumulus: round topped and flat based forming a whitish grey globular mass consisting of individual cloud units.

v) Cumulonimbus – is a lowering cloud which is usually white or black appearing as globular mass whose rounded tops often spread out forming an anvil structure. It is associated with convection rain lighting and thunder. This cloud is sometimes called "thunder head".

NB:
Cirrus and curriform clouds occupy high level and form high clouds; clouds that start with acto

are found in the middle level constituting middle clouds. Nimbus is the term that applies to rain bearing clouds; stratus applies to clouds that form layers or uniform cover and cumulus is the term used for clouds that occur in a massive nature.



Clouds at different levels and extent

Clouds at different levels and extent

The Amount of cloud cover is estimated in oktas; one oktas represents one – eighth of the sky covered with clouds.

WEATHER CHANGES

ATMOSPHERIC STABILITY AND INSTABILITY

Atmospheric stability

The state of stability is when a rising parcel of unsaturated air cools more rapidly than the air surrounding it. If there is nothing to force the parcel of air to rise such as mountains or fronts it will sink back to its starting points. The air is described as stable because dew point may not have been reached and the only clouds which might have developed would show flat topped cumulus which do not produce precipitation. Stability is often linked with anticyclones.

- Absolutely stable is experienced when the ELR is less than the SALR (Saturated Adiabatic Lapse Rate). During absolute stability even the saturated air, which is usually buoyant (light), tends to cool faster that the surrounding air and keeps on sinking rather than rising. Stability is also called stable Equilibrium.

Atmospheric instability:
Conditions of instability arise in on hot days when localized heating of the ground warms the adjacent air by conduction creating,a higher lapse rate.

The resultant parcel of rising unsaturated air cools less rapidly than the surrounding air. In this case the environmental lapse rate lies to the left of the Dry Adiabatic Lapse Rate, the rising air remains warmer and lighter than the surrounding air.

Should it be sufficiently moist and if dew point is reached, then the upward movement may be accelerated to produce towering cumulus or cumulonimbus type clouds. Thunderstorms are likely and saturated air following the release of latent heat,will cool at the saturated Adiabatic lapse rate.

CONDITIONAL INSTABILITY.

This type of instability occurs when the ELR is Lower than the DALR but higher than the SALR. It is the most common of the three conditions.

The rising air is stable in its lower layers and being cooler than the surrounding air would normally sink back again.

However if the mechanism which initially triggered the up lift remains, then the air will be cooled to its dew point. Beyond this point cooling a slower SALR and the parcel may become warmer than the surrounding air. It will now continue to raise freely even if the uplifting mechanism is removed as it is now in an unstable state.

Instability is conditional upon the air being forced to rise in the first place, and later becoming saturated so that condensation occurs. The associated weather is usually fine in areas at altitudes below condensation level but clouds and showery in those above.

- What to note is that

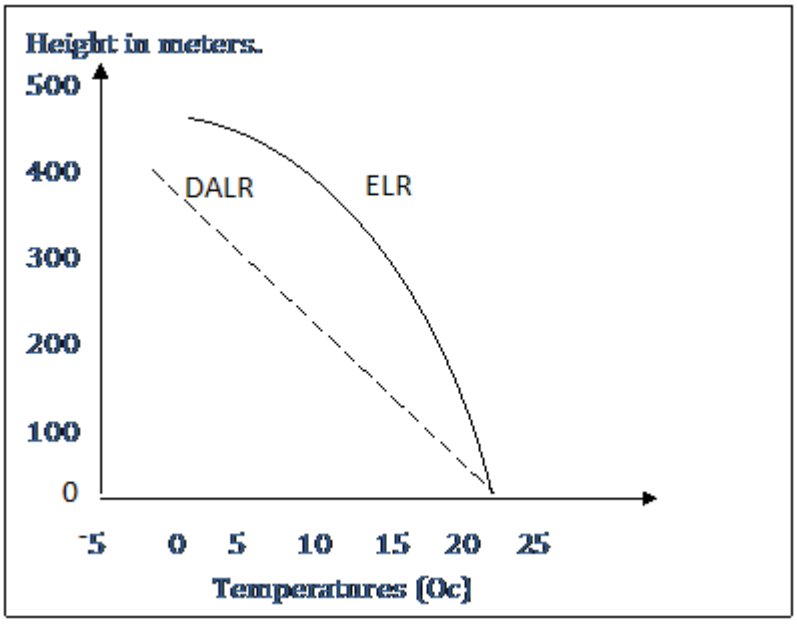
Unstable air mass is regarded to be either conditional or potential.It can be conditional if after it has reached dew point it cools very slowly to retain warmness that the surrounding and forced to rise higher and higher.

- It is regarded to be potential if the condition air is forced to rise above cold air mass. Atmospheric instability is associated with relative fall in temperature, high humidity (dampness) heavy clouds, sand, heavy rainfall.

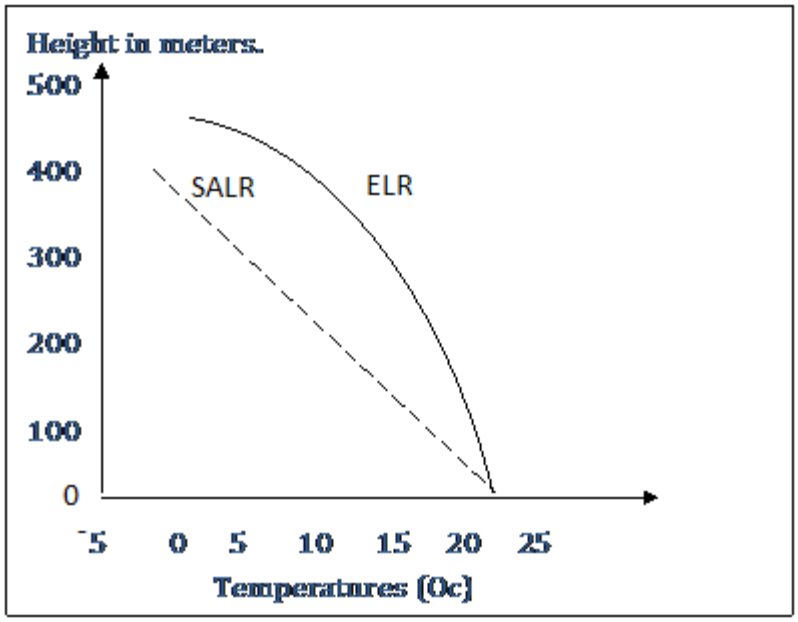
These conditions can be summarized as follows:

Stability when ELR< DALR or (DALR> ELR)
Absolute stability when ELR< SALR or (SALR >ELR)
Neutral Equilibrium when ELR = DALR or (DALR =ELR)
Absolute instability when ELR > DALR or (DALR < ELR)
Condition instability when ELR is between DALR and SALR.

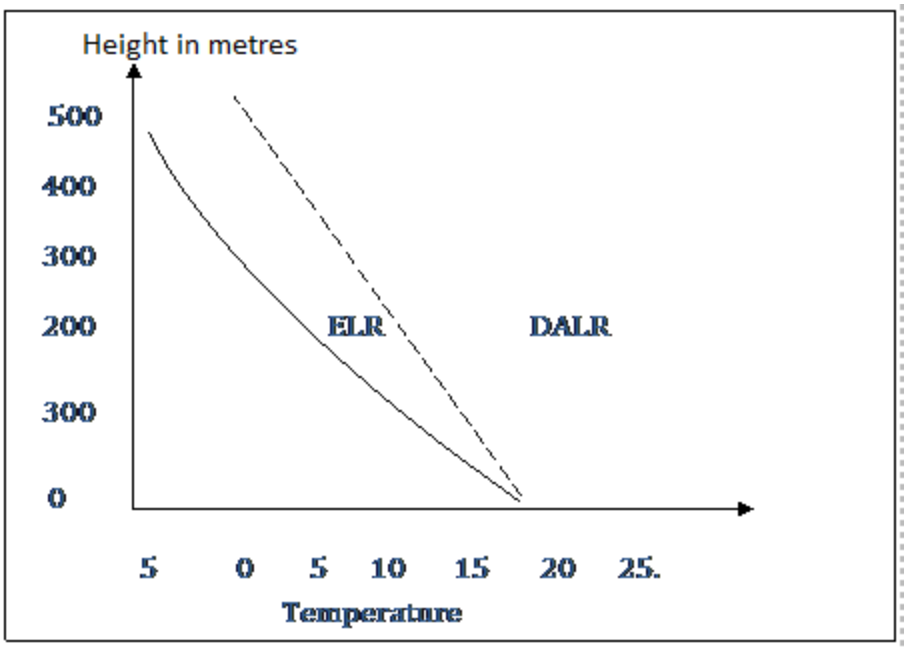
- Diagrams representing atmospheric stability and instability.



In diagram above.
The line for DALR is below the line for ELR. Indicating that the DALR is greater than the ELR and therefore the air is cooling faster than the ELR leading at atmospheric stability. In this case there is no vertical air – mass movement since the cold dense air mass tends to sink down to the surface.

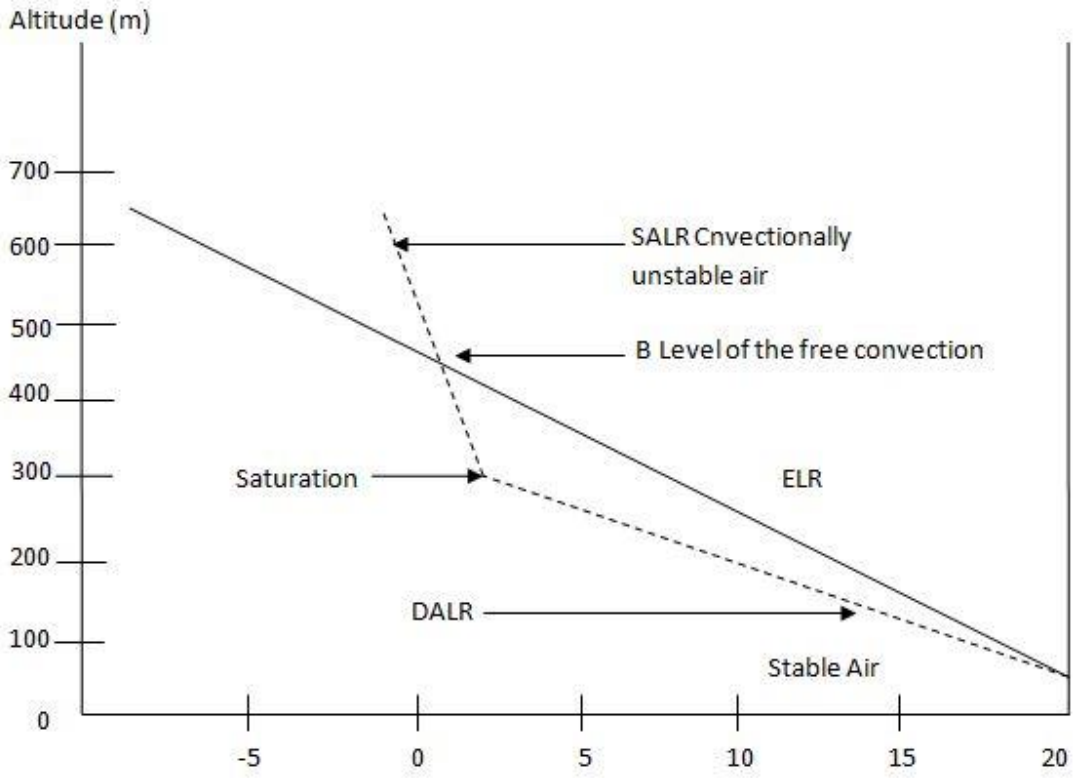


In the diagram above:
the line for SALR is below the line for ELR indicating that the SALR is greater than the ELR and therefore the saturated air is cooling faster than the ELR Leading to atmospheric stability. Also in this case the vertical air-mass movement is limited, since the denser air mass tends to sink down to the surface.



In the diagram above, the ELR is below the line for DALR indicating that the ELR is greater that the DALR and therefore the dry pocket of air is cooling at a lower rate than the ELR, Leading atmospheric instability.

Also in this case, the vertical air – mass movement is pronounced since the pocket air mass tends to rise because of buoyancy or lightness. Under this situation, these can be condensation, freezing and precipitation in the atmosphere. Storms also develop, affecting the earth's surface and its various features.



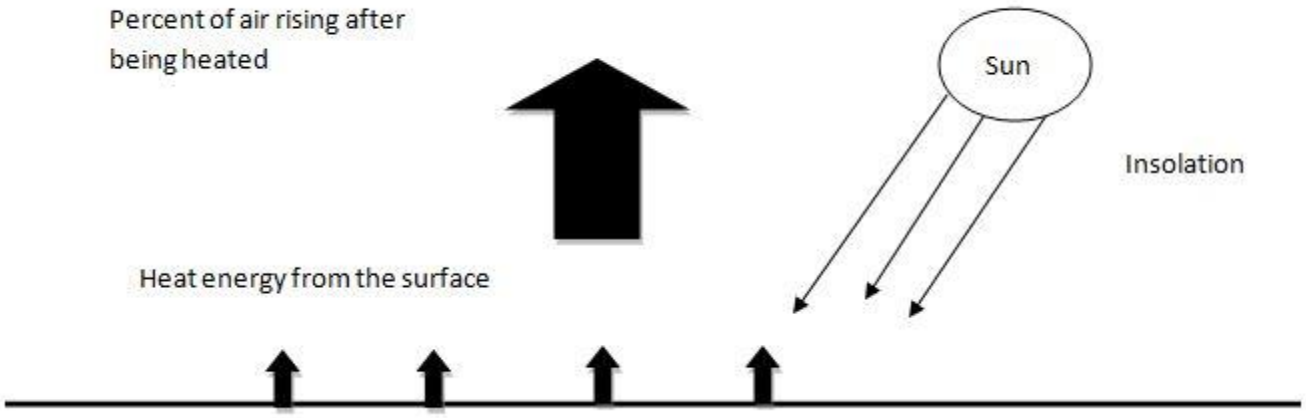
In the above diagram:
One can find that before condensation is the lower altitude, the air is dry and DALR is greater than the ELR. The atmosphere experiences stability. As air is forced to rise the cooling process leads to condensation which saturates the air. The saturated air becomes warm due to the

addition of moisture which has latent heat. It then starts rising spontaneously while cooling at the SALR, which is lower than the ELR. This situation manifests the attainment of a state conditional instability.

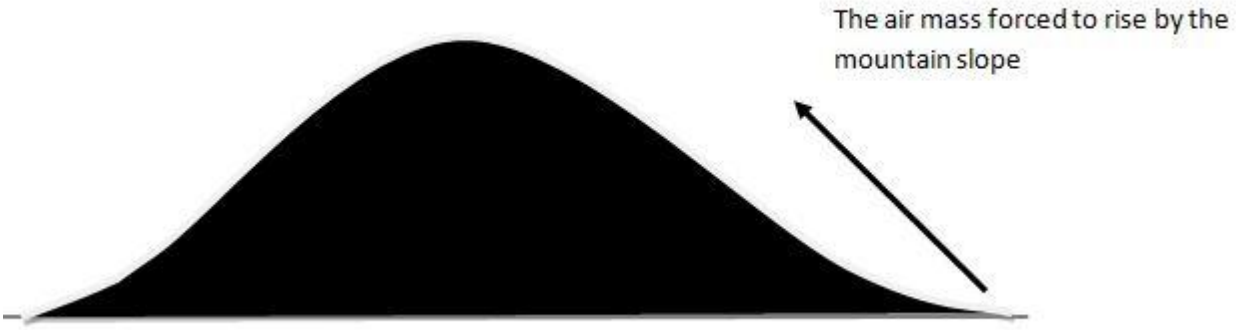
CAUSES OF AIR – MASS ASCENT.

Pockets of air are forced to rise several ways, which include;

i) When the air- mass is heated or warmed by conduction, air rises in conduction the heat energy which is reflected from the earth's surface warms the air resting above; then vertical convectional currents sets up. This phenomenon leads to the formation of convectional rain and it is common in the equatorial and tropical areas. The convection rain falls in the afternoon and is usually accompanied by rainfall and thunder.

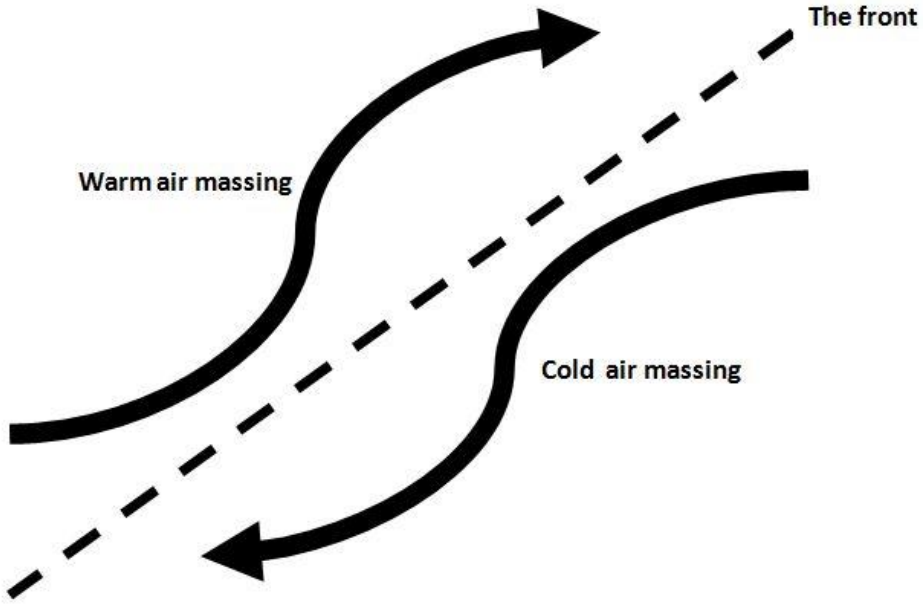


ii) The pocket of air can rise after being forced mechanically to rise up the slope incase the wind blows against the mountain side. The air mass that rises cools leading to condensation and later the formation of orographic rain, which is common in mountain areas like Kilimanjaro, Uluguru, Rungwe, Meru and Usambara in Tanzania.



Air rising or graphically

iii) The third way involves the situation where one air – mass, usually warm is forced by another mass of air which is usually cold. The warm air rises above the cold air creating a zone of contact in between them called front. In most cases of raising air a vertical element is introduced which is a form of convergent rotation. Under this situation a depression is usually created, which is associated with law pressure formation of clouds and rainfall formation.



It should be noted that when the air-mass is warm, it tends to expand and it always lighter, such that it keeps on rising above.

TYPES OF TEMPERATURE INVERSIONS

a) According to the causes, temperature inversions can be categorized into four types namely :

- Subsidence inversions
- Advection inversions
- Radiation (nocturnal) inversion
- Frontal inversion

i)Subsidence Inversion is formed where the air is descending in the high pressure zones. The sinking of the air leads to compression, which in turn causes temporary inversion at a higher level in the atmosphere. This type of inversion is also called high inversion and usually last a long time.

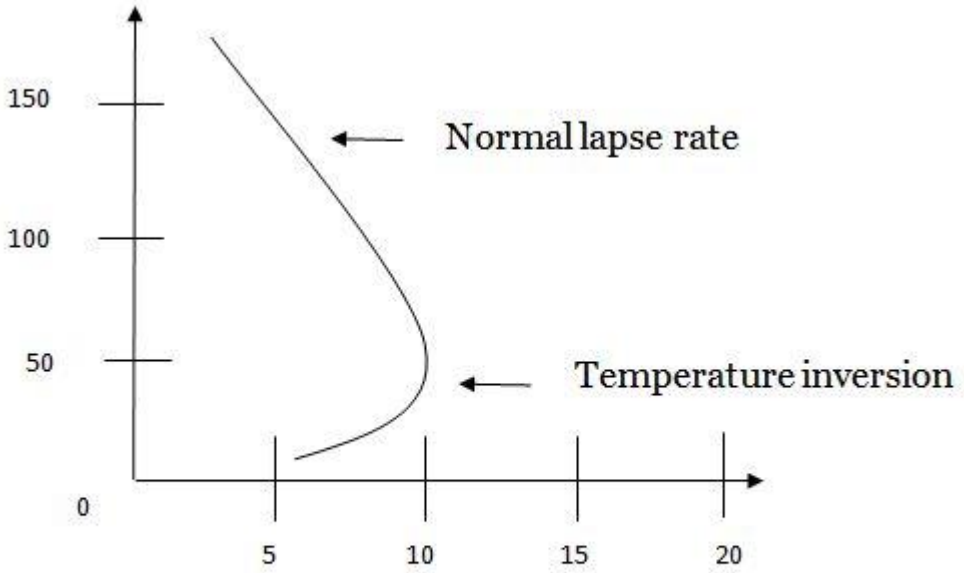
ii) Advection inversion is caused by a warm air mass advancing across the cold surface. The lower portion gets cold while the upper part remain warm this can happen over the colder sea in summer or over the land mass in winter.

iii)Radiation (nocturnal) inversion is the type of inversion that occurs during night when the land is very cold because of having lost most of the heat energy through radiation. Nocturnal inversion occurs exclusively over the land as the ground can cool much more quickly after sunset, than the sea. It is also called ground level inversion as it is near the surface. This type of inversion disappears when the sun rises in the Morning.

vi) Frontal inversion which occurs as a result of the formation of warm and cold front due to meeting of two air masses. The warm air rises over the cold air mass keeping the atmosphere above warm while near the surface.

b) According to the level of occurrence:According to level of occurrence temperature inversion can be classified as ground level and high level inversions.

i.Ground level inversion is the type of inversion that takes place near the surface of the earth due to cooling, caused by the lose of radiant energy into the space. The air near the surface tends to be cooler than the air above it. Since it is in contact with the cold surface. It takes place at night and disappears in the morning when the sun arises Nocturnal inversion is good.Example;



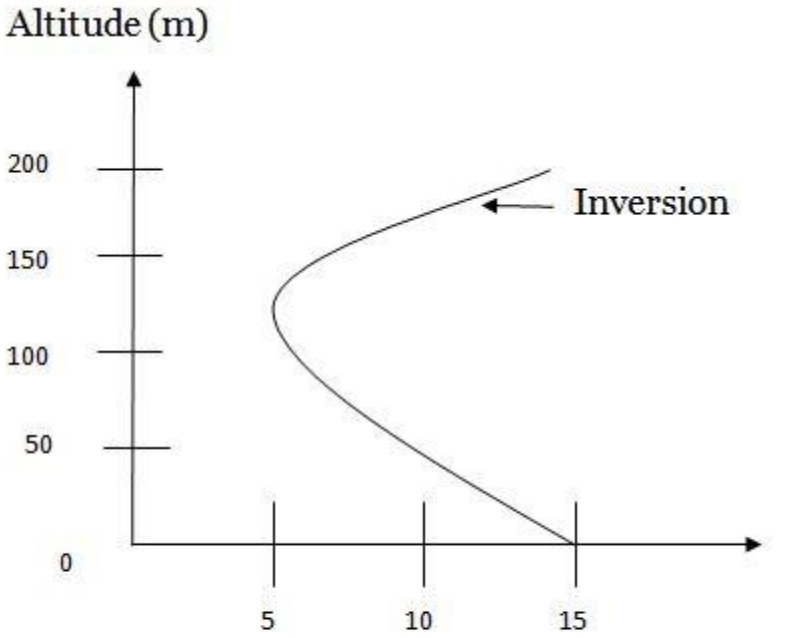
Ground level inversion

The above hypothetical diagram indicates that temperature inversion takes place near the ground level due to the influence of surface radiation such that as one moves from 0 to 45 meters above the sea level will experience the rise in temperature. After 45 meters of altitude the temperature starts decreasing at a normal lapse rate.

ii.High level temperature inversion

Takes place at upper levels of the atmosphere for example, after 145 meters above the sea level . It can be caused by air subsidence presence of water vapour or a layer of Carbon dioxide and

Ozone. It is usually last longer than the ground level temperature inversion.



High level temperature inversion

iii.The above hypothetical diagram illustrates that from 0 to 145 meters is above the sea level the temperature decreases with altitude at a normal lapse and after 145 meters it tends to increase with increase in altitude(temperature inversion occurs).

ATMOSPHERE

This is the this layer of gases held on the earth by the gravitation attraction.

Composition of atmosphere

Describe and explain the composition of the atmosphere atmosphere is composed of the following;

i. Mixture of various gases these included oxygen 21% nitrogen 78% Argon 0.09% and Carbon dioxide 0.03%others include neon, xenon, krypton helium and others in minute percentages

ii. Dust particle dust particles may be natural or artificial where natural dust particles are those caused by wind and volcanic eruption while arterial dust particles are those derived from industrial pollution

iii. Water vapour this is colourless, odourless gas in form of water which makes up a perfect mixture with gases. The degree at which water vapour is present in the atmosphere in termed as humidity water vapour condenses in term of rain snow, mist excess water vapour brings about capitation in form of rain snow, sleet and hail when water vapors is present in the atmosphere in small quantity extreme dryness of air many cause occur of hot desert.

THE STRUCTURE OF ATMOSPHERE

Atmosphere is divided into layers according to temperature these lases are

i. Homosphere and

ii. Heterosphere

A. HOMOSPHERE

This is the lower part of atmosphere running from 0-80km above the sea level. This layer has there sub layers which are Troposphere Stratosphere and Mesosphere.

1. Troposphere

This is the lowest part of homosphere found between 0-9miles or 0-15km above sea level, the layer is composed of gases water vapour and dust. All processes of rain formation take place in this zone and temperature decreases with altitude at a normal lapse rate. The lapse rate in Troprosphere is 0.6 ºC per 100 metres which is equivalent to 6.5ºC per 1000 metres rise. The lapse the result of the fact that the earth's surface is warmed by incoming solar rotation which in turn heats the air next to it by conduction, convection and radiation. The tropopause which forms the upper limit to earth's climate and weather is marked by an isothermal layer where temperature remains constants at -80ºC.

2. Stratosphere

This is the second part of homosphere lying above tropopause between 48 kilometres above the sea level. Much of the zone layer is concentrate within this zone particularly15 to 50 kilometres above the earth’s surface. Sometimes the term ozonesphere is used to refer the layer where there is concentration of ozone gases. Temperature remains unchanged with increasing height at tropopause but later it start to increase with height the lower stratosphere cover about 15 to25 kilometre from the earth's surface this is the layer in which temperature remain constant. This steady is case in temperature (temperature inversion) is caused by concentration zone (O_3) this gas absorbs incoming ultra violet (UV) radiations from sun. The stratopause which marks the upper limit of this zone is other isothermal layer where temperature does not change with increasing height.

3. Mesosphere

This is the third part of homosphere lying above stratopause between 48 to 80 kilometers above the sea level where temperature decreases with altitude up to -100ºC at 80 kilometers above the sea level. Temperature falls rapidly if there is no water vapour, clouds, dust particles or ozone to absorb incoming radiations. Thus this layer experiences the atmosphere lowest temperature and strongest wind. The mesopause like the tropopause and stratopause which is the upper limit of this zone records the minimum temperature that may fall to -100ºC and thus shows no further changes in temperature.

B. HETEROSPHERE

This is is the second zone of atmosphere where temperature increases with altitude from -100ºC at 80 kilometres to about 500ºC at 8o-5,000 kilometres above the sea level. The increase of temperature is assumed to be so because of lack of water vapour and dust particles zone. The upper part of this zone is called Ionosphere which is sometimes divided into exosphere and thermosphere. In the thermosphere temperature rises rapidly with height perhaps to reach 1500 ºC . This is due to an increasing proportion of atomic oxygen in the atmosphere which like ozone layer absorbs incoming Ultra Violet radiations.

TEMPERATURE INVERSION

Temperature inversion refers to the increase in temperature with height above the earth's surface. This phenomenon is a reverse of the normal lapse rate in the atmosphere; it is the exceptional lapse rate. This situation of increase in temperature with altitude is what called reverse lapse rate or abnormal lapse. In temperature inversion it means that, temperature in the air far above the ground.

CAUSES OF TEMPERATURE INVERSION

I. Presence of ozone layer in the atmosphere

Ozone in the atmosphere absorbs energy from the sun especially ultra violet(UV) rays. The reaction between these rays and ozone gives out heat whit warms the atmosphere from the ground surface.

II. Formation of fronts

This takes place when two air masses of different temperature meets. On meeting the warm air rises above the cold air. Under this situation two fronts are formed such that the warm front is above and the cold air leading to temperature inversion.

III. Air subsidence

When there is high pressure air tends to descend or sink down. The downward of air leads to compression or friction between molecules thus creating warm condition in the level.

IV. Atmosphere components

Water vapour and dust particles at a higher level, keep the atmosphere warmer than near the surface since it preserves energy from the sun for a longtime which leads to temperature inversion.

V. Advection

When the mass of warm air passes over the cold surface its lower part is cooled by the cold surface leaving the upper portion warm because of being far away from the influence of this cold surface.

VI. Radiation

Radiation of infra red energy from the earth's surface makes the ground cool very quickly. The cold surface cools the air immediately above leaving the other layer far above warm. For example; during clear settled weather, as radiation of heat takes place during the night the air on hill - slopes is rapidly cooled and thus dense air drawn down wards filling valleys or basins with cold air possibly at temperature bellow freezing point, when the upper slope are markedly warmer.

VII. Water vapour

Water vapour at higher altitudes keeps the atmosphere warmer than air the surface since it preserves heat energy for a long time. This also causes temperature inversion.

EFFECTS OF TEMPERATURE INVERSION

1. The warmer layer of air above the cold air may lead to increase in atmosphere stability and vertical air mixing as such the temperature is always calm with no precipitation. But when inversion occurs due to the development of precipitation and formation of cyclonic storm.

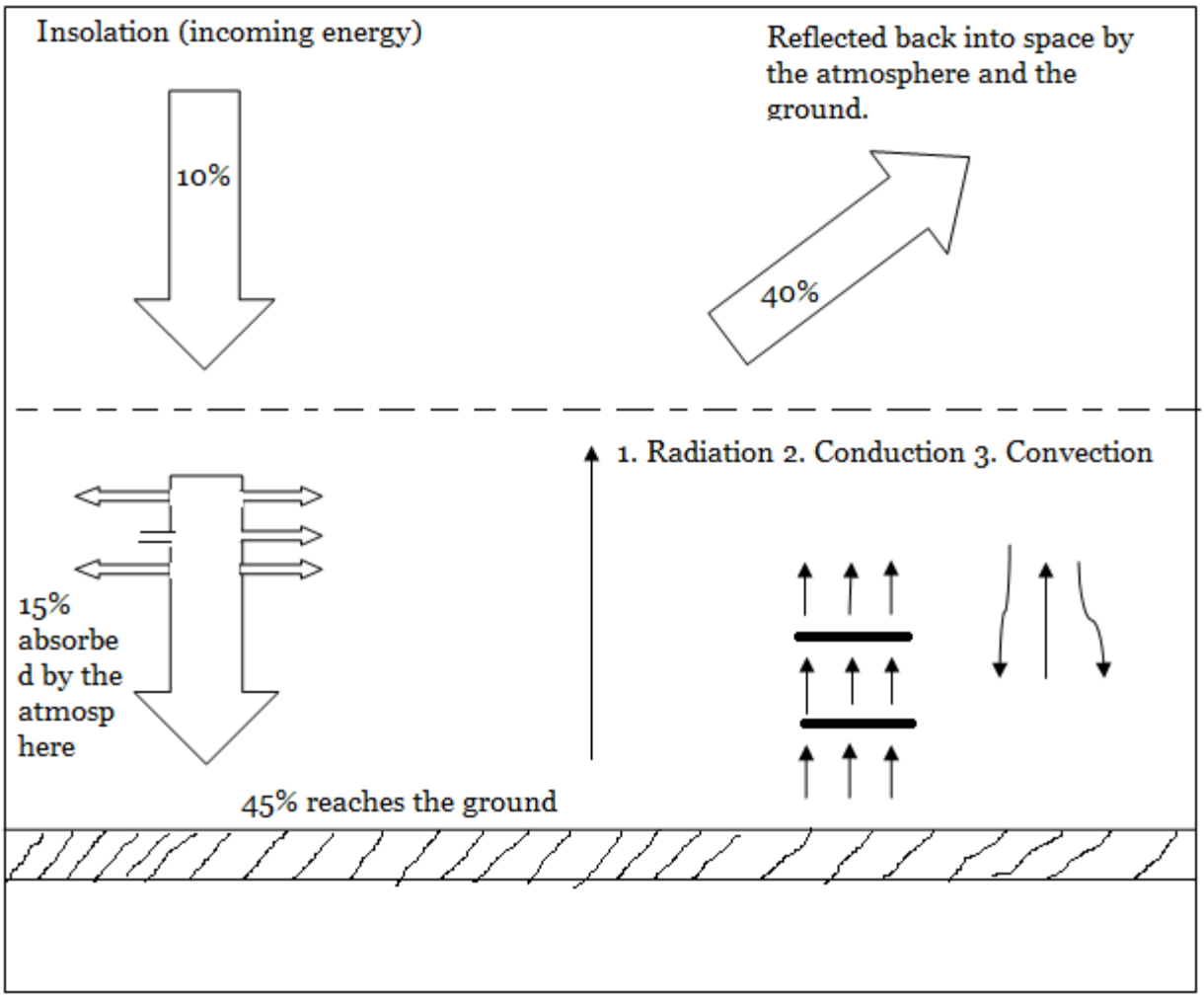
2. Temperature inversion leads to the formation of fog and smog. Smog is common in the industrialized areas with a of smoke which is produced from industries. The smoke so produced mixes with fog to from smog.

3. Air pollution takes place when there is temperature inversion.The air is polluted because of the sinking of particles which are hanging in the atmosphere due to the fact that the warm air above the cold air is less dense and thus not capable of holding the particles since they are denser than the warm air. The sinking down of air to the lower atmosphere level causes air pollution which affect human health, animal and plants. It can cause itching of body, inflammation of eyes and coughing.

THE HEAT BUDGET

The sun's energy is called insolation or solar radiation which turns into heat energy at the earth surface. Insolation travels through space from the sun inform of waves and interact with outer

edge of atmosphere before reaching the earth's surface. Total amount of solar radiation released from the sun is 100% since the earth is neither warming up nor cooling down, there be a balance between incoming insolation and outgoing terrestrial radiation. The atmospheric condition therefore reduces the amount of solar insolation through three processes;
1. By absorption: About 15% of total solar radiation is absorbed in the atmosphere by the atmosphere components. The greater absorbers are water vapour, dust particles and clouds.
2. By reflection: Certain amount of solar radiation is reflected back into the space by clouds, dust particles and ground. The amount of insolation reflected depends on the surface but the average reflection amounts to 40% of total insolation.



ALBEDO

Albedo refers to the percentage expression of the ratio between coming radiations and the amount reflected. Clouds and to a less extent, the earth surface are the principal reflectors of the incoming radiations back into space. The albedo varies with cloud type from 30-40% in thin clouds, to 50-70% in thicker stratus and 90% in cumulonimbus where only 10% insolation reaches the atmosphere below the cloud level. Albedo also varies over different land surface from less than 10% over oceans and dark soil, for 15% over coniferous forest and urban areas

25% over grass land and deciduous forests 40% over light coloured deserts to 85% over reflecting fresh snow. This reduces possibility at ice meet and disappears on mountain tops like Kilimanjaro.

THE OZONE LAYER

The ozone layer is found within the stratosphere and it sometimes re-termed as a shield of life. The layer is highly concerned with human and all other earth life and it sets in at an altitude of about 15km and even upward to about 55 kilometers. This layer serves as a shield protecting the troposphere and the earth surface from most violent rays or radiation from the sun. If these rays were to reach the earth directly, all bacteria exposed would be destroyed and animal tissues would be damaged.Destruction of this layer by some scientific discoveries has made the intensity of ultra violet rays reaching the earth surface to increase causing global warming. If this situation is left to continue, it will cause suffering particularly cancer , crop reduction in yield and killing of organisms on land, water and air.

FUNCTION OF ATMOSPHERE

1. It is an insulator: It moderates temperature during night winter.

2. It is a filter: It filters solar insolation through ozone layer and provides a layer through which meteors are burnt into gases.

3. It is a scientific field where radio, radar, television and other communication including air transport and telephones are done.

4. It has hydrological function where rainfall is formed.

5. It support its life through breathing in animals and respiration in plants.

CLIMATOLOGY

Climatology is the study of climate that deals with spatial distribution atmospheric phenomena. It mainly deals with definition and description of different climates in their geographical settings.

Meteorology is the study of weather. It is a scientific study of the physical process constantly at work in the atmosphere. It is highly applied in the forecasting of the future trend of the weather. It is a branch of Science which deals with the conditions of or within the atmosphere surrounding the earth.

Climatology and meteorology are the studies or the sciences which are concerned with the study of atmosphere and its elements like weather and climate.

CLASSIFICATION OF CLIMATES

By studying the weather, the atmospheric conditions prevailing at a given time in a specific place or area; it is possible to make generalization about the climate of that place or area basing on the

average normal condition over a period of time usually 35 years. In seeking a sense of order; the Geographers try to group together those parts of world that have similar measurable climatic characteristics in temperature, rainfall distribution winds, etc. Classification of climate is done in different systems.

- Greek's classification system.
- Germany climatologist classification system.
- Koepen's temperature zones classification system.
- Miller's classification system.

GREEK CLASSIFICATION SYSTEM

The early Greeks divided the world into three zones based upon a simple temperature description. A classification of climate by Greek is based on temperature control of the climate and they completely ignored precipitation. Under this approach climate is divided into:

i) Tropical climate where the amount of temperature is high.

ii) Temperate climate where the temperature is moderate i.e between the tropical and polar temperature condition.

iii) Polar climate where the temperature is extremely Low.

KOPPEN'S CLASSIFICATION SYSTEM

In 1918 Koppen advanced the modern classification of climate. To support his claim that natural vegetation boundaries were determined by climate, he selected as his basis what he considered were appropriate temperature and seasonal precipitation values.

The classification of climate by this approach is based on the duration above or below the value belt. By this approach climate is classified into the following belts;

- Tropical belt
  The climate having 12 months with temperature above 20^{o}C.

- Sub-tropical belt
  The climate having 4-11 months with temperature above 20^{o}C.

- Temperature belt
  The climate having 4 – 12 months with temperature ranging from 10^{o}C– 20 ^{o}C.

- Cold belt
  This involves those areas having 12 months with the temperature ranging from 10^{o}C to 20^{o}C.

- Polar belt
  The climate having 12 months with temperature below 10°C.

CLASSIFICATION BY GERMANY CLIMATOLOGIST

According to Germany climatologist, climate divided into the following types;

- Hot zone climate
  The climate with temperature isotherm of 20°C annually.

- Cold zone climate
  The climate with annual temperature isotherm of 10°C or below.

- Temperature zone
  The climate with temperature isotherm in between 10°C – 20°C.

MILLER'S CLASSIFICATION SYSTEM

In Britain, in the 1930s, Miller proposed a relatively simple classification based upon five latitudinal temperature zones which he determined by using just three temperature figures. This is the most popular method of climate classification today because it combines both maps of temperatures, showing temperature by means of isotherms and map of rainfall showing rainfall by means of isohyets. It shows a close relationship to vegetation zones and this it is easier to use and convenience.

- The structure of climate classification is as follows;

- Hot zone - With temperature above 20°C.
- Warm zone - With temperature ranging from 10°C – 20°C.
- Cool zone - With temperature of 10°C.
- Cold zone -With temperature near to 0°C .
- Arctic zone -With temperature near to 0°C and below.

CLIMATIC FEATURES

- Dry warm summers with offshore trade winds.
- A concentrated rainfall in winter with offshore westerly.
- Bright sunny weather with hot dry summer and wet mild winter.
- Presence of local winds around the Mediterranean Sea e.g. morocco and Muscat.
- Annual range of temperature is high about 11°C
- Rainfall is moderate about 838 mm and normally falls during winter and it is cyclonic rain type.
- Summer temperature is about 21°C and winter is 10°C, hence high range of temperature.

VEGETATION

Evergreen coniferous forest, Mediterranean bushes and grasses semi arid shrubs as well as grasses, evergreen Mediterranean forests.

ECONOMIC ACTIVITIES:

Crop cultivation due to high rain fall and moderate temperature, Animal rearing i.e. transhumance (pastoralism) orchard farming with different kind of fruits and vegetable (market gardening).

EQUATORIAL CLIMATE

This type of climate occurs as a belt around the world at about 5º North and South of the Equator but it is also found around 5º-10º North and South in some places. The continuity of this climate however is interrupted in several places by mountains such as Andes of South America and the East Africa high lands.

DISTRIBUTION OF EQUATORIAL CLIMATE

Zaire and Congo basin, Amazon basin, East Indies, South Ivory Coast, and Western Coast Nigeria, Eastern Coast, Malaysia and North eastern Australia.

PROBLEMS OF CLIMATE CLASSIFICATION

Classification of climate poses more difficulties since there is no clear boundary due to the fact that climates are Transitional. Thus all classifications have weaknesses, non is perfect because;

- They do not show transition zones between climates, and after the division lines are purely arbitrary.

- They do not allow for mesoscale variation such as the lake and district or microscale variation (local variation).

- They can be criticized for being either too simplistic (miller) or too complex.

- They ignore human influence and climatic change both in the long term and the short term.

- Most tend to be based upon temperature and precipitation figures, and neglect recent studies in heat and water budget, air mass movement and the transfer of energy.

- All suffer from the fact that some areas still lack the necessary climatic data to enable them to be categorized accurately.

GENERAL CLASSIFICATION OF CLIMATE

A: **MEDITERRANEAN CLIMATE**

The warm temperature Western margin or the Mediterranean climate is confined in the Western margin of continental landmasses between latitude 30º-40º North and South of the equator.

Areas involved

Central Chile, California, Cape Town, Southern Austria, South West Australia, San Francisco, and parts of Morocco.

CLIMATE CHANGE

It has been noted that a certain area experience a certain climatic condition. Therefore any deviation from the expected condition denotes for a climatic change. There are several evidences of climatic change. These include; rocks are found today in areas which seems to have a different climatic condition under which they formed, fossil landscape, sea level changes, shifting of vegetation belts Sahara, etc.

CAUSES OF CLIMATE CHANGE

For the factors or causes of historical climatic change, refer to the theories which explain the ice ages.

Note: However today the world is experiencing the so called "Global warming" Scientists have reached a consensus on this point of global warming as a published by the International Panel on climate change (IPCC).

Global warming may refer to the world wide increase in the lower atmospheric and terrestrial temperature. This may be as a result of increase in the concentration of one or more greenhouse gases (GHG) as well as the Ozone layer depletion. Global warming is mainly theory asserts that the increasing levels of GHG will progressively trap more of the Earth's heat, gradually warming the global climate as much as 3 to 9 degrees. However the reasons which have been put forward to explain the scenario are related to those activities which pump the GHG into the atmosphere. Therefore man through different activities carried out for his triggers off climate change.

The Marjory include;

CFC's and Halons: Scientists first suggested in 1974 that the worldwide use of CFC's and halons could be destroying the Ozone layer.

In 1982, British scientist for the first time documented the existence of a large hole in the ozone layer over the Antarctica that had been theoretically predicted earlier. In this case the emitted CFC's and halon react with the ozone in the stratosphere to be depleted which formally absorbed some incoming radiation. CFC's is emitted from coolants in air conditioners and refrigerators, propellants in aerosol spray cans, cleaners for electronic parts such as computer chips, production and burning of plastic foam products.

Fossil fuel burning: Like coal burning in industries before the introduction of alternative energy source; this could emit large amounts of GHG such as carbon dioxide and methane into the atmosphere. The industrial revolution sparked off the extraction of the coal to run the machines or industries which had sprung up. The perpetual burning meant continuous emission of carbon dioxide and sulphur hence contributing through the greenhouse effect.

Deforestation: This involve the clearing of vegetation and burning of grassland for either establishment of settlement/industries or agricultural activities. This results into the accumulation of carbon dioxide which would have been taken up by plants.

Cultivation of rice: This is couple with the release of methane gas into the atmosphere.

Livestock farming: Animals like cattle produce methane gas due to their microbial fermentative reaction. Therefore the dumping of cow dung will release too much methane as it decomposes. Animal husbandry is thought to be responsible for much of the increase.

Ozone layer depletion: The chemical reactions which take place between the GHG may break down or deplete the ozone layer. This makes it thinner or drill a hole making it easier for more insolation to pass through to reach surface. Therefore the more insolution reaching the Earth's surface, the more the temperature will increase hence climate change.

Industrialization: Some industries emit GHG into the atmosphere to change the climate through the greenhouse effect as well as reacting with the ozone layer.

Transportation: Automobile emit carbon dioxide during the combustion of fuel in the engine which act as GHG to contribute the global warming.

EFFECTS OF CLIMATIC CHANGE

The effects we feel or observe are rarely, if ever, the effects of a single factor, they are combined impacts of the whole of factors (pollutants) acting over the total life span, and frequently the effects are synergistic. For instance both plant and animals may be so stressed by climatic change and become vulnerable to other environmental factors such as attack by parasites and diseases.

Given the complexity of this situation, it is extremely difficult to determine the effect of any particular factor. Nevertheless some significant progress has been made to link climate change and some effects, these may include;

Soils: Higher temperatures could reduce the water holding capacities and increase soil moisture deficits. It should be noted that climate change will alter the chemical, biological and physical properties of the soils. The expected temperature raise and related prolonged droughts will increase the rate of soil organic matter decomposition thus accelerating land and soil degradation. This will escalate soil fertility depletion result into low productivity. On the other hand, the anticipated floods in highland areas will accelerate run off and soil erosion.

Flora and fauna: Higher temperatures and increased water deficits could mean loss of several species. This is because the exiting flora and fauna cannot adjust drastically to acclimatize to the new climatic conditions.

For instance the increasing temperature may affect the aquatic animals like fish which are used to cool/cold environment. In which addition to that, the change in climate will change in the quality of the different habitats and consequently all the flora and fauna in them. The habitats may include; wetlands, forests, etc.

Agriculture: Agricultural activities which entirely depend on rainfall will be hit by climate change such as prolonged drought, unreliable rainfall are evident in some areas. Droughts lower the productive capacity of rain –fed agriculture hence reducing the agro exports, increasing food prices, nutritional deficiencies and destabilize the macro economies. Cereals will be hit by dry seasons hence a reduction in the production of crops. For instance according to NAPA (2007), in the Lake Victoria basin in Tanzania, maize productivity is estimated to reduce by 17% due to the anticipated climate variability manifesting in form of temperature raise and reduction in rainfall.

The increase in the number of pest and diseases due to climate change is a set-back in the agricultural activities.

Coastal regions: Rise in sea level, increase in height of storms result into more flooding especially around estuaries. Flooding affects housing, industry, farming, transport and wildlife. Flooding increases the susceptibility of water borne diseases along lake shores, coastlines, and other places liable to flooding. For instance in Uganda the outbreaks of malaria, bilharzia, and other water borne diseases were reported to as often occurring during and immediately after floods, (Ugandan NAPA 2007), According to the Tanzania NAPA (2007), Malaria prevalence has been reported tom occur in areas where it was not commonly found in the previous decade for example in some parts of Kagera, Musoma, Mwanza in Tanzania; Kisumu and Kiisi in Kenya. In addition to the even the ice caps for instance on the Kilimanjaro Mountain has tremendously reduced as a result of accelerated ice melt.

It is also anticipated to accelerate the popular ice cap melt too. During the century, sea level rose about 15 cm (6 inches) due to melting of ice and expansion of warmer waters. Models predict that sea level may rise as much as 59 cm (23 inches) during the Century, threatening coastal communities, wetlands, and coral fees. Arctic sea ice is melting. The summer thickness of sea ice is about half of what it was is 1950. Glacier and permafrost are melting for instance over the past 100 years, mountain glacier in all areas of the world have decreased in size and so has the amount of permafrost in the Arctic.

Water: Water is most likely to become scarce due to the increased rates of evaporation as well as the variation in the rainfall pattern in some areas. The anticipated climate variability in form of long droughts will worsen the availability of and accessibility to clean water particularly the poor or those who depend on rivers, streams, boreholes. This is because such source may be dried out or lowering of water levels, in springs, rivers, underground aquifers. Communities will veer to any available water irrespective of its quality hence pausing a danger for water borne diseases, harden the production of hydroelectric power, limit water transport. For instance the declining

water levels of lake Victoria in 2002 to 2004 left many boat landing sites and harbours high and dry thus affecting water transport negatively; the extension of the Owen falls dam (Kiira and Nalubaale) opened in 2000 appears to have been designed to operate with conditions of high average water levels seen between 1960 1990 basing on the inability of the power plant to operate at full capacity during the low water levels of 2002. In Tanzania, the power cut off was extreme also as the mega like Kidatu could not operate at full capacity. This was portrayed through a more than 12 hours cut off.

Tourism: It predominately depends on the beautiful glamorous natural features like mountains, habitats and associated flora and fauna. Climate change will distort the natural environment to as well affect the tourism sector negatively. To make matters worse, floods may destroy the roads to access the distant tourist sites. This is because most of the tourists attraction sites are located in the remote areas of which their roads are impassable during the rainy season. Since the rainfall pattern is unreliable and unpredictable, this will impede the movement of the tourists to such sites. The scenario will ultimately slump the economies which depend on tourism.

Climate change will affect all the different sectors of a country and ultimately the micro economical status of the greatly affected areas or countries more so the developing countries. This is because they may not be robust enough to cope up with the changes hence rendering them variability and change.

Strategies to address Climate change.

It is responsibility for all people at a household or community level, NGO's, government, regional groupings, and the international community at large to strive to reverse the situation. This is because everyone contributes to the existence of the problem though the magnitude of contribution differs. To make matters worse, the effects cut across i.e affects all. However it may be difficult to reverse the situation but the efforts should revolve around strategies to adapt to the climate changes as well as reducing the emission of GHG.

Some of the avenues to fight climate change may include,

Renewable energy sources: Countries should adopt the use of renewable energy resources such as solar, nuclear, biogas, geothermal, etc which are environmentally benign.

In this case they should advocate against the use of fossil fuel such as coal, petroleum and natural gas which emit the GHG.

Afforestation: people should indulge in the policies which encourage the plantation of trees such as agro-forestry. This is because they act as carbon sink to minimize the amount of the carbon dioxide in the atmosphere.

Ambient standards: The International community should agree on the maximum amount of GHG to be emitted by a source point like an industry. In the extreme cases where the GHG can't be curtailed, the strategy may be inevitable.

Use of ethanol or gasohol: The vehicles and other automobiles may replace petroleum with the use of ethanol and gasohol Biomass from sugar cane can be used for the production of ethanol which replace the usage of fossil fuel (petroleum inclusive) this will minimize the GHG which could be emitted the combustion.

Abatement policies: Countries should be stringent on those who emit more than the ambient standards. Abatement policies my involve the pay or cost to cater for the damage caused by the extra emissions the cost as disincentives to pollution.

Comply to the relevant Conventions: signatories should implement accordingly. For instance the 1985 Vienna Convention on the protection of the ozone layer Depletion. The convention requires parties to take concern to the assessment of the cause, effects of ozone layer depletion as well as transmission of information and exchange of information and Technology to reduce ozone layer depletion.

Note; the convention was amended in Montreal 1987 to become the protocol on substance that deplete the ozone layer. It was later revised in 1990 in London and Stockholm in 1991.

It represents a much more significant agreement than the convention.

It sets a firm target for reducing and eventually elimination of consumption and production of a range of ozone depleting substances. It recognizes the equity of treatment of all Nations that produce ozone depleting substance including the developing countries which produce less.

The protocol also deals with the problem of non- parties by banning trade in ozone depleting with those states to control the use.

- Produce less ozone depleting substances. This is attained through technological transfer.
- Restrict the importation of ozone depletion substances through identifying and monitoring mechanism. For instance Revenue authorities like TRA, URA jointly work with the Environment authorities like NEMA, NEMC in Uganda and Tanzania respectively. In this case, the environmental authorities specify the ozone depleting substances while the revenue authorities escalate the taxes to narrow down the importation.
- Research and education of the stake-holders about the substances. This will also increase on the number of technical officers to ease the monitoring.
- International cooperation through the sharing and transfer of information.
- Establishment of incentives like subsidy to encourage the use of substitutes and disincentives to prohibit the of ozone depleting substance through taxation.

There are very many key players toward the adaptation to the climate change and chopping of GHG emissions.

5.3 SUSTAINABLE USE OF FUEL AND POWER

Exploitation means the use of something in order to get an advantages from it

Power mean rate at which electrical energy is converted to other form such as motion, heat

Energy is the ability or the capacity of doing work

Uses of energy

- Ø Energy is used in running machine in industry
- Ø Energy is using in cooking, warming the bodies

Classification of energy

Energy resources can be classified into two ways and that is

i. Renewable resources

ii. Non- renewable resources

Renewable resources are resources which can be replaced after being used and sustainable for example HEP, tidal energy, solar energy – Biogas

Non – renewable energy this are known as exhaustible resources, these are resources once used up they can not be replaced for example coal, petroleum, natural gas, fuel wood and nuclear energy resources

NB.

Non – renewable energy sources

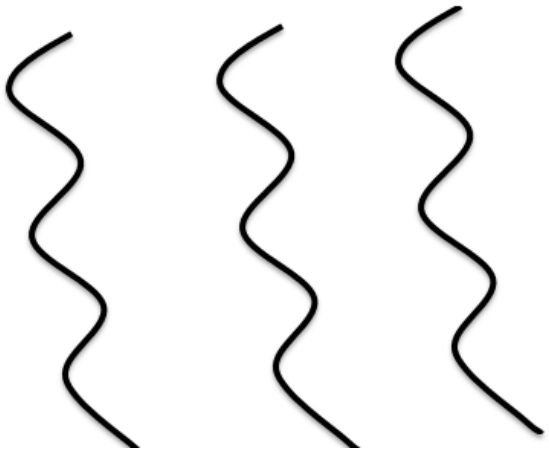
Coal is the ward old from old English term by means mineral of fossilized carbon by meaning coal is the black or brown rock which consist of carbon usually occur in rock strata in layers or veins, and this coal happen as a result of vegetative matter being deposit and compressed by being subjected to high pressure, heat and pressure turned vegetative matter into coal. Coal is the

one of oldest sources of fuel used by man kind about 3000 million of years ago through history coal has been used as an energy resources, primary burned fan the production electricity and heat is also used in industry purpose example refining metals, coal formed by dead plant matter is converted into lignite than sub-bituminous coal after that subtiminous coal lastly anthracite this involved biological and geological process that took place over long periods of time about million of years

TYPES OF COAL

Ø **PEAT**

It is not a true coal but make a first stage of coal formation it is brownish fibrous substance, which has been formed as a result of partial decomposition of vegetative matter compressed by over-lying layers of silt



The first stage of coal

It has a lot of moisture a big content of volatile matter with carbon making only one third of it bulk and has law heating value in some part of USA use as a domestic fuel and this mainly decompose in USSR, USA and Canada

Ø **LIGNITE.**

Is the second stage of peat it has high content of moisture with carbon less than 4% it still retains brownish woody appearance but more compact that peat it gives only moderate of heat and break up easily when exposed to air

Ø **BITUMINOUS**

It hard black compact coal with a carbon content of between 40% between 15% and 40% it has a very high calorific content calorific value and its further classified into gas coal, value and its further classified into cooking coal

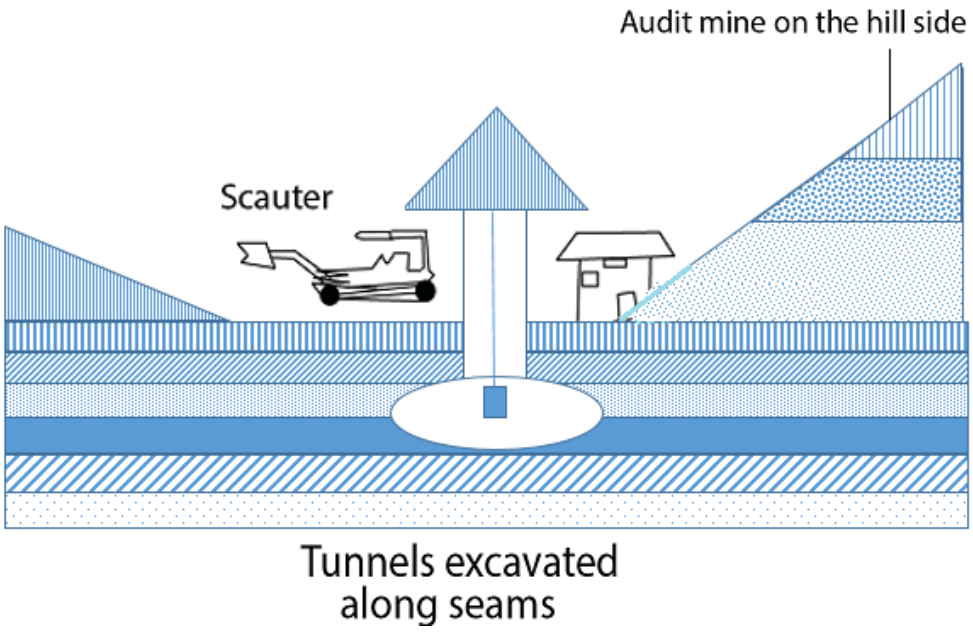
COAL MINING METHOD

i. Open cast mining method

It is also know as striping mining method and it is the most economical way of mining coal. It is used where se…….. are near the surface and the top layer of soil is removed and then quarried by mechanical excavator

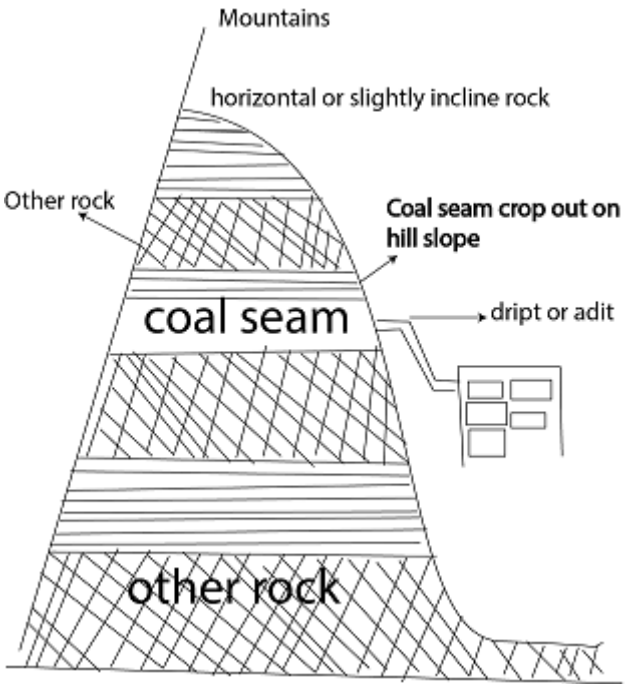
ii. Shaft mining method

It involved the sinking of vertical shaft down the level and seams then horizontal tunnels (galleries) are made from the shaft as the coal seams are dug out is the most common type of mining method. It is commonly used provided the seams of caol



iii. Admit or drifting method

It is used to extract coal from the horizontal or gently slopping seams that out crop along the valley or hill sides. It is commonly used to extract coal in the valley of Appalachian mountains



ADVANTAGE OF COAL

i. It used to produce other energy sources like oil and gas example South Africa is using coal to producing oil at sasolgurg (sasolgurg)

ii. It has promoted industrial development like of iron and steel and the manufactured of locomotives and ship

iii. It has promote the development of transport system like rail, ways and road

iv. It lead to the creation of employment opportunities

v. It has facilitating domestic activities like cooking, warning

DIS – ADVANTAGES OF CAOL

i. It is non-renewable resource's once exhausted it can not be replaced

ii. It lead to air population by emitting carbon-dioxide, which leads to global warming and sulphur dioxide, which lead to acid rain

iii. Destruction of land space

iv. It is heavy and bulky; thus it is difficult and costly to be transported

v. It use a lot of capital to exploitation leading to the decline of other sector

COAL IN CHINA

China rank the third in terms of both total production and reserves of coal. Coal in China was used as far back as 3000 years ago. The types of coal found in China includes bituminous, anthracite and lignite

In the country, coal found almost in every province; but actively exploited in the following principle areas

a. In shanks and shanks 1 and Shaanxi regions. The two greatest amount of coal and account for over 47% of China's coal reserves

b. Inner Mangolia; it accounts for 25% of China's total coal reserves. The main mining centers in this region are fen he(fenho) valley, Ningwu and along in the tatting loses plateau

c. Manchurian coal field, it is in the provinces of Jerkin (kiiin) Heilongjiang (hillungkiang) which support the industries which make steel, machinery, tractors, electrical apparatus, car and air craft

d. Sichuan (Szechwan) basin; it is where the deposits are extensive but rarely occur near the surface they support a wide rang e of light of and heavy industries around chungking and Chengdu areas

e. Other coal deposits of lesser amount include, Guizhou, Jiangx1 and Hunan

FACTORS WHICH HAVE FACILITATED THE USE OF CAOL AS A SOURCE OF ENERY IN CHINA

1. The presence of large deposit of coal almost in all provinces

2. The presence of heavy industries which needs great amount of power to run effectively these industries have provided steady market for coal

3. The use of mechanized methods in the extraction of coal due to the advanced level of technology in China. It has to bear into mind that in China are highly developed in technology

4. Depth of coal deposits has been another factor in some places like Fushun and Fuxin cheap open-cast methods are used in the extraction of coal. Since the deposits lie near the surface.

5. Labour available /availability due to high population of over 1.3 billion in the country hence labour has not been a big problem in the coal mining sector

IMPORTANCE OF CAOL MINING IN CHINA

1. It has stimulated the development of industries in the country like metallurgical industries in Heilongjiang province

2. It has provided employment to many people in the country reducing the problem of unemployment in such most populous country in the world

3. It has contributed to the generation of the government revenue and creation of capital to be invested for further economic development in country

4. Coal mining has stimulated the development of transport and communication systems like rall way line's roads etc there are car industries, shipbuilding industries and other transport- oriented industries which have developed as a result of the impact of coal mining

PROBLEMS ENVOUNTERED IN THE EXRACTION OF COAL IN CHINA

1. In some places the deposits are becoming deeper leading to the rising of expense of coal extraction

2. Some coals seams in some places like Mongolia are folded or faulted crating problem in extraction

3. Some deposits are so scattered like in the Sichuan coal fial fields

4. Coal is an unclean source of energy that creates some health problems in the process of extracting

COAL IN TANZANIA

Tanzania has a large resources in the South west of the country in the Ruhuhu Basin the Kete waka – Mchuchuma area and Songwe – kiwira area there are active mining taking place in Songwe – Kiwira to supply coal to the cement industry in Songwe.

The resources at the Ruhuhu basin and the Kete waka- Mchuchuma areas are estimated to be at over 5000 million tons of recoverable high quality coal at Songwe- Kiwira the reserves are estimated to be over 20 million tons. In this zone lies the future potentral for development of heavy industry in East Africa

Mchuchuma- Kate waka is the leading coal field in Tanzania it has coal that could generate about 400MW

IMPORTANCE OF CAOL IN TANZANIA

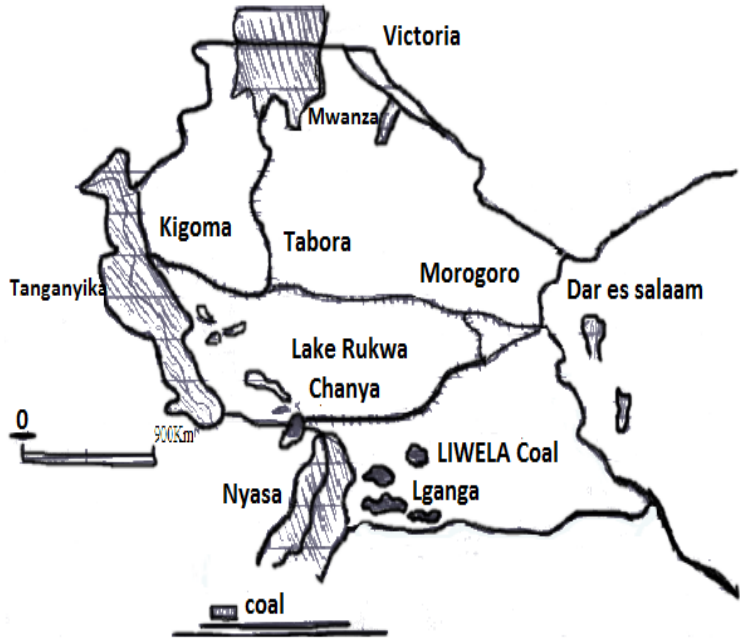
1. It will stimulate the development of iron and steel industry in Linganga where there are iron are deposits this kill lay a strong base for a large scale industrialization

2. It will lead to the creation of employment opportunities and hence solve the problem of un-employment there are some people who are already employed at Songwe- Kiwira coal mining area

3. It will father stimulate the development and expansion of the transport systems like road and railway

4. It stimulate/promote supply of energy for home use and local iron smelting industries like SIDO and other industries like Mbeya cement

5. Some of coal is export to other countries like Zambia and Congo leading to the earning of Foreign currency



THE DRAW BACK FACING COAL MINING IN TANZANIA

1. There are inadequate capital to be invested in the coal mining sector since Tanzania is economically poor

2. There is low industrial base, hence the market for coal is very low this discourages heavy investment in this sector

3. There is poor transport network in the country and the mining sectors are not well served with roads or railway

DECLINE IN THE COAL

In the past coal was in a high demanded in the international market. For example by 1900 coal accounted for almost 90% of the world's power requirements, but today very little coal enters the international market due to the decline of demand for coal the demand for coal has been declining due to the following reasons

- Coal has low calorific value compared to other sources
- It causes a lot environmental problems like land and air pollution
- Higher costs(costs) of production because some of the coal spams lie quiet for below the surface the surface and thus require more expensive methods to be exploited like that of shaft method
- Coal is costly to be transported because of being heavy and bulky
- Competition from other alternative energy sources which are more efficient and environmentally friendly like HEP

CLIMATOLOGY

CLIMATOLOGY

WEATHER, CLIMATE AND NATURAL REGIONS

Weather is the atmosphere condition of an area recorded within a short period of time which can be day after day or week after week or after a certain period of time.

The weather condition of the area is determined by recording to the behavior of weather elements such as temperature, humidity, sunshine cloud cover, rainfall, wind etc.

Climate is the description of the atmospheric condition which is recorded over a long period of time which can be above 30 years.

It is determined by measuring or recording the behaviors of weathers elements within a long period of time.

Climatology is the science which involves analysis of spatial distribution of atmospheric phenomena. It is a scientific study of different processes and conditions taking place in the atmosphere.

Micro- climate refers to the atmospheric condition of a small area which is different from the surrounding area.

Isolation is the solar radiation from the sun received in the atmosphere and on the surface of the earth or it is the total energy generated from the sun and received in the atmosphere and on the surface of the earth.

Weather station is the place where all elements of weather are observed, measured and recorded.

Weather forecasting is the practice of predicting future weather condition of the given area. It can be done into two ways

i. Traditional ways

ELEMENTS OF WEATHER

1. TEMPERATURE

Temperature is the degree of hotness or coldness of an area or a body.

Temperature is measured or expressed in terms of centigrade's

Temperature of the earth's surface originates from the sun and it called solar energy. Solar energy when reached on the earth's surface is transformed into heat by the land and the atmosphere before it reaches the surface of the earth.

The amount of incoming solar radiation or isolation received in the area depends on intensity and duration of radiation from the sun. There are determined by both angles at which sunrays strike

the earth and the number of day light hours. The two fundamental factors plus the following five factors determine the temperature of any given area on the surface of the earth.

Other factors which influence temperature are;

i. Earth's inclination (angle of the sun towards the earth)

The axis of the earth that is the imaginary line connecting the North Pole through the South Pole always remains in the same position.

It is titled at about 23.5 away from the perpendicular. Every 24hours the earth rotates once at that axis, while rotating the earth slowly revolve around the sun in a nearly circular, annual orbit. If the earth was not titled from the perpendicular, the solar energy received at given latitude would not vary during the course of the year. The rays of the sun would strike the equator and all other parts of the earth equally. When the Northern hemisphere is directly titled towards the sun, the vertical rays of the sun are felt as far North as 23.5 North latitude. Tropical of cancer and this occurs on June 21st and it is called summer solstice, and also winter solstice in the southern hemisphere.

ii. Cloud cover

Clouds which are denser concentrated normally tend to reflect a great deal of energy light, colored surface especially snow cover also serve to reflect large amount of solar energy, therefore the amount of cloud cover amount of sunrays that would reach the surface of the earth. More cloud cover reduces the amount of heat on the surface of the earth. Energy is lost through re-radiation as well as reflection. In re-radiation process the earth's surface act as a communicator of energy, the energy that is absorbed into the land and water is returned to atmosphere in the form of terrestrial radiation.

iii. Nature of earth's surface.

Some kinds of earth's surface materials especially water stone solar energy more effectively than others. Because water is transparent solar rays can penetrate a great distance below its surface. If water currents are present, heat is distributed even more effectively.

The land surface are opaque, so all the energy received from the sun is concentrated at the surface therefore the temperature of the earth between water bodies and the land is different where by the land earth experience more high temperature than the water bodies. Because the earth's heats and cools faster than water, hot and cold temperature are recorded on the earth or on the land and not in the sea or water bodies.

iv. The distance of elevation above the sea level

The temperature on the surface of the earth vary with the variation in altitudes but in every 100m rise above the sea level, the temperature decreases to the rate of 0.65^{-} and this process is called temperature lapse rate.

v. The distance from the sea

Note that, coastal areas have lower summer temperatures and higher winter temperatures than those places at the same distance from the equator excluding sea coasts. This difference in temperature during different season is influenced by water bodies.

vi. Ocean currents

Ocean currents are divided into two types as;

a. Warm ocean currents: warm ocean rises the temperature over the areas they flow

b. Cold ocean currents lowers the temperature of the areas they flow

TEMPERATURE LAPSE RATE AND TEMPERATURE INVERSION

Temperature lapse rate

A temperature lapse rate is the atmospheric condition where temperature decreases with an increase in altitudes. It is mostly found in troposphere and mesosphere. There are two types of temperature lapse rate.

i. Normal lapse rate

It is also called environmental or static lapse rate. It refers to the decrease in temperature due to increase in altitude in the rate 0.65☆ for every 100m above the sea level.

ii. Adiabatic lapse rate

Is the rate of decrease in temperatures with the rising air mass. It is divided in two types.

a. Dry adiabatic lapse rate (DALR) / un saturated.

It is the rate of cooling of a rising dry at the rate of 1☆ per 100m or 10☆ per 1km.

b. Wet adiabatic lapse rate (WALR)/saturated

It is the rate of cooling of a rising saturated air at the rate of 6☆ for every 100m

Temperature inversion

Under normal situation from environmental situation atmospheric temperature decreases with increase in altitude but in some occasions, Atmospheric temperature tends to increase with increase in altitude.

Temperature inversion is the atmospheric condition where temperature increases in height or altitude. It is mostly observed in stratosphere and thermosphere.

In stratosphere, temperature increases due to concentration of ozone layer or ozone gas which absorbs incoming solar radiation from the sun and converting it into heat energy making the upper part of the atmosphere to be more heated than the lower parts.

In thermosphere temperature increases with increase in height due to concentration of atomic oxygen and presence of electrically charged particles which absorbs incoming solar radiation.

Causes of temperature inversion

i. Presence of ozone gas

In the atmosphere the gas absorbs solar radiation and changing it into heat which eventually increases the temperature on the upper part of the stratosphere and other layers of the atmosphere.

ii. Presence of atomic oxygen gas and electrically charged particles

In the thermosphere these gas and particles increases heat on the atmosphere as the altitude increases.

iii. Terrestrials radiation

During night, there is no sunshine thus the earth's surface especially the land looses heat more rapidly and this makes warm air to be uplifted or rise up from the land. The process warm up the upper part of the atmosphere increasing the temperature as the altitude increases.

Along wave radiation is responsible for this process.

iv. Convergence of air masses(formation of air fronts)

Convergence of air masses of different temperature condition makes warm air to be forced up by cold air which descends from the atmosphere to the surface of the earth.

v. Presence of water vapour(atmospheric components)

Clouds, dust and other materials on the atmosphere which reflects and absorbs incoming radiation from the sun changing them into heat energy which lattes warm up the atmosphere.

SOLAR RADIATION

Weather results from the interaction of solar radiation on the earth's atmosphere and the earth's surface. The two movements (rotation and revolution) explain the changing elevation of the sun as well as latitudinal and seasonal variations in length of the day, receipt and escape of radiation and weather.

The sun is the source of all energy on the earth's surface. Only a portion of sun radiation reaches the earth's surface as direct radiation. The remainder being reflected, absorbed or scattered by the atmosphere or atmospheric components, therefore the sun emits almost 100% of the heat but all of it reaches the surface of the earth' as shown below;

The total amount of solar radiation received on a horizontal surface is about 43%. Out of this 27% penetrates directly to the earth's surface and 16% arrives as the diffuse sky radiation. So 43% reaches the ground together. The atmosphere including clouds absorbs 15%, the remaining 42% is reflected back into space, which represents the albedo of the earth. The ground which accounts for 33% and the defuse reflection which makes up remaining 9%

It is noticed that defuse radiation towards the grounds (16%) considerable greater than the returned to space (9%). This difference due to the fact that the larger dust particles scatter more radiation the direction away from the sun than the direction towards the sun.

In the figure the radiation received by the earth and atmosphere is counted positive (+ve) and the radiation emitted or reflected and scattered to space is denoted by negative (-ve).

42% of incoming solar radiation is returned direct back to the space and the remaining 58% is absorbed by the ground and the atmosphere.

This 58% must be radiated back to space since the yearly mean temperature of the earth as a whole remains the same. The radiation from the ground is called effective radiation.

The 24% represents the different between the actual radiation from the ground and radiation from the atmosphere to the ground. Out of these 24%, 16% is absorbed in the atmosphere while 8% returns directly to the space. The other 50% is radiated back to space by the atmosphere.

TERRESTRIAL RADIATION

Terrestrial radiation is the radiation from the earth (from the land masses and water bodies)

The radiation emitted from water and land is a long wave radiation and the radiation from the sun to the surface of the earth and to the atmosphere is a short wave radiation.

2. ATMOSPHERIC PRESSURE AND WIND SYSTEM

Atmospheric pressure

Atmospheric pressure is the downward force exited by weight of our per unit area of the earth's surface.

The distribution of it is not the same in all regions hence it differs from home time and from one place to another place.

Factors affecting atmospheric pressure

i. The vertical height above the earth's surface (altitude)

The atmospheric pressure varying with the variation in altitude whereby on the surface of the earth. It decreases due to increase in the altitude.

Therefore near the sea level, pressure is higher than mountainous areas.

ii. Temperature radiation from one places to another causes variation the atmospheric pressure. When air is heated it becomes less denser and it rises up causing a low pressure zone and when it cools. It contracts hence start to exert high pressure

iii. Overhead sun (apparent movement of overhead sun)

When the sun is overhead in the tropic, it creates a considerably seasons change of atmospheric pressure over the earth's surface in the respective area. And during that time, the rate of insulation is high resulting to low pressure as the air is heated and expand. Other areas which are not experiencing overhead sun, the insulation is low resulting to the cooling of air which creates a high pressure zone.

iv. Latitude

Atmospheric pressure varies from one place to another depending on the latitudinal position of an area, example in equatorial regions there is low pressure due to high solar radiation caused by high temperature at the equator.

In polar area, there is high atmospheric pressure because of low temperature caused by little insolation from the sun.

v. The earth's rotation

Rotation of the earth causes day and right which results to the variation in atmospheric pressure as the earth is inclined at different angle towards the

Wind system

Wind is an air in motion from the region of high pressure to the region of low pressure.

Wind can be classified into two types :

i. Local winds

ii. Interplanetary winds

i. Local winds

These are wind system operating only in a small area within a short period of time. These winds include the following

a. Land breeze

This is the movement of air from the land to the sea or ocean.

Land breeze occurs during night when the land is colder than the sea hence the land develop high pressure and the sea develop low pressure.

b. Sea breeze

This is the wind that moves from the sea to the land. It occurs during the day time when the ocean is cooler than the earth or the land. During that time, the water bodies especially the oceans and seas develop high pressure and the land develops low pressure.

c. Anabatic wind

The word anabatic is derived from the Greek word anabatos meaning that moving upward. Anabatic is a warm wind which blows up steep slope maintain side, driven by heating of the slope through insolation. It is also known as upslope wind as it blows from the valley towards the mountain slope or valley slope.

This wind occurs during day time when hill side is heated by calm sunny weather. It is common in mountainous area.

d. Katabatic winds

Katabatic, the word is derived from the geek word “katobasis” meaning that descending. It is the technical name for drainage wind, a wind that carries high density air from higher elevation down the slope under the force of gravity.

These winds are sometimes called fall winds. They occur during the right in mountainous area when the highland areas are losing more heat due to high rate of terrestrial radiation.

Monsoon winds

The word monsoon is derived from the Arabic word “mausin” meaning season. Monsoon winds are winds whose directions are reversed from one season to another due to the change of pressure belts caused by apparent movement of overhead sun. They develop due to difference in season when the sun is overhead in tropes. During summer when the sun is overhead in tropic of cancer, wind blows from high pressure belt in the southern hemisphere to the Middle East especially in Asia. During winter when the sun is overhead in tropic of Capricorn, the central Asia develop high pressure hence wind blows from Asia to Australia. Monsoon wind is common in India, Japan, Australia, Indonesia and other parts of Middle East.

ii. Interplanetary winds are as follows:

a. Trade winds

These are prevailing patterns of earthly surface winds found in tropes within the lower portion of the earth’s is atmosphere, in a lower section of the troposphere near the earth’s equator. They blow predominantly from the north East in the

Northern hemisphere and from the south East in the southern hemisphere strengthening during winter and when the arctic oscillation is in its warm phase. The wind blows from the sub-tropical high pressure belts, or towards the intertropical convergence zone. They are divided into two types:

i. North East trade wind

These winds are blowing from North-Eastern direction in the Northern hemisphere because of rotation which reflects wind direction.

ii. South East trade wind

They blow from South-Eastern direction in the Southern hemisphere.

b. Mid latitude weasterlies

The westerly, it comprises the air flowing from the sub-tropical highs to the sub polar lows from about 30 to 60 N and S of the equator.

These belts more north and south with the seasonal change of pressure belts

These winds originate from high pressured area in the horse latitude (30 N and S of the equator towards the 60 N and S of the equator (sub polar low pressure belts). The winds are predominantly from the south west in the northern hemisphere and from the north – west in the southern hemisphere.

Westerlies are strongest in the western hemisphere and at times, when the pressure is lower over poles while they are weakest in the southern hemisphere and wind pressure is higher over the polar.

c. Polar winds

They blow from the polar ice towards the equator wards. The movement is pronounced in the southern hemisphere and northern hemisphere. Polar winds are dry and cold wind that blows from high pressure area of the polar at the north and south towards low pressure area (sub-polar low pressure 60 N and S)

AIR MASSES

Air masses are formed resulting from when air remains stationary over a place for several days. During this time the air is likely to assume the temperature and humidity properties of that area.

Air masses are a body of air covering a relatively wide area, exhibiting approximately uniform properties through any horizontal section.

Air masses are a large volume of air in the atmosphere that is mostly uniform in temperature and moisture.

For a place to develop air mass it should have the following conditions.

i. There should be a large uniform surface for Example Ocean or a desert or any other surface which is uniform.

ii. There should be stagnation in atmospheric circulation or no change of weather condition.

iii. There should be relative constant temperature

Air masses can be divided into groups according to their source regions and characteristics, both of temperature and humidity.

On basis of temperature, they are known as polar or tropical and on the basis of humidity they are known as marine (having crossed the oceans and so moist) or continental (originating over the continent and so dry). Their combination allows four main categories of air masses to be distinguished.

i. Polar continental air masses (pc)

This air originates over the continental interiors, the northern Tundra land of northern America, Asia and Greenland forming mass of cold dry air, their air mass yield little / no rainfall

ii. Polar marine time air masses

These are air masses which originates and travel over high latitude oceans 60 N and S such as northern Atlantic Ocean. They are cooler in winter but warm in summer. They have low temperature and low moisture content.

iii. Tropical continental air masses (TC)

These are air masses which originates and develop from tropical deserts such as Sahara and Australian desert. They are warm and generally tropical continental air masses originate from tropical desert.

iv. Tropical marine tire air masses

These originate in tropical latitudes but having crossed the water bodies towards the north and South Pole or originate from tropical oceans such as pacific and Atlantic. They are warm and most, yielding heavy rainfall with lighting and thunders.

FRONTAL ZONES

A frontal zone is the point where two air masses of different characteristics in terms of temperature and humidity meet each other after they have moved outward from the various major high pressure areas.
The situation result in the condition of large scale atmospheric instability in the frontal zones.

Conditions for the occurrence of frontal zones

i. There must be two contrasting air masses moving towards one another

ii. There must a convergence of two air masses

TYPES OF FRONTAL ZONES

i. Warm frontal zones

This is formed when a strong warm air is moving or advancing and is forced to over ride a weak cold air mass. It is formed when a strong warm air mass meet with a weak cold air mass and slide up over it. The whole surrounding to be covered by warm air.

Weather conditions associated with warm frontal zones

i. Formation of clouds

ii. There will be a formation of warm weather condition

iii. Formation of cyclonic rainfall characterized by lightning and thunderstorms

ii. Cold frontal zones

If occurs when a strong advancing cold air mass overcome a body of weak warm air mass. During air meeting, weak warm air is forced to rise above causing the surrounding to be covered by cold air mass.

Weather conditions associated with cold frontal zones

i. formation of little / sparsed clouds

ii. formation of cold weather condition because the surface will be characterized with low or cool temperature

AIR STABILITY & INSTABILITY

AIR STABILITY

Air is said to be stable since dew point may not be reached and therefore making atmosphere produced few clouds with little or no rainfall at all.

The situation occurs when dry adiabatic lapse rate is greater than normal lapse rate.

The atmosphere stability is associated with low degree of dampness in the atmosphere with no cloud, high day temperature.

AIR ISTABILITY

Air instability occurs when the rising saturated air cools less rapidly than the surrounding air. The rising air remains warmer and lighter than the surrounding air.

If the air gets sufficient moisture and the dew point is reached this condition may reduce heavy clouds, thunderstorm, heavy rainfall and high degree of atmospheric dumpness and very small daily range temperature

It occurs when environment lapse rate is greater than dry adiabatic lapse rate

HUMIDITY AND PRECIPITATION

HUMIDITY

Humidity is the amount of water vapour in the atmosphere. It can be absolute or relative humidity.

Absolute humidity

Is the actual amount of water vapour present in a certain volume of air at a given temperature.

Relative humidity

Is amount of water vapour present in a mass of air expresses as the percentage

Factors affecting humidity

i. attitude

The amount of humidity increases as the altitude from the surface increases. This is because of normal lapse rate.

ii. temperature

High temperature increases humidity in the atmosphere due to increase in rate of evaporation from the earth's surface.

iii. Rainfall

High rainfall increases the amount of water on the surface of the earth which when evaporates results to the formation of humidity or water vapour on the atmosphere. Also rainfall increases the amount of water in the atmosphere due to increased moisture on the surface.

iv. Availability and size of water bodies on the earth's surface

Many water bodies like oceans and seas increase the amount of water vapour or humidity in the atmosphere through evaporation.

v. Vegetation cover

Areas covered by denser vegetation like equatorial region, atmospheric water vapour is high due to high rate of evapotranspiration from the vegetation.

vi. Human activities such as a forestation, construction of water reservoirs, also influence humidity on the atmosphere.

CONDESATION

A condensation is the formation of water droplets when a rising air has been cooled beyond its dew point.

A dew point is a temperature where air becomes saturated as a result of cooling process in the atmosphere.

It is the point where atmosphere do not contain any further water vapour and condensation begin to take place.

The cooling of air in the atmosphere occurs through the following ways:

i. When there is horizontal movement of warm air on the cold surface

ii. Through movement of air from warmer to cooler latitudes

iii. Through ascending of warm air.

iv. By direct radiation from the earth's surface to the atmosphere.

HAZE.

Haze is impaired visibility of 1 to 2 km as a result of dust and other small particles on the atmosphere.

MIST.

Mist is impaired visibility caused by condensation of water vapour into small droplets that form clouds at the ground level. It reduces visibility – less than 2km.

FOG

Is the collection of liquid water droplets or ice crystals suspended in the air at or near the earth's surface. Fog can be considered as a type of low – flying cloud and heavily influenced by nearby bodies of water, topography wind conditions and even human activities.

Fog forms when the differences between air temperature and dew point are generally less than 2.5 . They begin to form when water vapour condenses into a tiny liquid water droplets suspended in the air.

TYPES OF FOG

1. SMOG

It is the combination of smoke and fog, it reduces visibility to about zoom hence it is very dangerous and can cause accidents.

2. RADIATION FOG

Is formed by a cooling of land after sun set by thermo radiation in calm condition with clear sky. Cooling ground produces condensation. Radiation fog occurs at night and usually do not last long after sun rise, but they can persist all day in water months.

3. GROUND FOG

It is the fog that abs cure less than 60% of the sky and does not extend to the base of any overhead clouds

4. ADVECTION FOG

It occurs when moist air passes over a cool surface by advection (wind) and is cooled. It is common as a warm from passing over an area with significant snow-pack. It is common at the sea when moist air encounters cooler waters including areas of cooler waters upwelling.

5. EVAPORATION FOG (STEAM FOG).

These fog are formed over bodies of water over lying by much cooler air.

6. FREEZING FOG

A freezing fog is a composed of droplets of a super cooled water which freezes to surface on contact. They are very common in temperature regions and they occur during winter seasons.

7. PRECIPITATION FOG

This fog are formed as precipitation falls into dryer air below the cloud the liquid droplets evaporates into water vapour. The water vapour cools and at the dew point it condenses and forms fog.

8. UP SLOPE FOG

This fog forms when the moist air is rising up the slope of a mountain on hill which condenses into fog on account of adiabatic cooling and to a lesser extent the drop in pressure with altitude.

9. VALLEY FOG

This fog forms in the mountain valleys often during winter season.

CLOUDS.

Clouds are formed when water vapour from the earth's surface reaching the atmosphere cools and condenses at different height in the atmosphere.

Clouds may be classified basing on two main criteria

i. According to the height

ii. According to the general form/appearance.

According to the height clouds are classified into the following types:

1. HIGH LEVEL CLOUDS

These clouds are formed above 20000 feet or 6000m and since the temperature is so cold at such high elevations, these clouds are primarily, composed of ice crystals. High level clouds are typically thin and white in appearance but can appear in magnificent array of colors when the sun is low on horizon.

High level of clouds includes,

a. CIRRUS

These are fibers or feather like clouds in a blue sky. They indicate a fair weather condition (stable).

b. CIRROSTRATUS

These are thin sheet clouds found at high altitude but still spread out to the large area.

c. CIRROCUMULUS

A small heaped clouds with ripples or wave appearance.

2. MEDIUM LEVEL

The bases of medium level clouds typically appear between 6500 feet to 2000 feet. Because of their lower altitude they are composed of primarily water droplets however they can also be composed of ice crystals when temperature is cool enough.

Medium level clouds includes ;

a. ALTOCUMULUS

These are white – grey head clouds appearing like waves and are separated by patches of blue sky.

b. ALTOSTRARTUS

These are greyish sheet clouds which are much denser than cirrostratus clouds.

3. LOW LEVEL CLOUDS

These are mostly composed of water droplets since their bases generally lies below 6500 feet. However when temperature is cold enough these clouds may also contain ice particles and snow.

Low level clouds includes

a. NIMBOSTRATUS

These are very low sheet clouds found at a very low height . If rain falls from these clouds are known as nimbostratus rain.

b. STRATOCUMULUS

These are dark and heavy clouds with pronounced waves

DEPRESSIONS, CYCLONES AND ANTICYCLONES DEPRESSIONS

DEPRESSIONS

Depressions are large areas of low pressure due to the meeting of warm equatorial and cold polar air. They are oval or circular shaped on maps with closed isobars. Air of depression circulates in anti- clockwise direction in the northern hemisphere and in a clockwise in the southern hemisphere where they blow towards the centre.

Depressions mainly develop over the oceans, mid or temperate latitudes where humid tropical air meet with the cold polar air especially around latitude 60 North and south of the equator. It is at this point where westerly winds meet with the polar winds. The zone where these two winds meet or converge is called polar front and it is in this zone where depressions forms.

Weather conditions associated with depressions.

i. Clear sky with the formation of circus clouds which are little bit high.

ii. Winds blow from the south east after a definite time , a cloud cover develops and heavily occurs.

iii. When rain stops, wind direction changes and its starts blowing from south west, temperature rises and there occurs more humidity air.

CYCLONES AND ANTICYCLONES

A cyclone is a storm or a system of winds that rotates around a centre of low atmospheric pressure.

An anticyclone is storm or a system of wind that rotates around a centre of high pressure.

Distractive weather patterns tend to be associated with both cyclones and anticyclones are as follows;

i. Cyclones (commonly as lows)

Generally are indicators of rain clouds and other forms of bad weather,(lightning & thundering)

ii. Anticyclones (commonly known as highs)

They are predictor of fair weather.

iii. Wind in cyclones blow clockwise in the northern hemisphere and anticlockwise in the southern hemisphere

iv. In cyclones air close to the ground is forced inwards towards the centre of the cyclones where pressure is lowest, it then begins to rises up , expanding and cooling in the process. The situation increases humidity of the rising air which results in the cloud and high humidity in the cyclone.

v. Anticyclones, the situation are reversed. Air at the centre of anticylone is forced away from high pressure that occurs there.

TROPICAL CYCLONES

Tropical cyclones are areas of low pressure system which originates in temperature latitudes between 20^{-} to 60^{-} north and south of the equator. They occur all over the oceans except in the northern Atlantic ocean.

Tropical cyclone develops where the air mass brought by northern and southern trade winds meet, that is along the inter – tropical front. They from over the oceans as the air masses which have travelled over oceans.

Weather conditions associated with tropical cyclones:

i. The air becomes still, temperature and humidity rises.

ii. Thick clouds appear or develop

iii. Winds blow violently and finally dense clouds and torrential rainfall reduces visibility to a few meter.

Effects of tropical cyclones

i. There is rapid rising of air giving rise to torrential rainfall that causes floods.

ii. Strong blowing wind which cause considerable damage to property such as electricity, buildings etc.

iii. Formation of ocean wave storms, radial surges resulting from high winds

iv. Landslide which can result from heavy rainfall where buildings have been erected on steep and stable slopes as in the case of hongkong where landslides were responsible for 480 deaths between 1948 to 1998.

NATURAL REGIONS OF THE WORLD

Is a large area of earth's surface with similar characteristics of temperature, rainfall and vegetation cover. They are classified according to climatic type and natural vegetation.

CLIMATE TYPES

The major climatic types are classified basing on temperature and rainfall pattern.

CLASSIFICATION OF CLIMATE BASING ON TEMPERATURTE

i. If a place has a temperature above 20☆ is said to be hot climate.

ii. If a place has temperature between 10☆ and 20☆ is said to be warm climate

iii. If a place has temperature between 0☆ and 10☆ is said to be cool climate.

iv. If a place has temperature less than 0☆ is said to be cold climate.

CLASSIFICATION OF CLIMATE BASING ON RAINFALL

i. If a place has rainfall more than 1500mm is said to be very wet climate.

ii. If a place has rainfall between 1000mm-1500mm, the climate is said to be wet climate.

iii. If a place has a rainfall between 500mm and 1000mmm, the climate is said to be moderate.

iv. If a place has a rainfall between 250mm and 500mm, the climate is said to be dry climate.

v. If a place has a rainfall below 250mm the climate is said to be very dry climate or desert climate.

1. HOT CLIMATE

Areas which experience hot climate include the following climate regions;

i. Equatorial climate

ii. Tropical climate

iii. Monsoon climate

iv. Hot deserts

I. EQUATORIAL CLIMATE

This climate covers areas between 0 - 5 north and south of the equator. It includes places like

- Amazon basin
- Congo basin
- Guinea
- Southern eastern Asia
- Parts of west Africa

Characteristics of equatorial climate

i. They experience high temperature throughout the year , sometimes a monthly temperature may be above 27☆

ii. Have very small annual temperature range which is less than 4☆

iii. They have double maximum of rainfall ie. They receive heavy rainfall twice a year.

iv. They have thick forest and even green such as Amazon forest and Congo forest.

v. They have high and low vegetations ie. Vegetations in this area are grown in layers with no undergrowth.

vi. The areas experience high humidity and high cloud cover throughout the year.

Economic activities taking place in Equatorial climate

i. Lumbering activities examples in Gabon ,Amazon forest

ii. Tourism activities

iii. Agricultural activities especially cultivation of rice , banana, cocoa, coffee etc.

II. TROPICAL CLIMATE

It covers the areas located within the tropical belt. They are divided into two:

a. Tropical continental climate (savanna)

It is found in the interior of continent and located within 5° - 20° north and south of equator. It includes places like

- Central Africa
- Venezuela
- South Australia
- Parts of Sudan

This climate in Africa and Australia is known as savanna because it is dominated by grassland. In Brazil, it is known as compass and in Europe is known as Steppe.

Characteristics of savanna climate

i. It experiences moderate rainfall and convectional in type

ii. Temperature is high during hot season and low during cold season

iii. They have high annual range of temperature between 8☆ and 11☆

iv. The zone is under the influence of inter tropical convergence zone (ITCZ)

v. They experience moderate and sometimes wet rainfall

vi. Natural vegetation which dominated the region are grasses with very little scattered trees

Economics Activities

i. Tourism activities because of natural vegetations or grasses which are good for wildlife

ii. Cultivations of crops such as maize

iii. Pastoralism which is done in pastoral societies. Example Fulani in Northern Nigeria, Maasai in East Africa.

b. Tropical marine climate

They are found in the Eastern side of major landmass or of the continent especially where there is a steep highland. Such as areas are like;

- Philippines
- Mozambique
- Hawaii

Characteristics of tropical marine climate

i. They experience conventional and or graphic / relief rainfall

ii. They face trade wind coast

iii. They experience high temperature with a very small fluctuation

III. MONSOON CLIMATE

It is influence by seasonal wind. It is found in:

- South East Asia
- China
- North Australia
- Burma
- Indonesia
- Somalia

Characteristics of monsoon climate

i. They experience seasonal wind

ii. The summer season is hot with warm air.

iii. The annual rainfalls vary one area to another, due to the influence of water bodies, relief and natural vegetation.

IV. HOT DESERT/TROPICAL DESERT CLIMATE

iv. Hot deserts occur on the western side of the continent between 20 north and south of the equator. Example of the deserts are;

- Atakama desert

- Namib desert
- Sahara desert
- Kalahari desert
- California desert

Characteristics of hot desert

i. They experience very high daily temperature above 35☆, which vary from the day time tonight. The daytime is more high and night temperature is lower to about 16☆.

ii. The area is very dry as they receive very little or no rainfall. The annual rainfall in deserts is below 250mm but it changes by increasing as you approach the transitional zone between desert and tropical climate.

iii. They are characterized by little or scarce vegetation cover

iv. The velocity of wind in desert is high due to lack of vegetation cover and little or no water bodies.

VEGETATION

Vegetation is the general assemblage of plant species and the ground cover they provide. Is the total plant community growing in a certain area under the influence of the natural and man-made conditions.

Vegetation can be divided into the following types

1. NATURAL VEGETATION

These are primary or original plant cover that goes (grows) in the area even when there is no human influence. They exist in the given geographical area naturally.

2. SEMI- NATURAL VEGETATION

These are wild vegetation which their existence directly or indirectly have influence from man . Such vegetations are like palm, rubber, which were wild but now grown by human being.

3. CULTIVATED VEGETATION

Refers to the crops and cultivated trees planted to replace the destroyed vegetation

Important terminologies used to describe vegetation

1. ECOSYSTEM

An ecosystem is a community of living organism in conjunction with the non- living components of their environment (things like air , water and mineral soil) interacting as a system. These biotic and abiotic components are regarded as linked together through nutrients cycles and energy flows.

2. HABITATS

Is a surface of the earth adjacent to the atmosphere in which all organisms live, or in which all organic life exist. It is the natural home or environment for animals, plants and other organisms.

3. PLANT SUCCESSION

Plant succession is the changing of plant communities over time. Plant communities go through all sorts of changes over time depending upon various changing conditions, disasters, human influence, animal influence etc.

Or

A plant succession is the orderly process of one plant community gradually or rapidly replacing another.

The community begins with relatively few pioneering plants and animals and develops through increasing complexity until it becomes stable or self perpetuating as a climax community.

TYPES OF PLANT SUCCESSION

a. Primary succession

A primary succession is a dynamic which begins with colonization of an area that has not been previously occupied by an ecological community such as newly exposed rocks, lava flows, newerly exposed glacial tills.

Stages of primary succession include;

i. Pioneer plants (lichens and mosses)

ii. Grass stage ; grasses , smaller shrubs and trees.

Animals begin to return when there is food for them to eat

b. Secondary succession

Is a successional dynamies following sever disturbance or removal of a pre- existing community. Dynamics in secondary succession are influenced by pre-disturbance conditions when the former vegetation is cleared or bunt by wild harm fire caused by volcanic eruption and later the area become colonized by a new vegetation or plant community quite different from the former vegetation. Disturbance of the former vegetation can be by natural forces and human being through his different activities.

Secondary succession is often shorter process by which plant communities can shift rather rapidly if given the proper opportunity. Initially diversity increases, can decrease or hit a terminal point by which little change occurs.

c. Old field succession

Is the inversion of plant communities following the abandonment of the manage plant community by human

Qn.1 In brief, describe the characteristics of tropical rain forest vegetation

Qn.2.What are the characteristics of desert vegetation which have made them to thrive the hard condition of desert climate.

Qn.3. Write short notes of the following

i. Temperature lapse rate

ii. Plant community

iii. Fog

iv. Heat budget

v. Isolation

vi. Ecosystem

vii. Terrestrial radiation