S4 2020 Term 2

Topic: MINING INAFRICA.

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- ***Explanation @ 0775534057.***
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Introduction:

Mining refers to all attempts to extract valuable minerals, both solid and liquid from the earth's crust.

The mineral industry of Africa includes the mining of various minerals; it produces relatively little of the industrial metals copper, lead, and zinc, but according to one estimate has as a percent of world reserves 40% of gold, 60% of cobalt, and 90% of the world's platinum group metals.

Types of minerals.

There are three types of minerals:

1. Metallic minerals.
2. Non-metallic minerals.
3. Minerals which provide power.

Metallic minerals.

Most metals occur as oxides, sulphides or carbonates, such as gold and diamond may occur in pure state. There are two types of metallic minerals, namely non-ferrous minerals and ferrous minerals.

(i) Non-ferrous minerals contain minerals such as copper, lead, zinc, aluminum, tin, and so forth.

(ii) Ferrous minerals contain iron.

There are four types of iron ore:

a) **Hematite;** contain 70% iron.
b) Limonite: iron content rarely exceeds 60%.
c) **Magnetic:** mainly occurs in igneous rocks and has iron content of about 70%.
d) **Siderite:** has iron content of about 30% and mainly occurs in sedimentary rocks.

Non-Metallic minerals.

Several non-metallic minerals exist. They include

Phosphates, nitrates, potash, graphite, Sulphur, mica, precious stones etc.

- Phosphates, nitrates and potash are used for making fertilizers.
- **Graphite** is a form of carbon which is soft and used to manufacture of pencils, paint and dry cells.
- **Sulphur** is mainly used in the manufacture of a variety of chemicals and in vulcanization (hardening) of rubber. Sulphur is also used in the manufacture of medicines and insecticides. Sulphur occurs in regions of volcanic activity.
- **Asbestos** is mainly used for manufacture fire proof clothes and insulating materials.
- **Common salt** occurs in some in certain types of rocks. Over a half the salt produced in the world is consumed and the rest is used the manufacture of chemicals.
- Stones such as **graphite** and marble are used for building purposes.

Minerals which provide power.

Minerals which provide power include petroleum, coal, natural gas, uranium and water.

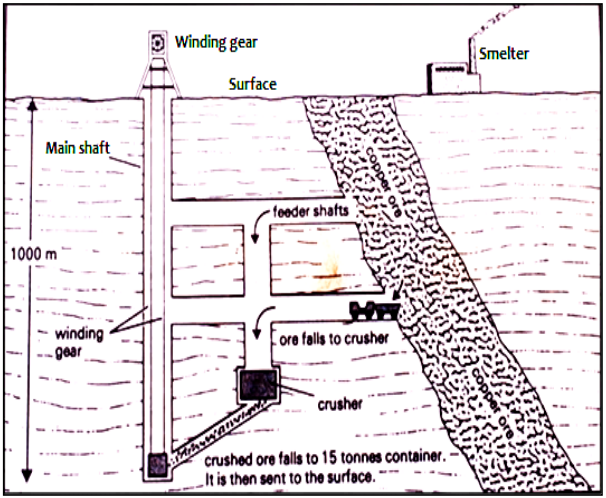
METHODS OF MINING MINERALS

Underground mining/ adit/ shaft / deep mining.

- This is used when the mineral lies deep below the earth's surface, the overlying layers may be too thick to be removed by mechanical means.
- A vertical shaft tunnels are dug into the earth's crust to reach the mineral. From the shafts tunnels or galleries are dug horizontally to reach the mineral.
- The roof of the tunnel must be supported by steel or concrete beams to prevent it from collapsing.
- Light railway tracks are then laid to bring the ore to the foot of the shaft for transporting to the surface.

- Minerals such as potash, salt and Sulphur are mined by sinking pipes underground to reach the mineral. Superheated water to the deposit until the mineral dissolves (or melt e.g. Sulphur) and is then pumped into the surface.

- At the surface water evaporate leaving the mineral behind.
- The drilling of oil and natural gas using a derrick is done in similar way.



Shaft method of mining

Drift or adit mining.

Simplest of the underground mining operations.

A slightly inclined or horizontal mineral seam(coal) that is overlain by very thick overburden but exposed on hillside is mined by simply cutting a tunnel called Adit or adrift into the mineral bearing stratum and extracting it.

Slope mining.

When the mineral seam is too steeply tilted for drift mining or is below a thick overburden, slope mining is sometimes practiced. It involves construction on of an inclined tunnel

known as slope through which conveyor belt or cable car is used to bring out the ore.

Open –cast mining.

- Used to extract minerals that occur near the earth surface.
- This method involves removing the top layers of the earth and other materials lying above the mineral.
- Heavy machinery is used like bulldozers and other earth removing machinery.
- Once the deposit has been reached electric shovels are used to dig up the mineral deposit and load it onto trucks or Lorries.

Sometimes the overlying layers are hard and had to be blasted using explosives in order to reach the ore.

- In open cast mining is employed when quarrying limestone for manufacture is cement, copper in Zambia, etc.

Alluvial mining.

Minerals that occur in alluvial deposits can be recovered by Placer

Alluvial mining method.

- This method involves the mixing of alluvial deposit with water in the container. The mixture is stirred/ rotated until light particles such as sand, mud and small stones are washed off leaving mineral particles such as gold, platinum and diamonds.

- Sometimes the miners use circular and by swirling the pan round, lighter materials are washed away leaving the heavy mineral deposit. This method is called **Panning.**
- If the mineral deposit outcrop is in the valley a jet of water under high pressure is used. The jet of water is directed to the rock outcrop deposit and because of great pressure; gravels and minerals collect at the valley bottom where mineral grains are recovered. Alluvial mining is common in river valleys

COPPER MINING IN ZAMBIA.

The copper belt extends from Katanga district of southern Zaire to the town of Ndola in Zambia.

The belt is about 450 km long and about 250 km wide and contains large reserves of copper.

The main mining centers include; **Roan Antelope** and **Nkana** opened 1931, **Mufulira** opened 1933, **Chibaluma** opened 1955, Bancroft in 1957, **Chimbishi** mine became fully operational 1965.

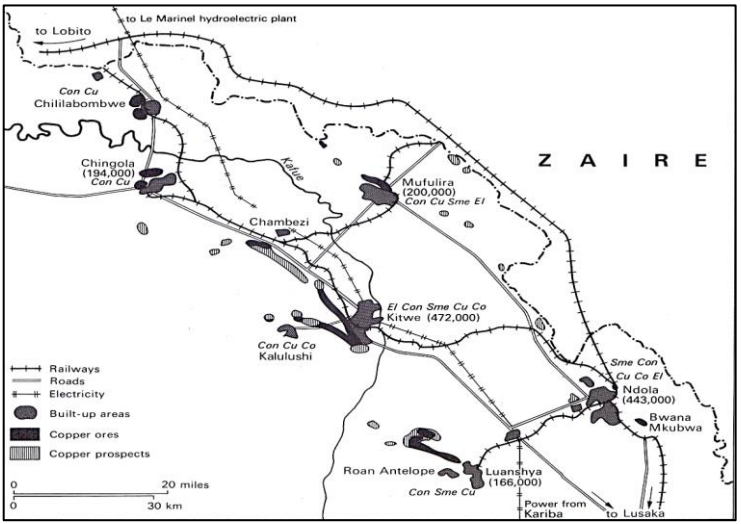
An **Anglo-American corporation** is fully involved in the mining of copper in Zambia. The Zambian copper Belt alone covers a zone of about 110km long by 50km wide.
Zambia's copper accounts for **10% of the world's total production.**

Copper industries are the largest consumers of electricity generated from **Kariba and Kafue** power generation stations. Smelting of copper is done at Mufulira, Kitwe,

Luanshya and Ndola. Smelting done to get rid of some impurities by melting.

Other minerals which are extracted in the Zambian copper belt are; **Silver and Gold** which are removed during copper-processing. **Cobalt** is mine d at Chibaluma and Nkana, while Lead, Manganese and Zinc are mined in Kitwe district.

LOCATION OF COPPER BELT.



Kitwe copper mine

Kitwe, in north central Zambia, is a major copper mining and processing center. The surrounding Copper belt Province provides about one-half of the country's export earnings.

Zambia, which holds one-fourth of the world's known copper reserves, is dependent on copper and copper products for 80 percent of its export earnings. The country's economy has suffered since 1975 as copper prices on the world market have fallen.

Methods of mining Zambia's copper.

There are two types of mining methods used:

a) Open cast mining.
b) Shaft or underground mining.
(***read for the process above for each method)***

Describe the factors that have favoured copper mining on the copper belt.

- Presence of high-grade copper in large reserves which enable large scale commercial copper mining to take place.
- Existence of copper ore near the surface of the earth makes it easy to exploit using cheap open cast mining method.
- Availability of gently flat relief makes the construction of roads and railway lines relatively easy.
- Presence of adequate skilled labour to work in the copper mining industry provided by the local population and immigrants.
- Existence of abundant supply of hydroelectricity power from R. Kafue to facilitate mining.
- Presence of adequate capital provided by foreign companies like Anglo- American Corporation to invest in copper mining activities.
- Availability of a large market for copper in the European Union markets.

- Presence of developed transport and communication network to facilitate transportation of copper to markets by road and railway.
- Existence of abundant water supply from R. Kafue for washing copper and other uses at the mine.
- Availability of favorable government policy to encourage copper mining for increase of export earnings to the country by inviting foreign investors.

Explain the Contributions of the mining sector to the development of Zambia.

- Provision of foreign exchange through copper exports for development of infrastructure.
- Provision of employment opportunities to many people to improve their standard of living.
- Generates a lot of income earnings to people to improve their standards of living.
- Led to development of infrastructure like roads and railway lines to open up remote areas to access social services.
- Led to attraction of tourists leading to development of tourism and earning of foreign exchange to the country.
- Led to development of industries e.g. copper smelting industries by providing raw materials.
- Generation of revenue to government through taxation for provision of social services.
- Provision of market for agricultural goods provided by industrial workers and miners.
- Led to diversification of the economy by reducing overdependence in on agriculture.
- Led to development of urban centers like Kitwe, Ndola, etc.

Outline the Problems facing the copper mining industry in Zambia.

- Exhaustion of minerals in some mines due to over mining for a long time since 1960's.
- Price fluctuations of copper in the world market affected profit margins.
- Zambia has a problem of land lockedness and has to transport her copper through other countries such as Tanzania, Malawi, and Zimbabwe to the port that are distant routes.
- Competition for market with other copper producing countries e.g. DR. Congo (Zaire) Chile and South Africa.
- Low wages are paid to the workers which often lead to strikes.
- Shortage of labour to work in the mines.
- Depreciation and obsolescence of machinery that is costly to replace.
- Competition from synthetic materials which reduces the demand to copper.
- Power fluctuations due to much electricity needed to process Copper that is costly.
- Political instability especially in the neighboring countries such as Zimbabwe and Angola affect the export of the mineral from Zambia through sea ports.
- Environmental degradation through air, land and noise pollution.
- Collapsing roofs of mines underground lead to death of the miners.

- Diseases like silicosis, lung cancer, etc. due to inhaling too much dust from the mines while at work.
- Very hot heat, pressure and sometimes suffocation of the miners while underground in the mines lead to death.
- Lead to occurrence of landslides that destroy people's property and lives.
- Has led to destruction of top layers of cultivable soil limiting food production in the area.
- Occurrence of soil erosion accelerated by mining activities affects productive soil.

Outline the environmental problems which have resulted from copper mining in Zambia.

or

Outline the effects of mining to the physical environment

- Displacement of people from the copper mines region lead to high cost of resettlement.
- Deforestation lead to global warming and desertification.
- Lead to destruction of habitats for animals lead to their migration and extinction of some species.
- Creation of hollows/ pits that are abandoned after exhaustion of the minerals as Ghost towns.
- Stagnant water in the hollows/ pits may act as breeding grounds for vectors that cause diseases to people.
- Dumping of wastes during mining and processing copper lead to pollution of air, soils, water and noise.
- Heavy rainfall that causes flooding of the mines may cause accidents and death of workers.

Outline the measures being taken solve the problems facing mining sector in Zambia.

- Recycling and treatment of wastes refilling of the hollows/ depressions to reduce the dangers from their existence.
- Resettlement of people in new areas.
- Setting up treatment centers where the sick are treated.
- Planting of trees to control landslides and soil erosion in areas affected by mining.
- Removal/ draining off stagnant water to destroy the breeding places for pests.
- Replacement of out dated machinery with advanced technology of modern machinery.
- Hiring of labour from other countries such as Angola, Malawi, DR. Congo, to work in the mines.
- Opening up alternative routes for export of copper e.g. Tanzam railway.
- Carry on with market research to widen market to other countries for increased sales of copper.
- Building up improved political relations with neighbouring countries through peace talks.
- Improve working conditions for workers by increase of wages and set up trade unions to reduce causes of strikes.

IRON ORE MINING IN LIBERIA.

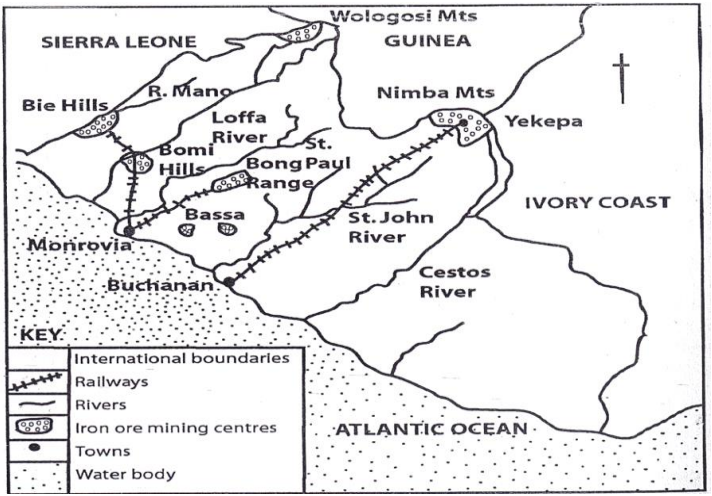
Liberia is endowed with large reserves of iron ore. Companies from USA Germany and Sweden have been granted concessions by the Liberian Government to mine iron ore. Large deposits of iron ore have been discovered at the Wolongsi Mountain Range in Liberia, at Bie Mountain Range in Western Liberia and at Bong Mountain to the north-

east of Monrovia, the Bong iron-ore mines have large deposits.

Transportation of the Iron ore.

A railway line links Monrovia with Bong Mountains. Iron ore from Bie Mountains Ranges, Bomi Hills and from Bong Mountains is exported to industrialized nations of Western Europe through the port of Monrovia. Iron ore from Mt. Nimba in northern Liberia is exported through the port of Buchanan.

***Map of Liberia showing iron ore deposits*.**



Describe the conditions which have favoured iron ore mining in Liberia.

- Existence of large deposits of iron ore in the country, in the areas of Yekpa, Bong, Voinjama, etc. for economical mining to take place.
- Presence of adequate capital to invest in iron ore mining provided by companies, e.g. LAMCO.
- Presence of adequate skilled and semi-skilled labour to work in the iron ore mines.
- Presence of adequate power supply in form of hydro-electricity and thermal power used in mines and mineral processing.
- Availability of efficient transport network in form of railway, roads and water for transportation of mineral ores to processing industries.
- Proximity to the coast which make exportation of mineral resources easy through Monrovia and Buchanan ports.
- Existence of large market for iron especially in Europe and America.
- Availability of advanced technology used in the mining of iron ore provided by foreign companies.
- Presence of adequate water supply from many rivers like; St John River, St Paul river, Mano, etc.
- Availability of favorable government policy of encouraging foreign investment in the mining sector.

Explain the contribution of the mining sector to the development of Liberia.

- Source of foreign exchange through export of iron ore to provide social services.

- Creation of employment opportunities to many people to improve their standard of living.
- Source of income to people leading to improved standard of living.
- Has led to diversification of economic of Liberia from other sectors.
- Led to generation of revenue for government through taxation to provide social services to people.
- Led to development of infrastructure like roads and railway for transportation of minerals and link people to services.
- Promoted the development of urban centers and ports like Monrovia and Buchanan to provide various functions.
- Promoted international relationships/ friendships with other countries.
- Led to the development of industries due to raw materials from iron ore mining.
- Mining is a tourist attraction has led to promotion of tourism and earning foreign exchange to the country.
- Has provided market for local products e.g. agricultural products consumed by miners to promote local production.

Outline the effects of iron ore mining on the environment in Liberia.

- Results into loss of vegetation cover affecting the local climate.
- Loss of land for agriculture due dumping of wastes from mining by heaping mass of rock.
- Formation of depressions/ hollows due to open cast mining (quarrying) and land subsidence after hollows is left uncovered.

- Pollution of land, water and air during excavation of the mineral.
- Collapse of mines causes accidents and loss of life.
- Stagnant water in hollows are habitats for breeding of pests and diseases affecting miners.
- Occurrence of soil erosion accelerated by heavy machinery used to excavate minerals.
- Led to displacement if people from mining areas, this has led to loss of their habitats.
- Occurrence of landslides due to use of explosives to blast iron ore bearing rocks.
- Occurrence of floods in the mines.

GOLD MINING IN SOUTH AFRICA.

Gold is a shiny yellowish mineral that does not rust or fade in colour. Gold is the world's most valuable mineral throughout history.
Today it is widely used as a basis of the world's money and jewelry.

South Africa is the leading producer of Gold in the world. The main deposits are at **Witwatersrand** goldmines close to Johannesburg, a city that developed due to Gold. Gold occurs as small grains in hard rock.

The Gold-bearing rocks are found very deep below the earth surface; hence **underground mining method** is used for getting gold ore to the surface.

Processing.

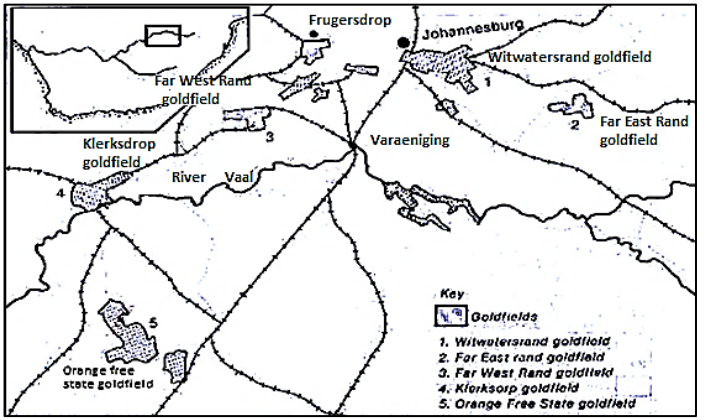
- At the surface, gold ore is crushed into fine powder and the stirred with solution of sodium cyanide which dissolves the particles of Gold

- Cyanide solution is mixed with zinc- durst causing the gold to precipitate. The gold is melted and then molded into bars.
- During the process of purifying gold, **Uranium** occurs with Gold is also extracted.
- **Uranium** is used in the production of atomic energy.

Describe the factors that have favoured Gold mining in the Rand.

- Availability of large gold reserves / deposits in the Rand–far west, East rand etc. for commercial mining.
- Presence of advanced technology used for large scale extraction of gold.
- Availability of abundant cheap power –HEP and Coal for running the mining industry.
- Existence of large / ready market for Gold both locally and international.
- Availability of highly skilled labour using the advanced technology in the mining.
- Presence of large supply of cheap migrant labour (Bantustans) from neighboring countries e.g. Lesotho, Swaziland and Botswana.
- Availability of developed transport network like railway and road network for easy access to the gold mines.
- Existence of large volumes of water from R. Vaal for mining and processing of gold. Presence of some minerals located either exposed or near the surface for easy mining.
- Existence of high-grade gold of commercial valve promotes commercial mining.
- Availability of favorable government policy that support large scale investment.
- Presence of adequate capital invested in the mining sector provided by both local and international companies

Location of South African Goldfields.



Explain the problems facing gold mining in the Republic of South Africa.

- Existence of some gold bearing reefs at great depth has led to high cost of mining.
- Accidents in the mines cause loss of lives and equipment.
- Pollution of air, land and water resulting from dumping of wastes in the environment.
- Competition in the international market leads to low foreign incomes.
- Exhaustion of gold reserves leads to closure of the mines, unemployment and residual towns/ ghost towns.
- Price fluctuation in the international markets reduces profit margins.
- Overpopulation in the mining centers has caused many urban related problems, such as, theft, poor hygiene, etc.
- Labour shortage resulted into reliance of expensive foreign labour force/ migrant labour.

- High taxes which discourage investors to invest in mining industry.
- Shortage of capital is limiting national investment hence relying on foreign investors.
- Repatriation of profits leading to loss of income to the country.

Outline the Steps being taken to promote the mining sector in the Republic of South Africa.

- Improving the working conditions of the miners through strengthening trade unions.
- Employing advanced technology to ease mining for quality and increased production.
- Erecting/ construction of props (beams to support roofs) in the mines to prevent the collapsing of mining roofs.
- Effecting proper waste disposal measures such as treatment, recycling, etc.
- Recycling water from the mines to reduce water wastage.
- Prospecting for more minerals to diversify the mining sector.
- Improving transport to ease movement of goods and services.
- Carrying out market research and advertising to increase sales.
- Encouraging foreign investors in order to increase mineral extraction.
- Training local workers to improve labour productivity.

Diamonds in South Africa.

Diamonds is a hardest mineral; it is not a metal but a precious stone that has been valued for centuries because of its transparent sparkling brilliant when out and because of its Varity.

Diamonds are found in few places occurring as scattered crystals in an igneous rock called **Kimberlite.**

Which forms pipes-like dykes or volcanic plugs deep underground in South Africa. Erosion of these pipes has caused the resistant diamonds to be washed into rivers and later deposited in river banks lower downstream; they are called alluvial Diamonds mined using placer method.

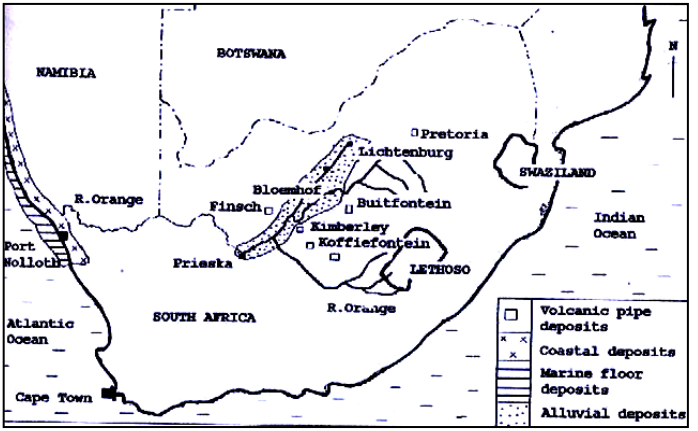
Method of mining Diamonds in South Africa.

- Alluvial Diamonds are mined using placer or alluvial mining method**.**
- In this case a steel dredge or gravel pump is used to suck up alluvial deposits, which are thoroughly mixed with water.
- The mixture is rotated and in the process diamonds settle down while the fallings are washed off.
- This type of mining is carried out extract diamonds in the Vaal, Hartz and Orange Valleys.

The diamonds in Pretoria, Bultfontein Jagersfontein and Koffiefontein are exploited by use of **Underground mining method.**

The major diamond producing areas are: **Pretoria, Kimberly and Fort Nolloth.**

MAP OF REPUBLIC OF SOUTH AFRICA DIAMOND FIELDS.



Uses of Diamonds

- Diamonds of gem quality are used for jewelry.
- Poorer qualities have a wide range of industrial use, e.g. cutting equipment.
- Making industrial equipment like drilling bits, lathe and abrasive polishing wheels.
- White sparkling diamonds are cut into pyramidal germs for decorations.

OIL MINING IN AFRICA.

Today Africa's main Oil producers include: Nigeria, Libya and Algeria which range among the top 14 producers in the world. These three countries together with Gabon are members of O.P.E.C. Other oil producers in Africa are not members of OPEC include; Egypt, Angola, Tunisia, Congo and Zaire

Oil prospecting and drilling.

- Oil prospecting i.e. survey and exploration to establish the presence of oil wells / deposits and rock alignments and hardness etc. are carried out.
- Construction of oil rings and derrick.
- Drilling is done to extract oil from the well.
- Oil is pumped out to reservoir.
- The crude oil is then transported by pipelines to the coast for refining into different products like paraffin, petrol, plastic, etc.

Methods of drilling oil

Off shore drilling is employed where oil occurs under the continental shelves.

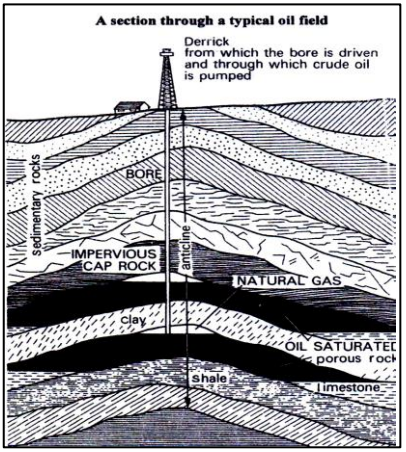
Derrick and other equipment are mounted on the platforms.

Methods of drilling oil include:

a) **Percussion or cable- tool method** – used for drilling shallow wells of not more than 2000ft deep. It is cheap to use but slow and inefficient and so it is rarely used.

b) **Rotary method** – used by modern oil companies and more efficient.

Structure of a Derrick.



The drilling stem carries steel drilling pipes each 30ft long and 5 inches' diameter at the bottom is a powerful drilling bit that cuts its way through the earth and rocks.

As the drilling operation progresses more and more steel pipes are added until the bore hole is thousands of metres deep.

The bore hole is reinforced by steel pipes of larger diameter than the drilling pipes which prevent it curving in.

When the drilling bit finally strikes the oil or gas bearing rocks, gas and oil often gush upwards to the surface because they are usually trapped under great pressure. The bore hole releases the pressure and allows oil to flow out.

TRANSPORTING OIL PRODUCTS

Petroleum is one of the minerals traded in large quantities and transported over long distances.

a) It can be conveyed by road, in oil trucks,
b) By railway wagons,
c) By sea in oil tankers and even by
d) Military aircrafts on emergency purposes.
e) The bulk of the oil in the world from oil fields is transported by endless network of pipelines. Once a pipeline is built the route is fixed.
f) Oil is transported to refineries from oilfields or to coastal terminals by pipelines.

Oil Refining

- Crude oil is made up of various hydrocarbons,
- The basic components have to be separated to have crude oil important for industrial use.
- At refinery crude oil s broken down the various hydrogen carbons into their respective fractions through a complex process called ***Distillation.***
- At the refinery many products are produced up to 80 different products of oil, gas and chemical products.

Products from petroleum after the refinery.

a) Petrol called Gasoline.
b) Paraffin (Kerosene).
c) Benzene.
d) Diesel,
e) Lubricants,
f) Fuel oils,
g) Also a number of residues are produced in the process these include:
    - Coke,
    - Asphalt,
    - Bitumen or tar

- Wax.

h) Gases such as butane and propane are produced.

OIL MININ IN LIBYA

Traces of oil and gas were discovered in Libya before 1914 but the exploration of oil was discovered by the 2nd World War in 1961 and by 1963 Libya was producing millions of tons of oil.

Both reserves of oil and Natural gas occur at ***Dahra, Zelten, Beda, Serir, Hamada, Hofra and other fields.***

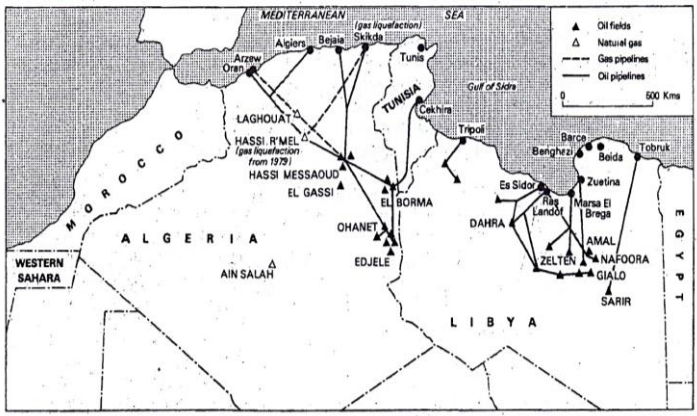
The mining of petroleum is done by foreign companies from Germany, Italy and Spain.

Most of the wells are very deep and operations cost are very high. There are several pipelines from the oilfields to the coastal ports such as Mersa el Brega, Sidra, Ras Lanuf and Tobruk.

At Zelten and Raguba natural gas is produced. The gas is piped to mersa el

Brega where it is converted into liquid gas. The liquidfield natural gas is then exported to Italy and Spain.

OIL PRODUCTION IN LIBYA AND ALGERIA



a) <u>Describe the Conditions which have favored oil mining industry in Algeria.</u>

- Existence of large deposits of oil in Algeria enabled commercial mining.
- Presence of adequate capital to invest in oil mining activities.
- Availability of large labour both skilled and semi-skilled in to work in the mining.
- Availability of favorable government policy of encouraging oil mining through negotiating for soft loans and foreign investors.
- Existence of advanced technology applied in oil prospecting, exploitation and transporting.
- Presence of developed transport for transportation and marketing of oil by pipelines, road in trucks and water and rail.

- Proximity to the coast which facilitates oil refinery and exportation.

b) Description of Process of mining oil in Algeria.

- Oil prospecting i.e. survey and exploration to establish the presence of oil wells / deposits and rock alignments and hardness etc. are carried out.
- Construction of oil rings and derrick.
- Drilling is done to extract oil from the well.
- Oil is pumped out to reservoir.
- The crude oil is then transported by pipelines to the coast for refining into different products like paraffin, petrol, plastic, etc.

c) Outline the Contribution of oil mining to Algeria.

- Provision of revenue to the government through taxation for development of services to people.
- Has facilitated to the development of infrastructure like roads, railway, etc. to link services to people.
- Source of valuable energy like paraffin, petrol and natural gas used in many homes and industries.
- Led to diversification of the economy to reduce dependence on agriculture.
- Source of income to many people to improve their standard of living.
- Promoted development of urban centers like Algiers, Hassi Messaoud, El borma and Edjele to provide various functions like administrative, commercial and residential, etc.
- Source of raw materials for industries like petro-chemical and plastic industries.

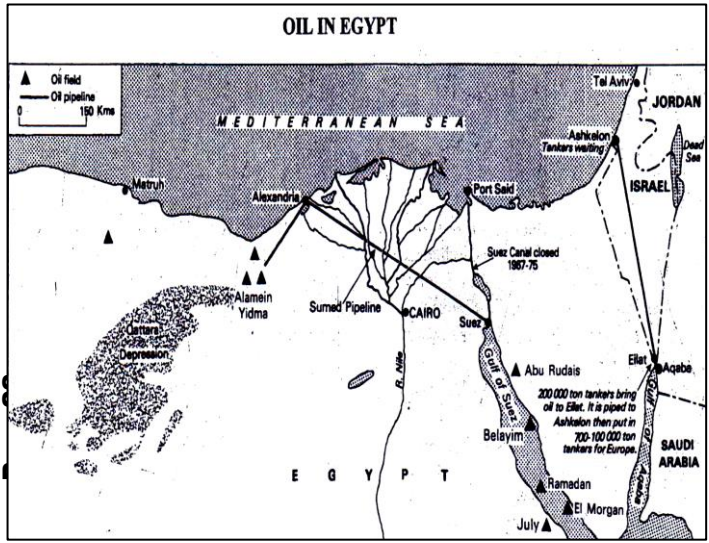
OIL MINING IN EGYPT.

- The earliest discoveries of oil were made in the delta region. Today over 80% of the oil producers comes from fields around or under Gulf of Suez.

- The leading producers are four in and bordering the Gulf with Ramadan bearing the most important.

- Egypt is also an important producer of natural gas and fields occur in the western desert countries.

- Provision of employment opportunities to people improving their standard of living.
- Has promoted international relations between Algeria and other oil importing off shore near Alexandria and in the Nile delta**.**



Emihen Geography resources

Oil mining in Nigeria.

Oil mining in Nigeria began in 1937 but it was not until 1956 that commercial deposits were discovered and production began in 1958 at the Otoibiri field.

The companies which started petroleum mining in Nigeria include: Shell B.P. (British Petroleum), Gulf, Mobil, Agip, Texaco and Safrap. In 1971, the Nigerian National Oil Corporation was established.

Prospects of locating other oil fields within Nigeria are on, for half of the country's total area consists of sedimentary basins in which oil-bearing strata are likely to occur.

These basins cover 450,000 km^2 occupying large areas inland from the delta and extending into broad arms north-west along the **Niger valley and north-west along Benue valley through Sokoto state towards the Chad.**

Oil fields of the Niger Delta.