FORESTRY RESOURCE

COURSE OUTLINE

- Definition and types of forest resource.
- World distribution of forest resource – sketch map showing word distribution of forest resource.
- Characteristics of forest vegetation types.

(1) Tropical rain forest /salve/Equatorial forests.

- Factors for growth of tropical rainforest
- Importance of tropical rain forest
- Factors limiting exploitation of tropical rain forests
- Case study about tropical rain forest (Forestry in Brazil, Gabon, Ivory Coast, Cameroon, Kenya etc.

(ii). Temperate forests.

- Types of temperate forests ; Their location
- Factors for growth and characteristics
- Case study about temperate forests (forestry in Algeria).

(iii) Boreal/Taigal coniferous forests.

- Location, tree species and x-tics of coniferous forests.
- Case study about coniferous forests (forestry in Canada
- Factors for dev't, limitation in exploitation and importance of forestry .
- Forestry in Europe (Sweden and Finland, Switzerland, Norway etc).
- Differences between tropical and temperate forests.
- Differences between tropical and Boreal forests
- Sample questions on forestry.

DEFINATION OF FOREST

A forest is a type of vegetation or an association of plant life dominated by trees, many species of which are usually woody and tall at maturity and have straight trunks.

Forests cover 29.6% of the earth's land area and almost a quarter of these are in Russia

TYPES OF FORESTS

Forests are categorised into four main types i.e.

1. Tropical rainforests (selva forests).
2. Temperate forests.
3. Boreal /Taigal forests
4. Artificial or planted forests.

1. Tropical rain forests (Selva forests).

These grow near the equator where it's hot and wet; temperatures are about 20˚-25˚c; more than 200cm (2000mm) of rain a year.

Tropical rain forests are further classified into four main types

I. Tropical Equatorial forests
II. Tropical deciduous (seasonal) forests.
III. Monsoon forests
IV. Tropical swamp (mangrove forest).

2. Temperate forests

These grow in places that have hot summers and cold winters. The summers are as hot as 30˚c and winters as cold as -30˚c.many of these trees are deciduous (lose their leaves in autumn and grow new ones in spring).

Temperate forests is categorised into three types ie.

I. Temperate hard wood (Deciduous forests).
II. Temperate mixed (semi-deciduous forest).
III. Boreal /Taiga coniferous forests.

Temperate forests are located in British Columbia (Canada) ,central ,Denmark ,Germany ,Finland ,Norway ,Sweden ,Russia ,Southern Chile .

3. Boreal /Taiga forests.

The term Boreal, means Northern forests. In Russia, the same forests are called Tiaga forests which mean virgin Northern forests.

Boreal /Taiga forests grows in Russia and Canada and elsewhere in the north.

These forests grow in Areas that experiences long and very cold winters, Rain fall is of 40-100cm (400mm-1000mm) a year but most falls as snow.

Most trees are evergreen conifers (coniferous) forests with tree having needle-like leaves.

4. Artificial /planted forests.

These are scattered all over the world .They are planted by man either for production of wood fuel or news print (paper) and soft boards. They often constitute soft wood tree species such as cypress, pines.

SKETCH MAP OF THE WORLD SHOWING DISTRIBUTION OF FOREST TYPES.

TROPICAL RAIN FORESTS (SELVA).

Tropical rainforests are also called “Selva” forests .They grow near the equator where it’s hot and wet with temperature of about 20˚-25˚c and more than 200mm of rain fall a year.

The biggest tropical rain forest are found in Latin America (Amazon forests) .they cover Brazil, Mexico and parts of Columbia.

In Africa ,tropical rain forests cover much of Congo basin and extend to the western coastline of Africa .They are found in D.R,Congo ,Gabon, Cameroon ,Nigeria ,Liberia, Uganda and Eastern coast of Madagascar. The Congo tropical rainforests are the biggest in Africa.

In Asia, Tropical rainforests are found in the west lowlands of Thailand, Cambodia, Vietnam, South western Sri-lank, Indonesia, Philippines etc.

CHARATERISTICS OF TROPICAL RAIN FORESTS (SELVA) OR EQUATORIAL FORESTS

- Forests are made of numerous tree species which do not grow in pure stands (highly Heterogeneous).There are different tree species such as Ebony, mahogany, Iron wood, Palms etc.
- Tropical rainforests are ever green .The trees shed of their leaves and grow young ones at the same time hence are evergreen (Different tree species shed their leaves at different intervals).
- They mostly yield hard wood e.eg. Mahogany, Ebony, green heart etc.
- Most of the large trees grow a big root system called buttress roots to provide Extra support for their enormous heights and weight.
- Trees are tall and straight stemmed with a smooth bark .They can attain a height of 50-60 metres.
- Trees have thick foliage on top that do not allow sunlight to reach the ground hence often have a thin or no undergrowth.
- There exist many climbing plants such as Lianas .These are rope –like plants that twist from tree to tree.
- Trees grow in 3 distinctive layers or canopies .The first layer is called the under canopy consisting of relatively short trees that grow up to 30m while third layer consist of the tallest trees reaching 50m .These are called Emergent.
- Trees such as Ebony and mahogany are broad leaved to release excess water through transpiration and at the same time trap sunlight for photosynthesis purposes.
- Forests are thick and luxuriant and sometimes impenetrable .This is due to the hot temperatures of over 20˚c and wet conditions (Heavy rainfall).
- Many of the trees have epiphytes. These are plants that grow on other plants but do necessarily feed on them. Examples are ferns and bromeliads.

- Once a virgin tropical rain forest is cut down, a secondary forest quickly grows .this is characterised by thick undergrowth with trees not big as those in the original forests.

FACTORS FOR GROWTH OF TROPICAL RAIN FORSESTS

- Deep and fertile soils within the Amazon basin in Brazil, Columbia ,Bolivia, the Congo basin covering ;DRC, Gabon ,Nigeria , Liberia etc favour the growth of tropical rain forests with a variety of tree species e.g. Mahogany, Ebony etc.
- Suitable ideal climate conditions such as heavy and very wet well distributed rain fall of over 1500mm per annum and hot temperatures of about 26°c favours the growth of tropical rainforests in the Congo basin. Amazon basin etc.
- Altitude favours the growth of various types of tropical rain forests. Areas of less than 200mm above sea level favours the growth of tropical lowland forests such as the Congo forests .Areas of high altitude above 2500 m also favour the growth of tropical highland forests also called montane forests e.g. Kilimanjaro forests in Tanzania, Ruwenzori forests in East of DRC or Brazilian highland forests East of Brazil and Guinea highland forests in south of Venezuela.
- Drainage factors i.e. Tropical rainforest grow in well drained areas .Riverine forests particularly grow along the courses of major rivers e.g. river Congo ,river Amazon, river Ogooue in Gabon etc .Both the numerous rivers .These supply water required for growth of those forests.
- The biotic factors e.g. the presence of pests and diseases such as tsetse flies which transmit sleeping sickness in the Congo and Amazon forests ,the presence of fierce wild animals such as Leopards acts as deferrrents that stop people from encroaching upon the forests hence favouring their existence .
- Sparse or low population favour the growth of the Tropical rain forests such as the Amazon and Congo forests.
- Government policy of forest conservation in Brazil, DRC, Gabon and Liberia has favoured the growth of tropical rainforests.
- Mountainous nature along Tropical highlands such mtn Ruwenzori in Eastern DRC, Guiana highlands in Venezuela, Brazilian highlands in the East of Brazil limits mobility and Exploitation hence favour growth of these forests.
- Poor technology such as hand axes characterised by most of the countries where tropical rainforests are located favour their growth .few tress can be cut down with such poor tools.
- Inaccessibility due to remoteness and poor transport with in Tropical rainforest such as the Amazon forest in Brazil ,Congo basin forests in Gabon have continued to favour the growth of these forests simply because such factors limits exploitation.
- Limited market for forestry products in DRC, Amazon, and basin favours the growth of tropical rain forests.

- Nature of trees in tropical rainforest limits exploitation hence favours the growth e.g. Mahogany and Ebony have buttress root system which makes felling difficult .They also have climbing plants that twists from tree to tree. This makes felling of the tree cut down not obvious.

IMPORTANCE OF TROPICAL RAIN FORESTS

POSITIVE IMPORTANCE OR CONTRIBUTION

- Source of timber and other building materials such as poles, house roofs in DRC and Liberia are made by use of timber from tropical rainforests.
- In developing countries like Gabon, DRC, Cameroon etc forests provide 90% of all energy requirements in form of fuel /wood.
- Tropical rainforests provide raw materials for the wood and pulp industries. Ebony, Mahogany and okoume tree species are particularly important for furniture and doors and windows frame fabricating in Liberia, Gabon etc.
- Tropical rainforests in Gabon, Cameroon and DRC provides a habitat for wild animals' .These includes Leopards, tree squirrels, baboons etc. These are important for Eco-system as well as promotion of tourism.
- Tropical rainforests act as catchment areas or rather ac as source of rivers e.g. river Congo, kasai in DRC etc that originates from Gabon forests a continuation of Congo forests ;River Amazon and its tributaries in Brazil originate from Amazon forests .This forms a basis for HEP generation .
- Tropical rain forests e.g. the Amazon and Congo forests are very crucial for the global climate .They facilitate rainfall formation and at the same time absorb the green house gases like carbon dioxide, thus controlling global warming.
- Tropical rainforests such as Amazon are source of medicine and local herbs e.g. Aloevera and Moringa plants that cure over 300 diseases .Others are cinchona from whose bark quinine for treatment of malaria is extracted.
- Source of food stuffs including wild yams, mushrooms, Arabic gum, Honey, Bernes etc .These are collected from the Amazon and Congo forests.
- Tropical rain forests promote economic diversification reducing reliance on agriculture of mining in Brazil, DRC etc.
- Employment opportunities have been created by tropical rainforests .This is inform of forest guards ,forest rangers ,conservation staff etc from such employment income is earned to improve employees standard of living.
- Tropical rainforests protect the soils against erosion especially along highland Areas such as Guiana Highlands in Venezuela, Brazilian highlands etc.
- Foreign exchange is earned through exportation of the forests products such as timber, herbs from Gabon, Congo and Amazon forests.

- Government revenue inform of taxes levied on forest exploiting companies is Earned to develop the country.
- Tropical forests are used for settlement by some indigenous tribes e.g. pygmies in Congo forests, Kayapo Nihau Indians, Tikuna, Yonoman. And Guajajara tribes in Amazon forests, today there are over 200,000 Indians in Amazon forests.
- A variety of minerals are found in tropical rainforests e.g. Gold along Madeira river in Amazon forests in Congo, there is gold and diamond and Tin in the Congo forests.

NEGATIVE IMPORTANCE /CONTRIBUTIONS

- Tropical rain forests harbour pests and vectors which cause diseases in plants, animals and human beings e.g. Tsetse flies in Congo forests that transmit sleeping sickness to man, nagana in cattle etc.
- Forests limit development of transport lines e.g. in much of Congo there are poor or no roads due to Congo forests.
- Forests are contain wild animals that kill people livestock in the nearby villages e.g. Leopards and pythons in the Amazon and Congo forests.
- Forests are used as hiding grounds for anti-government elements and rebels eg LRA rebels in Congo hide in the Congolese forests and central Africa forests.
- Profit repatriation by foreign companies that carry out logging affects the country's capital accumulation e.g. in Gabon only 7 companies have access to more than a third of the country 's forests .these are French company ,German's Gluns etc.
- Accidents occur during felling of trees resulting into loss of lives .The wide trunk of tropical trees makes felling difficult and risky.
- Several towns have grown up near big forests particularly to provide service to the forestry industry, However these social evils such as congestion, slum development and crime proliferation. Such towns include; port Gentil in Gabon, Douala in Cameroon, and Kisangani in DRC etc.
- There is pollution resulting from timber ,furniture and paper industries that develop to process the forest products, This pollution is inform of smoke ,toxic wastes such as chlorine etc which is normally dumped in nearby streams /channels.
- Forests limit land available for settlement and agriculture e.g. tropical forests limit expansion of Gabon palm oil farm.
- Forests are often associated with fire started by picnic falls, lightening, farmers or friction or hot winds .this results into destruction of property especially in Gabon, Cameroon etc.

FACTORS THAT LIMIT EXPLOITATION OF TROPICAL RAINFORESTS

- Most of tree species are bulky and heavy hence difficult to transport e.g. Ebony ,Mahogany, iroko and idigbo in ivory coast , etc
- Most tree species yield hard wood e.g. mahogany, Ebony ,Ironwood and Rd heart .These have limited market on the international market because their purpose mostly limited to furniture purposes other than a variety of uses such as pulp and paper ,newsprint.etc
- Commercial tree species of Mahogany and inferior tree species inter mixed (Absence of pure stands) .This makes extraction difficult.
- The limited skilled labour to exploit tropical forests in Brazil, DRC, and Ivory Coast etc labour at times falls to identify the tree species of commercial value.
- Limited capital to purchase the necessary logging equipments such as tractor ,Chain sows , Diesel saws makes exploitation difficult in Gabon ,DRC, Brazil etc
- Inaccessibility due to limited communication lines in most tropical forests such as the Amazon in Brazil, Columbia, Congo forests makes exploitation of tropical forests difficult.
- Presence of fierce wild animals e.g. leopard ,reptiles like python (anaconda)in Brazil ,biting insects such as bees ,wasps, red ants, black ants limit exploitation of tropical forests in Amazon (Brazil), DRC, Nigeria ,Gabon etc.
- Competition from other countries that produce valuable soft wood such as Norway, Switzerland, Canada, Finland etc affects exploitation of tropical forests.
- Local demand for charcoal and fire wood makes exploitation of tropical forests difficult, much of the forests are cut down for energy purposes.
- Tropical hard wood tree species such as Azobe, Okoube, teak, Ebony etc in Gabon have huge trunks and buttress roots that make felling of trees difficult. A platform has to be constructed around the trunk before felling can start. This takes a lot of time.
- Low levels of technology characterised by use of hand axes, hand driven saws in Ivory Coast, Nigeria, Gabon, and Brazil make felling of trees difficult.
- Political instability in DRC, Brazil, Ivory Coast, Liberia, Gabon etc limits exploitation of tropical forests.
- Tropical hard wood species e.g. Ebony Red heart, Mahogany etc take long periods of time to grow (mature). This may be 60-100 years to yield valuable timber. This affects the lumbering activities.
- Thick undergrowth in tropical forests makes felling. Selection and transportation of trees/ logs difficult.
- Competition from other sectors of the Economy affects exploitation of tropical forests e.g. Brazil exploitation of forest is competing with Iron ore mining at Serra Palade. In Gabon oil mining competes with forestry.

- Bush fires started by hunters, farmers, e.g. the Seringgueiros and Ribeirinhos indigenous tribes in Amazon (Brazil) set the forest ablaze hence destroying tree species.
- The rope-like climbing plants such as Lianas make felling difficult. They tend to hold back the tree species thus many other trees have to be cleared in order to bring down the cut wood.
- Limited electricity to process timber limits exploitation of tropical forests e.g. In Gabon, DRC, and Nigeria.
- Limited local market for forestry products in tropical countries such as Gabon, DRC and Ivory Coast limits exploitation of tropical forests.
- Tropical climate of hot, wet, and humid weather affects exploitation of tropical forests in Brazil, Gabon, and DRC, eg it almost rains every day in Congo forests, and hence felling of trees is halted.
- Limited research to identify commercial tree species controlled lumbering, replanting of the forests, market research have affected forest exploitation.
- Occurrence of accident during the process of lumbering or felling of trees has often resulted into loss of lives, hence discourage lumbering.
- Massive deforestation for either agriculture ,settlement ,mining or establishment of HEP ,there have reduced the amount of forests available for lumbering activities especially in Cameroon ,Ivory Coast ,Nigeria etc.
- Hilly Terrain in some countries such as Gabon, East DRC , Brazilian highlands etc makes felling and transportation of logs difficult.

FORESTRY IN BRAZIL

- Brazil has one of the biggest forests in the world its forests are part of Amazon forests the biggest tropical forests in the world.
- Tree species here include;; Ebony ,teak, Mahogany , Rose wood ,Red heart etc.
- Timber is exported through ports of porto-Alegie Sao Goncolo, Saoluis, Salvador etc.

FACTORS THAT FAVOUR FORESTRY IN BRAZIL

- Equatorial nature of climate characterised by hot temp (24˚c) and wet conditions (1500mm) per annum favour growth of forests.
- Relatively low altitude (below 500m) and generally gentle slopes favour growth, felling and transportation of trees.
- Deeply weathered fertile soils favour growth of trees.
- Numerous rivers e.g. river Amazon, river Madeira, etc favour floating and transportation of logs.

- Abundant Energy (HEP) e.g. Tucuri dam, Altamira dam, Balbina dam etc process logs into timber.
- Both skilled and semi-skilled labour to handle forestry activities e.g. muliti-national corporations from Canada and Germany offer skilled labour -select /fell trees while semi-skilled does loading of logs.
- Sparse population i.e. much population in cities (82%) of population live along coastal cities, leaving big proportion of land for forestry activities.
- Relative political stability due to multi –party democracy enabled long term investment in the forestry industry.
- Application of modern technology e.g. tractor, diesel saws, chain saws etc applied in felling down trees hence efficiency.
- Intensive research involving cutting of trees in patches ensures sustainability.
- Favourable government policy e.g. afforestation and re –afforestation program e.g. at Carajas favour sustainability ;attraction of foreign investors from Canada ,Norway, China etc
- Local population of 186 million people (2004 figures) provide adequate local market for forestry products .However much is exported to china and Japan.
- Existence of developed transport Network e.g. perimeter highway in the North, Trans-Amazonian high way from East-West favour exploitation of forestry resource.
- Existence of several industries that process logs into several aspects (furniture, timber, pulp and paper industries).
- Presence of capital to invest in forestry sector e.g. from Banks such as citi group bank, World Bank; receipt s from mineral exports etc.
- Existence of a variety of valuable tree species such as Ebony, Mahogany, Teak etc.

FORESTRY IN GABON

Gabon is located in central Africa, sitting astride the equator and with plenty of rainfall all year round .Three quarter of Gabon is covered with tropical rainforests. Timber is an important resource, though Gabon's biggest earner is oil.

Gabon's forest hold high levels of endemism (species that do not occur elsewhere) Okoume species is the most important and the main timber export used for high quality ply wood. Other tree species are Ozigo, Azobe, Maobi, Mukulungu, Ebony, and Mahogany etc.

Initially logging was concentrated along the coast but today with modern transport, logging has extended to the interior.

SKETCH MAP SHOWING LOCATION OF FOREST

FACTORS FAVOURING THE DEVELOPMENT OF FORESTRY INDUSTRY IN GABON

- Latitudinal location astride the equator characterised by hot temperature (24℃) and heavy well distributed rainfall (1500mm-2000mm P.a) through the year favours growth of the forests.
- Existence of the fairly low attitude below 1000m a.s.l.also favours the growth of lowland forests with huge and tall trees.
- Existence of a variety of unique and valuable tree species suitable for manufacturing high quality plywood and veneers eg Okoume ,Azobe and Ozzigo others are Ebony ,Mahogany
- Existence of a variety of Navigable Rivers such as river Ogoowe facilitates transportation of logs to the coast for the export.

- Developed coastal ports such as Port Gentil handles timber exports destined to china ,japan,france etc
- Availability of HEP generated fro river Ogoowe is used to process forestry products.
- Sparse population especially in the interior ensures adequate land where forests grow.
- Existence of both skilled and skilled labour to carry out the lumbering operations such as felling ,logging, transportation ,loading ,marketing etc.
- Large sums of capital were invested in the forestry industry by both local ,foreign and the state such capital was used to purchase machinery ,pay labour ,construct ware houses.
- Existence of developed transport Network e.g. perimeter highway in the North, Trans-Amazonian high way from East-West favour exploitation of forestry resource.
- Relative political stability due to multi –party democracy enabled long term investment in the forestry industry.
- Application of modern technology e.g. tractor, diesel saws, chain saws etc applied in felling down trees hence efficiency.
- Existence of several timber processing factories in form of saw mills at kango ,port owendo and Lambarene have favoured the forestry industry.
- Rugged relief /steep slopes that limit settlement in certain areas hence favouring growth of forests.

IMPORTANCE OF FORESTRY INDUSTRY IN GABON

POSITIVE IMPORTANCES

- Source of raw materials for the timber, furniture and pulp industries at Kango, Lambarence etc.
- The forestry industry is a source of timber for house construction there by providing shelter to people.
- Timber exports to Japan, France, China, USA etc promotes international co-operation.
- Forestry exports have led to towns and ports e.g. Owendo, port Gentil, Booue town etc .These act as trading centres, accommodation and service centres.
- The forestry industry modifies the climate through facilitating rainfall formation through transpiration moisture raise up to levels of condensation and falls back as convectional rain fall to adjacent areas like Limbarene, Boove etc.
- The forestry industry provides a habitant for a variety of wild animals such as leopards, monkeys, reptiles like pythons, birds etc.
- Tropical forests i Gabon are the source of energy in form of fuel wood and charcoal used for cooking and baking of clay and earth bricks.
- Forestry industry has led to development of tourism industry .This is due to variety of tree species ,birds ,and wild animals .from tourism ,foreign exchange to develop roads ,schools and hospitals is obtained.

- Exploitation of forestry resources has stimulated infrastructural development inform of roads ,railways and HEP station along river Ogoove .Examples of infrastructures includes ; Libreville –boove railway line ,.the Gabonais highway that link port Gentil to the interior etc these stimulates transport and communication.
- Forestry industry is the source of government revenue in form of taxes and loyalties paid by lumbering companies from France, Malaysia and China.
- Forestry industry diversifies the economy against dependence on agriculture and oil mining .this leads to steady income in flow.
- The forestry industry promotes education and research for example foreign lumbering companies from France, Malaysia etc .train their labour through short courses hence acquisition of skills.

NEGATIVE IMPORTANCES

- Forests harbour insects that transmit diseases e.g. tsetse flies spread nagana to cattle and sleeping sickness to man. Others are black flies that spread river blindness.
- Profit repatriation by foreign companies that carry out logging affects the country's capital accumulation e.g. in Gabon only 7 companies have access to more than a third of the country 's forests .these are French company ,German's Gluns etc.
- Forests limit land available for settlement and agriculture in both the interior and coastal regions around port Owendo.
- Of recent, Gabon's forests act as a hiding ground for antigovernment elements such as rebels, thieves etc.
- There is water and air pollution caused by timber industries that come up .for example the Atlantic Ocean is polluted by saw mills at port Owendo and port Gentil.
- Several towns have grown up due to forestry operating for example port Owendo, Boove, Lambarene and port Gentil however these have evils such as congestion, slum development, prostitution etc.
- Floating of logs along river Ogoove affects fishing and destroys the fish breeding grounds.
- Thick forests in Gabon hinder development of transport and communication hence retards Economic growth in the country.
- The forests harbour wild animals such as monkeys ,baboons that destroy crops ,fierce animals and reptiles like leopards,paython,black cobras ,crocodiles along river Agoove that kill people.
- There have been loss of lives due to accidents that occur during the process of felling trees.
- Fire out breaks started by shifting cultivators and hunters damage property.
- Planted forests particularly those that constitutes of eucalyptus tree species drain the soils making them un-suitable for agriculture.

FORESTRY IN CAMEROON

- Cameroon is located in West Africa. Cameroon's tropical rainforests are a continuation of the Congo basin forests.
- Major tree species include; Okoume, Bougongi, Ebony, Mahogany, Olwe, mukulungu etc.By 2004, 2/3 of Cameroon's forests had been cut down causing serious consequences.
- Rivers eg Sanaga, Dja are important in facilitating transportation of logs to coastal ports of Douala and Buela for export to China, France, Japan etc.
- Roads and railways link to coastal ports of Douala, Youndae (capital city) favoured transportation.
- Adamawa highlands limited se4ttlements and favoured montane tropical forests.
- Local population (16 m) provided cheap labour and market.

FACTORS FOR THE DECLINE/ DISSAPPEARANCE OFG FORESTS IN CAMEROON

- Excessive lumbering for exportation of timber to France, China, Japan etc.
- Cleaning land (forests) for Agriculture e.g Cocoa and coffee plantations.
- Demand for fuel wood and charcoal for energy purposes.
- Development of transport routes e.g roads, railways necessitated cutting down port5ions of forests hence deforestation.
- Mining of Aluminium led to clearance of forests.
- Fire outbreak started by farmers (shifting cultivators) or lightening have led to considerable loss of forests.
- Population pressure ie need for land for settlement.
- Use of modern technology e.g Power driven saws, diesel saws highly effective and fast but led to rapid deforestation.
- High demand for forest products such as fruits, roots etc have led to rapid clearance of forests

FORESTRY IN IVORY COAST

Ivory Coast is located in North West Africa. Ivory Coast forests are an extension of vast Congo basin forests.

Major tree species are mahogany, Iroko, ebony, okete, onzabili, aprokuma etc.

Rivers such as Sasandra, cavalla, komoe and river Bandama etc facilitates transportation of logs to coastal ports of Sasandra, san pedro and Abidjan for exp[orts as timber (after processing)

Local population (2004 figures) ie 18 million people provided local market and labour in forestry related activities.

Relative political stability for 33 years under leadership of Felix Houphuet Boigna favoured foreign investment in forestry industry.

Intensive research by Cote d'Ivoire forestry authority ie replanting of forests, introduction of quick maturing tree species e.g pines and eucalyptus trees favoured growth of forestry industry.

Abundant energy for processing forestry products generated from R. Bandama and sassandra.

Development of timber processing factories at Abidjan, San pedro and Bouake created market for forestry products hence development of forestry industry.

FORESTRY IN KENYA

Kenya lies on the equator on the East coast Africa

Kenya's tropical forests have been cut down except a few remaining mangrove forests along the coast of Mombasa, pockets of tropical montane forests at Cheragani hub, Abedare, Ndoto and Mt.Kenya.

Tree species include mahogany, Ebony, Elgon, olive, camphor, Africa pencil cedar, podo etc.

Much forest located in the west near Victoria basin but much cut down to create tea plantation of Kenco and Kenya highlands.

Today, softwood plantations for pulp and paper at Wabuye paper industries, veneer and fibre board at Thika and Eldorent.

Wattle trees planted to extract Tannin from hard bark used in leather tanning industries.

Eucalyptus trees planted for fire wood, poles, pulp, and paper.

Railway lines and road from Mombasa coastal port in the East to Kisumu in the West are main routes of timber exports to Japan, China and India.

NB; Factors favouring development of the forestry industry are almost similar to those of Gabon.

TEMPERATE FORESTS

These forests grow in places that have hot summers and cold winters. The summers may be as hot as 30˚c and winter as cold as -3˚c.

Average rainfall ranges between 750mm-1500mm a year.

Many of the trees are deciduous .they lose their leaves in autumn and grow new ones in spring.

TYPES OF TEMPERATE FORESTS

They are of three types namely;

1. Temperate Hardwood or Deciduous forests.
2. Temperate mixed or semi-deciduous forests.
3. Boreal /Taiga/Coniferous forests.

TEMPERATE HARD WOOD OR DECIDUOUS FORESTS

These are located in the mid –latitude just above the tropics .they grow between approximately 40° and 60° north and south of the equator on the west coasts of continents.

Tree species here include, Bach, Elm, Oak, Ash and Poplar .they are found in southern Canada, Eastern and Western U.S.A, France, Germany (black forests);Britain ,Northern China and Japan. In Africa, these trees exist in Algeria, Tunisia and southern tip of South Africa around Cape Town.

CHARACTERISTICS OF TEMPERATE HARDWOOD FORESTS

- Consist of relatively a few tree species e.g. Oak, Elm, and Beech which usually do not grow in pure stands .some species e.g. Beech may appear as a single dominant species over a big area.
- They are made up of mostly deciduous tree that shed off their leaves in autumn and grow new ones in spring.
- Contain a variety of hardwood tree species such as Oak, Ash, and sycamore, Chestnut, Beech and Elm.
- Have thin and less luxuriant undergrowth than that of the rainforests.
- The forests consist of a mixture of shrubs ,smaller plants such as brambles ,hazel, ivy and a mixture of trees like birch that dominate.
- Trees are generally tall with some reaching a height of 60 metres e.g. the Giant Sequoia in California .Oaks may reach a height of 30-40 m while others such as Elm, beech, ash, chestnut grow.
- Trees develop large crowns and have broad but thin leaves.
- Trees usually have epiphytes such as lichens, mosses and algae. Epiphytes are plants that grow on others but don't necessarily feed on them.
- Temperate deciduous forests show some kind of stratification where there are tall trees made up of dominant Oak of 30-40m , then subdominant trees e.g. Birch and ash over 30m tall ,short trees of 10m e.g. Haze and the short grass or plants below 5m e.g. blue hell ,brackens and brambles.

TEMPERATE MIXED OR SEMI DECIDOUS FORESTS.

They are found in Eastern USA, Greece, Italy, and Canada, some parts of northern Algeria and southern tip of South Africa.

Tree species here include; Cedar, Oak, Alep pine, Olive, Eucalyptus and Juniper.

IMPORTANCE OF FORESTRY INDUSTRY IN ALGERIA

POSITIVE IMPORTANCE

- Forests provide habitant to wild life such as wolves reptiles, birds, and monkeys hence promote tourism .
- Forestry products such as Cork, Dak, timber etc are exported to France, Japan, and China Earning the country foreign exchange. This is used to develop the country inform of roads, hospital construction etc
- Forestry Industry promotes industrialisation e.g. saw mills, furniture industries at Algiers, Constantine.
- Provides employment in wood related industries such as saw mills ,forest rangers etc.from this people earn incomes to improve their standards of living.
- The forestry industry is a source of energy in form of fuel wood and charcoal used in homes and industries at Algiers.
- Forestry industry provides raw materials for construction of railway slippers, poles for electricity transmission in Algiers, Biskra and Eloued etc.
- The forestry industry resources have facilitated development of infrastructures in form of roads, railways, that link up to Algiers.
- The Algerian temperate mixed semi deciduous forests protect water catchment areas .they act as source of the seasonal rivers in this highly arid country.
- The forests checks soil Erosion or act as wind breaker that could cause erosion.
- The semi-deciduous forests in Algeria modify the environment by re-charging the atmosphere with moisture leading to formation of convectional rain fall necessary for farming purposes.
- Exploitation of forestry resources have led to growth of towns and their associated benefits such as trade and commerce, accommodation etc such towns include Skikta, Tiaret etc.

NEGATIVE IMPORTANCES

- Exploitation of forestry resources result into land degradation off setting desertification.
- Forests limit land available for agriculture and settlement
- Forests harbour wild animals and biting insects e.g. centipedes, poisonous reptiles etc.
- The wood /timber processing industries result into atmospheric pollution causing health hazards.
- Deforestation leads to loss of valuable tree species such as Oak, Alep pine.
- The forestry industry has led to growth of towns with associated evils such as congestion, pollution, prostitution etc.

BOREAL / TAIGA / CONIFEROUS FORESTS

The term boreal means Northern forests .in Russia the same forests are known as Taiga, a term meaning Northern virgin forests.

The major commercial species are Scots pine, white pine, lodge pole pine, Douglas fir, balsam fir, red spruce, Norway spruce etc.

They grow in the far north between 50˚-70̊ of the equator .these forests have grown in Russia ,British Columbia ,Canada ,Finland, Sweden, Switzerland ,Norway .they generally grow in far north where winter are long and very cold .there is rainfall of 400mm-1000mm a year but most fall as snow.

Most of the trees are ever green conifers with needle like leaves; tree species in coniferous forests are Hemlock, Spruce, Fir, Larch, Pines, and Birch etc.

CHARACTERISTICS OF BOREAL /CONIFEROUS FORESTS

- Coniferous forests have trees often growing in pure stands of a single species of tree e.g. spruce, fir, and hemlock .this makes extraction easy.
- Coniferous forests are ever green; they don't shed their leaves at once .Apart from Larch most trees are not deciduous.
- They mostly made up of soft wood tree species such as pine, spruce.
- Trees have straight and generally tall stems .they normally grows up to a height of 20metre or more.
- Trees have needle shaped leaves with thick cuticles which reduces evapo transportation.
- Trees are conical in shape with supple and compact branches forming an inverted U-shaped. This shape protects the trees from heavy snow in that snow easily slides off avoiding breaking of the branches due to overweight.
- The trees are quick maturing taking between 8-20 year to reach maturity.
- The leaves have wax coating on their surface and thick leathering structure to protect them from forest attack.
- The tree bark has a large content of resin which is used in making pulp and paper.

LOCATION OF CONIFEROUS FORESTS

1-Western North America in Northern California and Oregon in USA, British Columbia in Canada, South Western Alaska has very luxuriant coniferous forests.

Tree species include; Sitka spruce, Douglas fir, gigantic California, Red woods etc.

2-Central and eastern North America i.e. forests extends south wards around the great lakes and into the Appalachian Mountains;

Tree species include; Red spruce, jack pine, Balsam fir, pitch pine, Hemlock, White pine etc.

3- Northern Europe; in Scandinavian countries such as Switzerland, Sweden, Norway, Finland, and Northern Russia.

Valuable tree species include; Scots pine, Norwegian pines, larch and spruce.

4- Southern continents in South America along the western coastal lands of southern Chile and southern port of Brazilian plateau in South Africa and Australia.

5- Southern USA in states such as Virginia, India and Texas.

Tree species include; Loblolly, Long leaf, Short leaf and slash pines etc

FORESTRY IN CANADA

Canada is the second largest country in the world .Canada has a well developed forestry industry and is the leading producer of newsprint (papers) made from timber.

Almost all Canada's forests are coniferous by nature .in the western region, British Columbia of Canada is very important in lumbering activities.

Tree species here include, Douglas fir, hemlock, cedar and spruce. Such trees produce high quality sawn wood used for building, construction and furniture industries.

Douglas fir is Canada's leading timber by value though spruce mostly produced in the east is the leading timber by volume.

British Columbia has many timber based industries such as furniture making, construction of pre-fabricated buildings, ply wood production etc all centred at Vancouver and Franser valley e.g. Prince George.

Lumbering activity is done at Vancouver Island particularly at Alberni on the deep inlet known as the Albeni canal.

In the eastern Canada, the most important species are Balsam fir, Red spruce, white pine, scot pines etc.

Lumbering activity is concentrated in the provinces of Ontano and Quebec.

FACTORS FAVOURING DEVELOPMENT OF THE FORESTRY INDUSTRY IN CANADA

- The cool temperature climate of cold temperatures up to 20˚c and adequate rainfall above 1000mm per year favours the growth of a variety of coniferous trees such as Douglas fir, western hemlock, spruce and cedar.

- The poor soils of the Laurentian shield region in the East discourages agriculture but favours the growth of Balsam fir ,red spruce, ponderosa, lodge pole pines while in Western British Columbia, relatively fertile soils support Douglas fir, Western hemlock, spruce and cedar.
- The availability of extensive forest land e.g. of the barren northern beyond the tree liner is excluded, forest cover as much as 60% of Canada.
- In the West, British Colombia consists of a rugged terrain (Landscape) made up of the coastal ranges and Rockies mountains. In the East there is Laurentian Highlands. These limits settlement and agriculture hence forestry is the only viable Economic activity practised in these regions.
- Generally high altitudes in British Colombia in the west of Canada limit settlement but are favourable for the growth of coniferous forests particularly on the Rocky Mountains, coastal ranges and Vancouver Island.
- Existence of many rivers that are used for transportation of logs to the saw mills and factories. Examples of these rivers include; R. Fraser, R. Mackenzie, R, Skeena, R. Columbia, R. Athabasca, Gold river on muchalet inlet etc.
- The abundant rivers in British Colombia (Western Canada) e.g. R. Fraser, R. Columbia have been dammed to generate HEP.This has facilitated dev't of timber processing and pulp and paper industry at Vancouver and Fraser valley at Prince George, Albern. In the East, HEP is got from sagueny river along the St. Lawrence sea way. This is used in the pulp and paper industries at Quebec, Ontario etc.
- The numerous rivers like Fraser, Columbia in British Colombia (West Canada) and Saguenay river in the East supply clear un polluted water for soaking and bleaching the pulp (papers) at Ottawa, Quebec, Montreal and other industrial
- Canada has a variety of valuable tree species e.g. spruce trees which are used for pulp and paper, Douglas fir suitable for sawn wood for production of furniture and pre-fabricated building timber. Other species are red cedar, Western hemlock, pines etc.
- Canada has a small population of about 30 million people most of who live in the south along the Greater lakes region. This has left the Northern region with very low and sparse population hence favouring development of forestry activities.
- During winter, the ground surface is frozen or covered by snow. Logs can then easily be transported by dragging them along the rather slippery ground. During spring, the logs are then floated down stream when the rivers thaws and are filled with melt water.
- Application of modern technology to extract trees. This include use of tractors, chain saws, power driven saws, use of steel tower as a spar from which the logs are picked and then lowered and loaded either on the ground or directly on transportation trucks have made work more faster and efficient.

- Readily available market for the Canadian timbers, pulp and news print is provided by the North Eastern USA where there's a big print and publishing industry, the Britain, Japan, China, India where spruce pulp is used to make rayon (textiles).
- Trees generally appear in pure stands of a single species of e.g. spruce or hemlock. This makes selection and cutting of trees easy.
- Availability of an experienced labour force working in the forestry industry to select, fell and chop trees into logs. Labour is provided by native tribes such as Algon quin, Cree and migrant labour from USA, France, and Norway etc.
- Availability of capital to invest in the purchasing of logging machines such as tractors, st5eel towers, timber processing machinery. Capital is got from oil revenue and loans from banks such as Citi group bank, HSBC bank etc.
- Influence of both foreign and local investors in the forestry industry e.g. Abitibi9. Consolidated (a global leader in news print and un coated ground wood papers with owners in 28 paper mills in Canada, USA, UK and Asia); others are Apollo forest products ltd, Alberta-pacific forest Industries Inc (Al-Pac), Columbia forest products etc.
- Presence of a well developed transport network by road, railway that link the East to West coast facilitates transportation of logs and timber products to processing factories in Vancouver, Ottawa, Quebec and Montreal.
- Canada is a politically stable country. This has favoured long term investment in the forestry industry involving setting up of pulp and paper industries at Vancouver, New West Minster, Nelson lumbering centre on R. Columbia etc.
- Favourable government policy which emphasises a forestation, re-a forestation, attraction of foreign investors etc.
- Intensive research to develop the forestry industry e.g. research is done to establish causes of fire outbreak, disease and pest control methods etc.

FACTORS LIMITING EXPLOITATION OF TEMPERATE (CONIFEROUS FORESTS) IN BRITISH COLUMBIA/ CANADA

- Fire outbreak started either by holiday makers, friction or lightening destroys large portions of forests.
- Limited transport routes to the far north limit exploitation of the forests.
- Sparse and low population in BC implies limited supply of labour to carry out lumbering activities.
- The steep slope along the Rocky Mountains in BC limits mobility and exploitation of forests.
- The harsh cold winters of freezing temperatures below -10˚c is the problem to the workers.
- Over exploitation due to use of modern and efficient equipment have led to deforestation
- Pests and diseases such as moths, caterpillars tend to destroy the valuable timber.
- Accidents that often occur during the process of cutting down the trees limits exploitation.

- Forests take long to mature once cut down. This limits sustainability of the forestry industry.
- Competition with other Lumbering countries like Norway, Finland, limits market for Canada's timber and wood.
- Competition with other economic activities such as mining of iron ore, zinc, coal, oil and natural gas reduces concentration on forestry.
- Environmental conservatives discourages forestry activities

IMPORTANCE OF FORESTRY INDUSTRY IN BRITISH COLUMBIA (CANADA)

- Forestry have led to dev't of timber based industries such as pulp and paper mills, saw mills at Vancouver, Prince George, Nelson etc.
- Timber exports to USA, Britain, Japan, China, etc bring foreign exchange to the country. This is used to develop roads , hospitals etc
- The forestry industry is the source of government revenue inform of taxes paid by lumbering industries such as Atcon plywood, Columbia forest products, Ardew wood products ltd based in merit British Columbia.
- Development of forest processing industries has led to urbanisation .Such towns include; Vancouver, Prince George, Prince Rupert in British Columbia .such towns offers health, education, and commercial services.
- The forestry industry provides timber for house construction. Wooden houses are quite popular in Vancouver, Nelson and West minster.
- Timber exports to USA, Japan, China, Britain promotes international cooperation between Canada and those countries.
- The Canadian /British Columbia forest promote habitant for a variety of wild life e.g. wolves, Bears, foxes etc.this promotes tourism.
- The forestry industry provides employment opportunities to a variety of people. These people earn income to improve their standard of living e.g. Abition-consolidated timber industry employs approximately 18000people .others are Atcon, plywood ,Alberta-pacific forest industries, Aras ales company ,Columbia forest products etc.
- The forestry industry diversifies the economy reducing reliance on Iron ore, Zinc and oil mining or wheat growing along the Canadian prairies.
- The forestry industry promotes education and research e.g. Timber and lumbering companies such as Atcon ply wood, Abitibi-consolidate company trains their labour through short courses, Canadian Universities also does research on these coniferous forests.
- The coniferous forests are a source of wild fruits and herbs collected within. Mushrooms are also collected.

NEGATIVE IMPORTANCE

- There's water and air pollution resulting from the pulp and paper industries e.g. R. Fraser. R. Skeena and R. Columbia are often polluted by industrial chemicals.
- Transportation of logs along R. Skeena, R. Fraser and R. Columbia affects aquatic activities like fishing. It also destroys the fish breeding grounds.
- Forests tend to harbour pests and diseases that affects plants, animals and man. Months, caterpillars in BC are a problem to the wheat farms.
- Several towns that have grown up due to timber and lumbering activities such as Vancouver, Nelson, Albert, Prince Rupert have associated evils such as congestion, slum dev't etc.
- Forests limit land available for settlement and agriculture on Vancouver island and along the coastal ranges.
- Fire outbreaks started by holiday makers tend to destroy a lot of property including settlement5 and agriculture fields.
- Accidents due to felling of trees have led to loss of life.
- Coniferous forests limits dev't of transport routes in much of northern Canada hence leading to remoteness of the region.
- Use of modern and quick lumbering equipments has led to over exploitation of forests leading to soil erosion and climate change.
- Profit repatriation by foreign lumbering countries from Malaysia, Japan and France affects the sustainability of the forestry industry and the loss of government revenue.

FORESTRY IN EUROPE (BOREAL/TAIGA/CONIFEROUS FORESTS IN EUROPE)

The major timber producing countries in Europe are Scandinavian countries (Sweden and Finland followed by Norway).

SKETCH MAP SHOWING FORESTRY IN SCANDINAVIAN COUNTRIES

FORESTRY IN SWEDEN

Sweden is a rich country with a high standard of living. Forest cover about 50% of the total land area and also have a prosperous timber and paper industries.

Forests are typically coniferous by nature and valuable tree species are Scots pine, Norway spruce, fir and larch. Such trees are important for the production of both sawn wood and pulp and paper.

Most of the forests are concentrated in the north of the country and the major industrial centres in the north are Norn sand and Sundsvall. In the south, they are found at Orebro, Karl stand, Norrkoping, and Trollhattan. Most of the saw mills are located on the coast of Gulf of Bothnia e.g. Amells furniture industry.

FACTORS FAVOURING DEV'T OF FORESTRY IN SWEDEN

- Low population of only 9 million people concentrated in the southern region leaves a big proportion of land in the north free from settlements.
- Mountainous nature in the north region limits settlement and agriculture hence forestry thrives.
- Cool temperate climate of cold temperature up to -10℃ during winter favour the growth of boreal forests.
- Abundant rivers from northern region flowing to the guilt of bothnia in the south where most saw mills are located favours transportation of logs downstream. These rivers include, Klaralvan, river Lushun, river Toni, River Dal etc.
- HEP for processing timber ,pulp and paper is tapped from R.Toni, Dal, etc
- Clean and clear water for soaking of timber during processing is got from rivers; Toni, Dal, Klaralven etc.
- Coastal ports/ towns of Sundsvall, Hamosand etc handle timber paper and pulp exports.
- Thin and poor soils in the north discourage agriculture and so favour forestry.
- Political stability has made Sweden to develop a successful forestry industry. Sweden has one of the longest life expectancy in the world owing to political stability and other factors.
- Availability of valuable tree species like the Scots pine, Norway spruce, larch etc.
- Trees such as Scots pine, spruce appear in pure stands thus making selection and cutting easy.
- Intensive research involving introduction of quick maturing tree species such as cedar from Canada.
- Dev't of several processing saw mills industries like Amells furniture industry.
- Presence of skilled labour from Sweden, Norway, Malaysia etc.
- Ready market for paper and pulp, sawn wood, in UK, Germany, china etc.
- Developed transport networks by road and railways connecting production areas and market centres e.g. Nornosand and Sundsvall in the north, Nourkoping and Trollhattan in the south of Sweden.

FORESTRY IN FINLAND

Finland is the most Northerly independent country in the world. 78% of the land is used for forestry (coniferous forest). Finland is unique in the sense that for about half a year, the country is covered by snow and this affects the growth of forests.

Finland however is the third world largest exporter of softwood plywood. The tree species includes; Scots pine, Norway spruce and birch.

The chief timber processing centres are located along the coasts and they include; Pori, Vaasa, Tempera, Turku, Rauma etc. Helsinki-the capital city is also important centre for processing pulp and paper.

Being a cold country, the timber is a source of energy in the villages as well as in the Saunas to generate heat. The bark saw dust and waste are burned to produce electricity.

FACTORS FAVOURING FORESTRY IN FINLAND

- Cool temperate climate almost half a year with snow, temperatures of -10℃ and ample rainfall favour growth of Boreal/Taiga or coniferous.
- The poor moraine soils are too hard for agriculture but support growth of coniferous forests.
- The rugged relief discourages agriculture and hence land left for forestry purposes (70% land covered by forests resources).
- Existences of vast forest resources cover i.e. 76% covered by the forests.
- Abundant rivers e.g. R.Ounasijlki, R. Tornionijlki have been dammed to produce HEP for timber processing.
- Finland i9s a land of over 50,000 lakes with large Saiman being the largest. These lakes provide clean water for soaking and bleaching of pulp and paper in industry.
- Skilled labour by the Lapps or samer people who live in the north (frozen area) is essential for timber exploitation during winter, to which they are a accustomed to.
- Presence of many timber, pulp and paper, furniture industries e.g. Haka wood industry specialised in wood workings, Finn lumber for timber exports etc.
- Modern technology involving steel towers that quick pick and load logs within forests, tractors, chain saws, power saws etc are readily available. Some of these technologies were developed by the Helsinki-University of technology, Ampere-University of technology while some technology is imported from Japan.
- Ready market for timber, pulp and paper from UK, Germany, China, Japan etc.
- Supportive government policy that encourage foreign investors, a forestation, re-a forestation through Finish forest federation industries.
- Finland has a small population of only 5.2 million people. This has created vast areas for forestry activities.

- Snow during winter favours transportation of logs by dragging along the slippery ground.
- Occurrence of pure stands such as Scots pines, Norway spruce that makes felling easy.
- Abundant commercial tree species such as Norway spruce, Scots pine, birch tree etc.
- Developed transport networks e.g. roads, railways encourages exploitation of forests.

PROBLEMS FACING FORESTRY IN FINLAND

- Frozen north limits accessibility.
- Acid rains that destroy forests.
- Fire outbreaks destroy forests.
- Competition with other countries such as Sweden.

FORESTRY IN NORWAY

Norway is also among the Scandinavian countries. It has a small population of only 4.6 million people and total square area of 306,800km2

Norway is a rich country with high standard of living only Russia, Saudi Arabia export more oil than Norway and it's the biggest exporter of sea food.

Only 3% of Norway is sustainable for farming. The country is high mountainous and rugged that discourages agriculture and so facilitates forestry.

However, due to great fishing potential and oil mining in the north which have transformed the country's economy, forestry is not a very important activity as compared to Finland and Sweden.

Forests in Norway are coniferous by nature found along the Skagerrak in the hinterland of Oslo fiord, along the Glom men valley and around Trondheim, covering about 25% of the total land area.

Tree species here include, Scots pine, Norway spruce, Fir and Larch etc. there also exists pockets of Temperate mixed (deciduous) forest with tree species such as Oak, Beech, Elm and Birch.

Timber, pulp and paper industries have grown up in Hone Foss (saw milling); Fredrick tad and Sharpsburg (pulp and paper mills) Drammen and Trondheim (variety of furniture and timber processing industries).

FACTORS FAVOURING DEVELOPMENT OF FORESTRY IN NORWAY

- Cool temperate climate up to -10˚c and adequate rainfall over 1000mm favour growth of Scots pine, Norway spruce.
- Thin poor discourage Agric but create land for forestry, afforestation etc

- Variety of coastal ports e.g. Trondheim, Stavanger, Oslo (capital), and Bergen etc with H2O kept ice free by warm Gulf Stream .Facilitates exportation of timber.
- Mountainous nature of land, hence vast land for forestry activities.
- Tree species e.g. Scots pine, Norway spruce fir etc appears in pure stands .this makes selection and cutting of trees easy.
- Large sums of capital generated from oil exports used to import quick maturing species from Alaska, British Columbia, important of logging equipment e.g. steel towers etc.
- Availability of several rivers e.g. sogne, R. Glommen etc used for transportation of logs to processing centres of Trondheim, Honefoss etc.
- Abundant rivers used to generate HEP for timber processing, pulp and paper.
- Existence of valuable tree species e.g. Scots pine, Norway spruce etc with great demand worldwide.
- Modern technology e.g. tractors, power driven chain saws, steel towers to pick and load logs on trucks.
- Most tree species e.g. Oak, Scots pine, Norway spruce have light and straight stems. This makes transport easy.
- Ready market for timber products by local fishing and construction industry for wooden houses, foreign market in USA, China, and Japan.
- Norway is politically stable hence favouring the long term investments in forestry industry.
- Skilled labour provided by cold temperate adopted people e.g. Lapps and migrant labour from Sweden and Finland etc does selection, felling and transportation of logs.
- Developed transport e.g. roads, railways, etc radiating from Oslo, Trondheim; Stavanger etc to interior facilitates transportation of logs and timber products.
- Supportive government policies that include; Afforestation, re-afforestation, silvi culture etc.
- Intensive research to develop industry i.e. involves introduction of quick maturing tree species, fire control methods etc.

FORESTRY IN SWITZERLAND

Switzerland is the most mountainous country in Europe .The Alps occupy 60% of its land area .it (Switzerland) has got a population of 7 million people (2004) and total area of 39600km squared.

It has a very high income per capital per person and long life expectancy .its forests are both coniferous in nature and mixed in the North.

In the north near the border with Germany, there are Black forests with tree species such as Spruce, fir, Cedar, and Larch.

Timber processing centres are based at Basel, Baden, Schaffhausen and Deremont. many pulp and paper ;furniture industries have grown up eg Global wood ,America forests and paper association ,Lignum timber industry etc .the forestry and timber industry employs over 72000 people.

FACTORS THAT FAVOUR DEVELOPMENT OF SWISS FORESTRY INDUSTRY

- Availability of cool temperate climate favour growth of forests.
- Poor and thin soils in much of the country discourage agriculture and settlement, hence used for forestry activities.
- Mountainous nature discourage agriculture/settlement and therefore used for forestry activities.
- Ready market for timber products encourages afforestation and forest conservation.
- Availability of valuable tree species e.g. Spruce, Scots pine which are used for variety of uses fetch high demand on the world market.
- Development of transport networks like railways that link forest areas to market centres encourage forest exploitation.
- Availability of capital used to purchase logging equipments; timber processing facilities have encouraged development of forestry industry.
- Skilled labour to do lumbering and processing is readly available.
- Neutrality (political stability) has facilitated long term investment in the forestry industry.
- Supportive government policy involving attraction of foreign investors in forestry industry has led to development of timber processing industries.
- Hep from river Rhine, Ticino, Danube River etc is used in forestry processing industries to process Newsprint and Sawn wood.
- Intensive research involving growth of quick maturity tree species like spruce has led to the development of forestry industry in Switzerland.
- Abundant water from Necker River, R.Rhine etc provide area for soaking and bleaching of timber, pulp and papers have led to growth of forestry sector.
- High levels of technology such as use of electric chain saws in cutting trees have led to development of forestry industry.
- Tree species e.g. spruce, Scots pine etc appears in pure stands. This makes selection and cutting of trees easy.

DIFFERENCES BETWEEN TROPICAL AND TEMPERATE FORESTS

TEMPERATE FORESTS	TROPICAL
1. Trees are found in high latitudes (temperate areas)	Trees are found in low latitudes (tropical Equatorial).
2. Trees are quick maturing taking 8-2 years	Trees take long to mature up to 50-100 years
3. Soft wood e.g. spruce, fir, pines dominate.	Hard wood e.g. ebony ,mahogany dominate
4. Trees grow in pure stands	Trees grow in mixed stands
5. Trees have needle shaped leaves	Trees have broad leaves
6. Trees have straight trunks	Trees have wide buttress root system
7. No under growth	Thick undergrowth.
8. No climbing plants	Variety of climbing plants.
9. Yield cones mostly other than fruits.	Some yield fruits.
10. Trees /timber are light and slender.	Trees /timber is often heavy and bulky.

DIFFERENCES BETWEEN TROPICAL AND BOREAL FORESTS

BOREAL/CONIFEROUS FORESTS	TROPICAL FORESTS
1. Located in high latitudes (temperate areas)	Trees are found in low latitudes (tropical Equatorial).
2. Trees are quick maturing taking 8-2 years	Trees take long to mature up to 50-100 years
3. Soft wood e.g. spruce, fir, pines dominate	Hard wood e.g. ebony ,mahogany dominate
4. Trees grow in pure stands	Trees grow in mixed stands
5. Trees have needle shaped leaves	Trees have broad leaves
6. Trees have straight trunks	Trees have wide buttress root system
7. No undergrowth	Thick undergrowth.
8. No climbing plants	Variety of climbing plants.
9. Trees yield cones mostly other than fruit	Some yield fruits.
10. Trees /timber is light and slender	Trees /timber is often heavy and bulky.
11. Trees are conical shaped and have cone	Trees are umbrella shaped and have 3 canopies/layers
12. Consists of few tree species	Consist of variety /many tree species
13. Consist of medium height trees	Consist of very tall trees.

SAMPLE QUESTIONS

QN. Asses the contribution of forestry sector to the development of either Canada or Swaziland.

Approach

- Choose any one case study (country of your choice).
- Identify major forested areas, tree species and production/processing.
- Explain contribution of forestry sector to chosen country i.e. give both positive contribution or importance and negative contribution.

QN. Account for development of forestry sector in either Canada or Switzerland

Approach

- Choose any one country (case study).
- Identify major forested areas, tree species and processing areas/centres
- Explain factors for development of forestry in chosen country.

N.B; While explaining factors, identify/use relevant examples, source and role played by factor e.g. labour (i.e. e.g. or form of labour, e.g. skilled labour; source of this skilled labour and role it plays toward development of the sector).

QN. With reference to either West Africa or Brazil, Examine the problems facing exploitation of the forest resources.

Approach

- Choose any one case study
- Identify forested areas; types of forest resource and tree species
- Explain problems encountered in exploitation of forest resource.

QN. To what extent have physical factors favoured the development of timber industries in either Norway or Gabon?

QN. Assess the importance of forestry industry to the economy of either Sweden or Algeria.

QN. (a). Distinguish between Boreal and tropical rainforests

(b). Explain the factors which favoured the growth of tropical rainforests in either Brazil or Democratic Republic of Congo (DRC)

QN. (a) Distinguish between temperate and tropical forests

(b) Examine the factors which limit the exploitation of tropical forests in either Brazil or Ivory Coast.

MINING

COURSE OUTLINE

- Definition of mining
- Mining in North America (USA and Canada)
- Mining in Europe (Germany, Spain)
- Mining in Asia (China)
- Mining in Africa (S.A, DRC, Nigeria, Zambia)
- Problems facing mining sector in Africa
- Mining in South America (Peru, Brazil, Argentina, Chile etc)

DEFINITION OF MINING

Mining is an extraction of minerals and non-metallic ores from the earth's surface or crust. Mining is important because it provides minerals which form a basis for industrial development.

MINING IN USA (NORTH AMERICA)

USA is not only endowed with a vast size but minerals as well. Almost all minerals on the earth can be found in USA.

The great lakes region is the most important mining centre in USA and world at large. It's centred at Lake Superior region and Mesabi ranges for iron ore. L. Michigan, L. Huron, Pitts burg, Hamilton, Duluth, Chicago, Buffalo, port Arthur areas etc. It's important for minerals like iron ore, limestone, Bauxite, oil, Phosphates, Silver and Titanium.

In western region of USA, minerals are found in the states of Utah, Nevada, California and Wyoming. Minerals here include; steel, vanadium, tungsten, manganese, nickel etc.

In south of USA, minerals are found at Birmingham, Alabama and minerals here include; iron and steel.

MINING IN CANADA (NORTH AMERICA)

Minerals are concentrated around the great lakes region. The main mining centres are Shefferville and Wabush city; Iron ore fields at Labrador and Eastern Quebec is also very important.

Saskatchewan and Alberta in the mid-West are important mining centres for natural gas, coal, uranium, iron ore etc.

The mining companies include, Debears group, Harmony gold mining Co. Ltd, Canmin resources etc.

FACTORS FAVOURING MINING IN NORTH AMERICA (USA AND CANADA)

- Existence of a wide range of minerals e.g. iron ore, steel, uranium, cobalt etc aroud the great lakes regions/Pitts burg, Chicago, and Mesabi ranges.
- Presence of good quality minerals e.g. 60% of the iron ore rock in Pitt's burg is pure iron.
- Modern technology involving Adit and shaft methods, bucket conveyors, drilling bits etc. USA has 100 companies manufacturing mining technology e.g. Douglas dill services, Inc repair and technology, Conelly and Associate drilling equipment etc.
- Location of minerals near the surface, thus reduced costs of mining and efficiency e.g. iron ore from Pitt's burg and California.
- Availability of capital to invest in mining equipments, cleaning sites etc. This capital provided by the world bank and big corporations such as General motors, Exxon, Mobil, Texaco, Chevron, Ford motors, De Bears mining company etc.
- local and foreign market for the minerals e.g. iron and steel in USA is highly demanded by Mittal steel, Tata steel in India, General motors, MC Donald steel rolling mills, Cascade steel rolling mills in USA.
- Political stability in USA and Canada has encouraged local and foreign investors in the mining sector e.g. the British Petroleum Royal/Dutch shell from U.K. Others are New England Boring Contractors, Pitt's burg and Midway coal mining company, Oregon gold mining and prospecting, general minerals corp., and free man-united coal mining companies.
- Supportive government policy e.g. compensation of people in Pittsburgh and Chicago iron mining areas, tax exemptions.
- Good transport network via the st Lawrence seaway, modern railway from Labrador to Chicago and slept isles on the gulf of st. Lawrence and shipped to several steel making Centres.
- Both skilled and semi-skilled .Skilled labour initially the elites from Europe while semi-skilled labour was from the slaves, blacks, and poor indigenous people .skilled labour does mineral exploration, refining etc while semi-skilled labour does drilling, transportation etc.
- Adequate energy requirements e.g. HEP from Niagara falls, coal, Thermal and nuclear energy in Pittsburgh, Chicago etc
- Increased research through mineral exploration, Aerial Survey and mapping, GPS (Global positioning system) location system in Pittsburgh and Labrador iron ore mining regions etc.

CONTRIBUTIONS OF MINING INDUSTRY IN NORTH AMERICA (USA AND CANADA)

- Mineral exports e.g. Tata steel and mittal steel companies from India brings in foreign exchange.
- Development of industries using minerals as source of raw materials e.g. iron and steel industry at Pittsburgh, Douglas Drill services one of 100 companies manufacturing mining technology in USA.

- Offered great employment opportunities to people both skilled and semi-skilled labour e.g. Elites in exploration and refining, semi-skilled in drilling and transportation.
- Promoted economic diversification, there by reducing over dependence on sectors like tourism and industry.
- Source of government revenue through collection of taxes from mining companies such as De-bears group; Canmin resource limited etc. This revenue is used in infrastructural development (roads, HEP etc)
- Acquisition of skills related to mining e.g. Geo-survey, mapping, Geology, mineral exploration areas etc in Pittsburgh and Labrador iron ore mining regions.
- Mining promotes power and energy sector e.g. Natural gas and coal in Saskatchewan and Alberta areas.
- Promotion of research e.g. through mineral exploration, Aerial survey in Pittsburgh, Labrador
- Promotes international cooperation btn USA and Canada; other countries e.g. UK through giving contract to foreign investors e.g. British Petroleum royal company.
- Promotes social services through establishment of schools, hospitals etc in the great lakes regions

NEGATIVE CONTRIBUTIONS

- Encroachment to agricultural land for mining coal in Saskatchewan and Alberta regions. This affected wheat growing in the Area.
- Mining leads to air e.g. burning fossils fuel in Chicago; water and land degradation. This is noted in coal and iron ore mining areas e.g. L. Superior mesabi ranges; Pittsburgh etc
- Mining leads to destruction of landscape through creation of mine pits hence increased government expenditure to fill/cover pits.
- Loss of lives due to accidents in mining centres .This involves collapse of mines, diseases due to breathing in toxic lubricants used in mining.
- Mining causes deforestation and negative impacts on Flora and fauna through cleaning sites by big mining corporation e.g. De-bear, general motors' in order to obtain minerals e.g. iron ore at Pittsburgh and Chicago iron ore mining areas.
- Mining leads to displacement of people coupled with their high costs for compensation in affected areas such as Pittsburgh and Chicago iron ore mining areas.
- Mining activities have led to regional imbalance or unequal development e.g. the great lakes region being a major mining centre is more developed than the other areas in North America, with highly developed infrastructures and dense populations.

MINING IN GERMANY (EUROPE)

The Ruhr is the main mining region.

Other mining areas are Hamburg, Bremen, Bochum

Major minerals mined include; coal and iron ore from Ruhr region, Saar and Silesian coal fields; Uranium mined from Harz mountains; Steel from Essen; Rock salt and potash, cobalt, Nickel, Copper, Lead and Zinc are also mined in Germany.

MINING IN SPAIN (EUROPE)

Mining centres are at Bilbao, Oviedo and Santander.

Major minerals mined include; Iron ore, steel, lead and zinc, silver, Bauxites etc.

Most minerals occur near the surface making extraction relatively easy through use of open cast method.

Minerals are located near the coast making export oriented mining centres at an advantage.

Foreign investors in Spanish iron and steel industry e.g. Prakesh mittal (steel giant) from India /Uk have boosted mining activities.

MINING IN CHINA

China also endowed with a variety of minerals including gold at Jinfeng mines in the southern China; Eastern provinces of Shandong, Fujian, Liaoning, Hehen, and some western provinces e.g. Yunnan and Guizhou.

Other minerals mined include Cobalt, Iron and steel, Nickel, Vanadium, Molybdenum and manganese.

SKETCH MAP SHOWING MINERAL CENTRES IN CHINA

China is the current leading gold producer in the world after S.Africa in 2007 with an over taking output of 276MT (9.7 million ounces) as opposed to south Africa's 254MT.

FACTORS FAVOURING MINING SECTOR IN CHINA

- Presence of a wide range of minerals such as Gold at Yanshan gold mine, Ivanhoe gold mines etc .there are over 1000gold mines alone. Other minerals mined include ;Iron, steel, Nickel, vanadium etc
- Supportive government policy towards promoting mining activities e.g. the country's largest and old gold producer belongs to the state. It's called the China national gold group corporation (CNGGC) accounting for 20% of total gold production.
- Influence of foreign investors in the Chinese mining sector. Examples are Vancouver based Jinshen gold mine s inch working at Changshan Hao gold mines in Northern Province of Inner Mongolia; gold fields and Austria Sino gold mining industry company. Others are Fujan Zijin mining industry company, Zhaojin mining industry company, Lingbao gold company etc. Most of these companies come from Canada and Austria.
- Ready market for Chinese minerals in local and foreign industries. For example ,most of the Chinese gold produced stays in the country where its transformed into Jewellery and manufactured items in Manchuria and Yangtze industrial centres. China is now the world's fourth largest gold consuming country.
- With a population of 1.3 billion people, China has both skilled labour and semi-skilled to extract, process, survey, and transport the minerals. For example in Zhao Yuan, A Shandong provincial city of a population of 580, 000, more 60 gold mines have been opened up.
- Presence of good quality minerals such as gold from Ivanhoe gold mines, Zhao Yuan gold mines, Jingeng gold mines in the south etc. Other minerals of high quality includes iron, steel, Vanadium etc.
- Location of minerals near surface or along the rivers e.g. gold along river Yangtze. This makes extraction easy.
- Availability of capital to invest in mining. Such capital is got from the World Bank. Local banks such as Shenzhen development bank, Industrial and commercial bank of China and the state etc. For example the largest and old gold producer belongs to the government "the China National Group Corporations (CNGGC).
- Relative political stability especially since 1976 has led to massive investments in the mining sector.
- Good transport network in form of roads, railways linking to Major mining centres such as Shandong, Fujian, and Henen, Liaoning etc.
- Increased research through mineral exploration use of aerial survey, GPS mineral location etc. Such research has been conducted by Sino gold mining ltd, Zhaojin mining industry company etc.

MINING IN SOUTH AFRICA

This is another country endowed with a variety of minerals ranging from Gold, Diamond, Uranium, Limestone, Silver, Zinc, Copper, Rock salt etc .it's only Bauxite and oil which are not found here.

The major mining centres are; Witwatersrand for iron ore, coal, gold; others are Orange Free State with about 55% deposits of the world's gold; Kiedersdorp gold field; Transvaal, Kimberly diamond fields for Diamonds etc.

South Africa has the most developed mining industry in Africa and one of the leading mining countries in the world.

South Africa produces 90% of platinum metal on the earth; 80% of the vanadium and 41% of the Gold. It's the fourth largest producer of diamond it produced 254 tons of gold in 2007 while China is current leading producer of gold produced 274 metric tons in 2007.

Since 1905, South Africa was the leading gold producer till 2007 when it was over taken by China.

FACTORS FAVOURING MINING IN SOUTH AFRICA

- Existence of a wide range of minerals such as Iron ore, gold from the rand, gold from Orange Free State, others are; silver, diamond from Kimberly, Zinc, Limestone and lead etc. These have attracted foreign investors from USA and Europe to South Africa.
- Existence of abundant energy for processing of minerals e.g. Coal from the Rand; HEP from river Limpopo and R. Transvaal. Others are Thermal energy in Cape Town through use of imported oil, nuclear energy at the land and Cape Town.
- Foreign investors have influenced South Africa's mining industry e.g. Arcola mittal (the world's mine in the sinter complex at the Cape Province and smelter complex at the Coega industrial development. Others are Kalahari resources running the Kalahari manganese mining project; India giant Tata is constructing a high carbon Ferro ch-home plant at Richard bay on the Kwazulu Natal coast. De-Bears mining giant from Canada have constructed 2 new mines i.e. one at voorspoed in the free state and the second in the South Africa Sea areas off-shore marine mining division; Harmony gold mining co. Ltd ; Anglo- American corporation of S.Africa LTD.
- Modern and efficient technology for mining has been brought in by several companies such as Anglo American Corporation of South Africa, parabola mining company, West Rand consolidated mines Ltd etc. Technology involves drilling rigs, bucket conveyors, Vision gadgets, gas detectors, winding cables etc for example the Moab khut song gold mine in New province has the world's largest winding cable to lower workers to 354 meters in one un interrupted four minute journey.

- Supportive government policy to develop mining through provision of mining contracts to potential mining companies, tax exemption, loans etc for example the state financier –the industrial development corporation (IDC) give loans to both mining companies and industries.
- Most of the minerals are located near the surface of the Earth. This reduces the mining costs and efficiency. For example coal, iron and Limestone from the Witwatersrand region etc.
- Political stability since 1994 when apartheid was stopped / dropped have reduced tension and strikes in the mining areas of the Witwatersrand, Orange free state, and Kiedersdorp.
- Increased research through mineral exploration, Aerial survey and Geo mapping has led to efficiency and maximum exploitation of mineral resources.
- Presence of both skilled and semi-skilled labour. The white settlers provide technical service such as managerial, extraction, surveying while the blacks and Africans provides the semi-skilled labour such as drilling, underground, mineral transportation etc.
- Good transport network inform of roads, railways to the major mining centres such as the rand, Orange Free State, The Gauteng province in the western facilitates transportation of minerals to refining and smelting centres.
- God quality and large quantities of minerals facilitates mining in South Africa e.g. Diamond from Kimberly, Gold from the Orange Free State is some of the best quality in the world hence commanding a high price on world's market.
- Local and foreign market for minerals e.g. Aluminium from Coega mines has a ready market by a Canadian firm called Alean aluminium, iron and steel giant Tata steel the biggest steel industry in India.

CONTRIBUTION OF MINING SECTOR TO SOUTH AFRICA'S ECONOMY/ENVIRONMENT

POSITIVE CONTRIBUTIONS

- Mineral exports such as steel to India, Spain, Aluminium to Canada, gold to USA brings in foreign exchange.
- Mining has led to development of industries for example the Indian steel giant Tata are constructing a rand 650 million high carbon Ferrochrome plant at Richard's Bay on the Kwazulu Natal Coast. Anglo Australian miner, Rio into is building (2008) US $2.7 billion Aluminium smelter at Coega industrial development zone near Port Elizabeth in the Eastern Cape. Other industries are; Billing ton smelters at Richard's bay, Hullet Aluminium, Iscor smelters etc
- Great employment opportunities through which people's standards of living are raised. Mining industry is the biggest employer with around 460.000 employees and 400.000 employed by suppliers of goods and services to the mining industry.

- Growth of towns with positive effects such as health care, education, trade and commerce etc such towns includes Pretoria, Jonesburg in the Rand mining region. Others are Cape Town, Richard's bay etc.
- Mining stimulates other sectors in the economy e.g. gold mining in Orange free state, Iron and coal mining in the rand have promoted tourism, agriculture in the Natal through the need to provide food stuffs to the mining companies.
- Mining has promoted Economic diversification thus reducing over dependence and creates other benefits e.g. it has reduced reliance on tourism and industry.
- Source of government revenue through taxing mining companies such as Kalagadi manganese corporation, Arcellor mittal, Petra diamonds, Moab Khutsong gold mine, Parabola Mining Corporation etc contributes a lot of revenue to the government through taxes and contracts.
- Acquisition of skills related to mining e.g. Geo survey, Mapping, Geology, mining exploration, marketing, grading, etc for example Arcellor mittal, Tata steel. Parabola Mining Corporation etc train their workers through short courses, on-job training etc.
- Mining has led to accumulation of capital through saving/exports; these are used to develop other sectors like tourism industry etc.
- Mining of coal, iron, Limestone from rand, gold from the Orange Free State reduced government expenditure on imported minerals such as oil, limestone etc.
- Promotes international corporation through giving mining contracts to foreign companies such as Arcellor mittal from India, Canadian aluminium group, Alcan, Anglo-American corporation of S.Africa (AAC), BHP Billington, mineral exports like gold, Aluminium, Vanadium, Platinum, to USA, Canada, India, has promoted corporation.
- Mining promotes the power and energy sector .this is through coal extraction from the Rand, Uranium leading to development of nuclear energy station in Cape Town, HEP from R.Transvaal has also been exploited to generate/supply mining operations. Energy stimulated the health, industry and other sectors in the country.
- Promotes research e.g. through mineral explorations involving modern exploration and survey techniques such as aerial survey.
- Mining promotes social services through establishment of schools, hospitals etc for example Anglo-American P/C built schools in the Rand, and Petra Diamonds built health centres and schools in Northern Cape Province around the Kimberley Diamond mines.

NEGATIVE CONTRIBUTIONS

- Encroachment on agricultural land e.g. coal mining in the Natal province has affected growing of sugarcane and tea in the province.
- Mining leads to air, water and land degradation. This is noted in the Rand coal and iron mining region.

- Mining of gold in the Orange Free State, Western deep gold mine in Gauteng province has led to displacement of local people.
- Mining caused deforestation with negative impacts on Flora and Fauna. For example the Rand and Natal coal fields led to devegatation.
- Loss of lives due to accidents in the mining centres. This involves collapse of mines, diseases such as Silicosis (a lung disease caused by breathing in too much dust and fumes), breathing in toxic Uranium gases in the Wit watresrand region.
- Mining leads to destruction of the landscape through creation of mine pit in Natal, The rand. These have led to spread of water born diseases such as Bilharzia.
- Leads to rural-urban migration. This reduces labour force to agriculture hence decline in food production. For example people have left Natal agricultural province and gone to the Rand creating unemployment in the latter
- Profit repatriation by foreign investors e.g. Canadian Aluminium group Alcon, Hullet Aluminium, Rio Tinto from Canada and Petra Diamonds from UK.
- Mining in South Africa is a basis for political instability just like any other developing country Greed by mining companies and need by local people in mining regions to share the mineral proceeds have often led to strikes and political instability in the Rand and Orange Free State.
- Over dependence on mineral results into mineral exhaustion e.g. Diamonds at Kimberly have reduced in stock and the mine was temporarily closed down in the early 2000s.
- Urbanisation with associated evils such as Congestion and slum settlement e.g. Natal and Johannesburg.

MINING IN D.R.CONGO (AFRICA)

D.R.Congo is another African country highly endowed with mineral resources. There are over 300mines occurring in mainly 3 regions namely; Shaba province/Katanga region. Chief minerals are copper, cobalt, tin, uranium, manganese, zinc and coal. Copper is the most important mineral whose deposits are continuation of those of Zambian copper belt.

The major mining centres are Kolwezi, Kambone, and Kipushi.

Other mining areas are Kilomoto region in North East near L.albert. This is noted for petroleum around L. Albert.

D.R.Congo has large quantities of Gold only ranked second to south Africa .This gold is found in Kilo-Moto region. Diamond is mined in Kasai region while iron ore is mined near Lake Kivu.

There are over 200 foreign mining companies in D.R.Congo e.g. Dominion Mining Corporation from Canada, Gold corp. i.e.canada’s largest gold mining company, Anvil mining company from Canada

etc. others are Congolese State mining company owned by Non-governmental organisations, Katanga mining limited etc.

HEP from Inga dam and thermal energy have facilitated mining.

However the Congolese mining sector is badly affected by;

- Political instability in the east.
- Poor transport.
- Limited skilled labour
- Limited energy requirements etc.

MINING IN ZAMBIA (AFRICA)

The major minerals here include; copper, cobalt, lead, zinc, and gold. Copper is the most important mineral and is found along the copper belt.

The major mining centres are Ndola, Mufulira, Lubumbashi, Likesi, Bwana-mkubwa, Chingola, Chilabombwe, Kitwe etc.

Foreign companies from Canada, Australia and Britain and local firm do mining.

Tazam railway facilitated exports f copper.

MINING IN GHANA (AFRICA)

Major minerals are Bauxite, Diamond, and Gold, Iron ore from Nimba mtns, salt, coal, natural gas, and zinc from Tarkwa.

The mining centres are; Asante Dunkwa and generally southern part of Ghana.

Asante gold field corporation manages the richest deposits at Obuasi in Asante uplands.

HEP from river Volta (Akasombo dam) and thermal energy have facilitated mining and Bauxite smelting at Tema.

Railway networks especially in the south has connected mining areas to processing/ export ports such as Takaradi, Tema, Accra etc on Atlantic Ocean.

MINING IN NIGERIA (AFRICA)

Oil is the most important mineral. Nigeria is the second largest oil producer in Africa after Libya.

Major oil fields are located in the Niger delta near port of bonny. Major refineries are found at Port Harcourt on Atlantic Ocean.

Other minerals mined are; Tin at the Joss plateau; coal near Enugu and iron ore along or near R.Niger. Natural gas, Limestone and salt are also mined in Nigeria.

MINING IN LIBYA (AFRICA)

Oil is the most important mineral mined. Others are natural gas, Limestone, Asbestos, iron ore etc.

Libya is the most oil mining / exporting oil country in Africa.

Major mining centres are Zecten, Beda, Zahra oil and natural gas fields.

Other oil fields are found in the south e.g. Edfeheh.

Thermal energy through use of diesel generated is the main source of energy.

MINING IN LIBERIA (AFRICA)

The major mining centres are Nimba Mountains, Bong hills, Biehilb, The mano river valley, Vonifana region of iron ore.

Iron ore is the major mineral mined in this country

Many factors favour mining in Liberia, these include the following.

- Presence of iron ore in large quantities
- Capital from local and foreign investors
- Presence of skilled man power
- Ready market for the mineral
- Presence of ell developed transport routes
- High quality grade ore (iron ore)
- Intensive research carried out in mining sector
- Presence of power source for mechanisation of mining and processing of mineral
- Political stability
- Favourable government policy

GENERAL PROBLEMS FACING MINING SECTOR IN SOUTH AFRICA,DRC,CHINA,GERMANY, ETC.

- Exhaustion of minerals e.g. coal from the Ruhr exposed coal fields .reduction of diamond in Kimberly diamond mines (South Africa); copper in Bwana-mkubwa mines (Zambia).
- Poor transport especially in the land locked countries such as Zambia; remoteness in DRC, congestion in developed countries in Germany.
- Inadequate power supplies for example in China, DRC, and Nigeria etc.

- Competition with other countries such as gold production between China and South Africa, DR.Congo etc.
- Development of ghost towns due to closure of mines by Bwana-mkubwa town in Zambia with negative effects such as unemployment.
- Inadequate skilled labour for mineral survey exploration, extraction and processing.
- High costs of maintenance e.g. expatriate labour like for Uranium in South Africa or with increasing depth of minerals e.g. South Africa has deepest mine i.e. the western deep gold mine in Gauteng province that penetrates 3.6 km into the earth while the Moab Khutsong goldmine in south Africa have the world's longest winding cable, able to lower workers to 3054 metres deep in one un interrupted four minute journey.
- Strikes by labour e.g. in South Africa and Chinese gold and coal fields or local people who destroy or explode oil pipelines in Nigeria.
- Political instability e.g. D.R.Congo, Liberia, South Africa etc.
- Limited market for some minerals such as Uranium in South Africa due to Embargo on production of nuclear weapons. Other minerals with limited market are copper , Vermiculite.
- Less supportive government policy e.g. less grants, over taxation, termination of mining contracts like in D.R.Congo.
- Profit repatriation by foreign mining companies that undermine development and opening up of new mining areas.
- Growth of towns near mining centres and their associated evil such as robbery, congestion, slum development that limit the mining companies.

MINING IN PERU (SOUTH AMERICA)

Peru's mining industry is only 2nd to Chile and has potential to become leader in Latin America.

Minerals mined include; silver, lead, zinc, copper, mercury, phosphates, gold. Oil is drilled by Talisman Oil Company from Canada at Achuar region.

The major mining centre is Cerro de Pasco in the Nazca-marcona area.

Peruvian mining industry only started growing in the 1990's with important changes to both corporate law and legislation governing investment in the sector-promoting both domestic and foreign investment.

Because of these reforms, Peru has been able to recover its position as a major world's supplier of base and precious metals such as ;

- Pyrite from Huazala
- Barite from the Huarihayan mine in Huanaco province.

- Rhode chrosite from Santa Rita, Morococha.
- Cookeite with Quartz from pasto, Bueno etc.

Foreign mining companies mostly from Austria and Canada dominate the Peru mining industry. Examples are Xstrata copper, Rio Tinto, Strike resources, investor resources, Gallipoli mining, Alturas minerals, Western mining and New crest.

Other mining companies /corporations include;

- Grupo mexico from Mexico operating the ILO smelter and energy.
- Gold fields from South Africa based at Cero corona
- Barrick gold from Canada based at Perinea Lagunas Norte
- Mitsubishi from Japan at Toromcho etc.

FACTORS THAT HAVE FAVOURED DEVELOPMENT OF PERU'S MINING SECTOR

- Modern geological information system provided by Peruvian mining engineers institute, institute for geology and metallurgy.
- Efficient administration of mining rights and title granting procedures.
- Free trade of mineral suppliers, supplier service in a free market Economy and other supportive government policies such as a competitive taxation system, free profit repatriation scheme.
- A successful privatisation process that has created an attractive investment environment for international mining companies such as Mitsubishi, Gold fields, China co etc.
- Capital mobilization through mergers between mining families (local) mining company and foreign companies. Such mergers involve Del Castillo at Aruntani, Arias Aavilla at san Ignacio Vancouver based Manhattan minerals invested US$240 in Tambo grade open pit gold mine.
- Use of modern technology such as drilling bits, bucket conveyors etc. For example in 2002, the Canadian international development agency (CIDA) began a US$9.6 million mineral resource reform project which provides technical assistance and technological support to the country's ministry of energy and mines.
- Availability of a variety of minerals such as gold at Tambo grade open pit gold mine, oil at Achuar, others are Cobalt, Copper, silver, Silver etc.
- Energy requirements from HEP and thermal energy is available, Use of oil from Achuar oil fields.
- Ready market for minerals in China, Japan, U.S.A and Europe.
- Relative political stability that allow intensive investment in the mining sector for example in the Achuar oil fields.
- Good transport services that link mineral fields like Achuar oil fields and Tambo open pit gold fields to market centres.

- Presence of many oil refineries and many processing facilities at the Nazca- Marcona region.
- Skilled labour from Canada, Austria, China etc
- Location of minerals near the earth's surface.
- Intensive research carried out in mining sector involving Aerial survey, mapping etc.

MINING IN BRAZIL (SOUTH AMERICA)

Brazil is one of most important iron producers with reserves of 19.7 billion tons.

Iron ore has traditionally been the country's largest export products accounting for 5% of the total value of mineral exports.

Iron ore is exported to Japan (13%), Germany 11%, China 22% and South Korea.

Iron ore is the basis of rapidly developing Brazilian steel industry at Volta Redondo and Belo Horizonte.

The major iron ore mines in Brazil include Aguas claras, Alegeria, Brucutu, Capenema, casa de pedra, Cave, pico, mutuca, minas Gerals etc

The other minerals mined in Brazil include ;

- Bahia oil field in North East
- Uranium at Angra dos peis
- Manganese at Amapain north east Niobium
- Zinc ,copper, tin, gypsum ate at Amapa
- Aluminium, coal, lead etc
- High quality iron ore in the state of par and Habirito mining field in south east Brazil. Foriegn mining companies from Austria, China, Canada, Japan dominate the Brazilian mining Industry .These include BHP from Australia, Rio Tinto, Mitsubishi from Japan, China co from China etc.

MINING IN CHILE (SOUTH AMERICA)

Chile is noted (famous) for copper, nitrates, silver, mercury, coal, iron and steel, Aluminium etc.

The major mining centres are EL Teniente for copper and Algarabo in central Chile for iron ore.

Both local and foreign companies do mining in Chile. These include Medina Mineral inc, Trinity mineral inc, BHP steel etc.

Coastal ports such as Taka, Valdivia, and Valparaiso handle mineral exports to USA, Japan, China and Europe.

MINING IN ARGENTINA

The major mining centres are Potrerillos and Elyalwadore mostly for copper.

Other minerals mined include; Uranium around San Miguel in the northwest and near Santa Cruz in the south, Tin, Iron, Steel, Manganese, gold and Mica are also important minerals mined in Argentina.

HEP from river Parama, Nuclear power from Atucha and Cordoba facilitate mining.

Foreign companies such as Rio.Tinto and Mitsubishi from Japan, BHP from Australia, and Chinalo from China do mining.

Much of the minerals mined are handled by Buerios Aires port /city

METHODS OF MINING

1. **Open cast mining method**
   - This is the easiest and cheapest method of mining
   - It's used to mine minerals which occur close to the earth's surface
   - It involves removal of earth, other rocks bands and vegetation lying above the mineral bearing strata using excavators.
   - The ore bearing rock are then blasted using explosive to break it into smaller pieces and which are then loaded into trucks and taken to factory for processing /refining.
   - The ore is extracted in successive layers until the mineral becomes too deep.
   - The method is used for mining minerals like limestone at Tororo in Uganda, copper in Zambian copper belt.

2. **Under ground or Adit mining method.**

   - This method is used when ore containing the mineral is found deep underground.
   - Vertical shafts have to be sunk to reach the mineral bearing Strata.

   N.B Vertical shafts are vertical entry passage from top to bottom to excavate mineral ores found deep underground.

   - The horizontal shafts are dug to connect to the rock bearing the ore. The ore is then blasted using explosives to break it into smaller quantities.
   - The ore is loaded into lifts that lifts it underground and taken for processing centres using railway wagons (trucks).
   - The method is very expensive and examples of minerals mined using this method are gold.

     NB: Adit method. is nearly horizontal passage from surface into mine purposely used for haulage, drainage and ventilation.

3. Placer mining /Alluvial mining

- The method involves excavating loose or alluvial deposits such as sand, grave, silt or clay.
- Valuable minerals are then separated from alluvial materials through a system of screens, jigs and sluices.
- Examples of minerals mined using these methods are salt and soda ash. Sometimes Gold is also mined using this method depending on where the deposits are.
  N.B for salt; scooping may be done manually especially in LDC's while mechanical draggers are used in fairly developed economies e.g. soda ash in Kenya.

4. Drilling method of mining.

- It is the only method by which oil and natural gas can be found (mined) by drilling a hole into the mineral reservoir.
- The basic equipment for drilling oil is the derrick method which is steel tower of about 40 metres high.
- The derrick carries a drill stem on which ore screwed length of steel drilling pipes attached to a powerful drilling bit that bores through the rock strata to reach the oil below.
- Lubricating mud is pumped into drill pipes to lubricate the bits and to bring up rock samples to be examined by geologists.
- Once the bit reaches the oil bearing strata crude oil (petroleum) rushes out and is captured by pipelines for transportation to refinery.

SAMPLE QUESTIONS

QN.(a) Differentiate between Adit and Shaft method of mining. (5mks).

(b) Explain the challenges facing the mining sector in either the DRC or Libya (20mks).

QN. To what extent have physical factors limited development of the mining sector in either Peru or tropical Africa?

QN. Account for the development of mining in either China or South Africa

QN. Discuss the role of mining in either Nigeria or U.S.A.

QN. Assess the contribution of mining sector in either Argentina or D.R.Congo.

QN. Examine the impact of mining sector on the environment in either the Ruhr region of Germany or the Rand republic of South Africa.

Approach

- Select the case study, state the minerals together with the mining centres.
- Explain the positive and negative contributions of mining.

N.B; Consider environment in its broad sense including social economic, drainage and land (soils and vegetation).

Qn. "The development of mining in tropical Africa has been limited by shortage of capital" Discuss with reference to either D.R.C or South Africa.

Approach

- Choose any one case study (country of choice)
- Identify major mining areas and particular minerals mined.
- Discuss how capital shortage has limited mining
- Bring in other factors limiting development of mining.