

Minerals and Mining

Minerals in our houses

If you look around in your house you will find walls made of mud bricks or just mud joined with cement and sand. Your house may be whitewashed with white lime. Your floors may be paved with Kadapa stones. Pillars and rafters may be made of granite stones. Most of these are really minerals we get from the Earth – mud, sand, lime, Kadapa stones or granites. Again if you go around your house, you will find many objects made of metals like iron, copper, lead, chrome, aluminum etc. You may be wearing ornaments made of silver or gold. These are metals which have been separated or extracted from natural ores which are also minerals. We use fuels like petrol, diesel, kerosene: these too are extracted from mineral oils called crude petroleum. Other forms of fuels like coal and gas too are forms of minerals. In fact the groundwater which we get from wells or tube-wells is also a mineral. In other words almost anything which we obtain naturally from under the earth (which is not in the form of plants or animals) is a mineral.

Renewable and non-renewable resources

Environmentalists differentiate between two kinds of resources – renewable and non-renewable. Renewable resources are those which can be regenerated – like wood. If we cut a tree we can plant another tree and hope that it



will yield the same amount of wood after some years. However, if we use up a rock outcrop for preparing granite blocks and sell them off, can we plant another rock or make it in some way? Since it is not possible to regenerate these resource they are called non-renewable or finite resources. Most minerals are non-renewable. If we continue using them we will reach a stage when we will not have any more of it. Let us take the case of gold: it occurs in very limited quantities in deep mines. The only gold mine in India – the Kolar Gold Fields had to be closed down. Similarly coal or petroleum. There is only a limited amount of these available on the earth. If we finish them then there will not be any more of it. These are called non-renewable sources of energy.

- Can you imagine a world in which we cannot run motors or trains?
- Can you think of some mineral which renews itself and we can help to increase it?
- Can you think of some source of energy which will not diminish with our use of it, which will keep renewing itself even if we don't do anything?

- Classify the following natural objects into renewable and non-renewable resources. Put a tick (✓) against those which are minerals and cross (✗) which are not minerals. Bamboo, Coal, Sea water, Mud, Ants, Sand, Iron Ore, Diamond, Trees, Petroleum, Grass, Air, Marble rock, Fishes, Well water, Sunshine.

Renewable resource	Non renewable resource	Minerals
1 Bamboo		✗
2	Coal	✓
3		
4		

- Can you classify the following minerals into metallic, non-metallic and energy source? Iron ore, bauxite (aluminum ore), coal, copper ore, limestone, gypsum, mica, groundwater, petroleum, rock salt, sand, gem stones.

Metallic	Non-metallic	Energy resource
Iron ore		

Some important minerals and their uses

You may already know about the uses of some minerals like iron ore, sand, petroleum, limestone, coal etc. In modern industry we use many kinds of minerals. Hence, these minerals have become very important in our lives. Uses of some important minerals are given here. You can look up your library for more information and even check on the internet about them.

Bauxite: Aluminum is extracted from bauxite ores. Aluminum has become a very important mineral in our times because of its light weight. It is used in making aircrafts utensils, electric wires etc, and also extensively in packaging of food products.

Mica: It is a shiny mineral and is used extensively in electrical and electronic industry. It has many properties which make it useful – it comes in thin layers, and is a non-conductor of electricity and heat.

Chrome: It is used for preparing ‘stainless steel’ utensils. Since it does not corrode (unlike iron or copper) it is used both for cooking food and also for storing industrial liquids like acids.

Asbestos: It is a heat resistant mineral, which is used extensively in industry and also for household roofing. However, it is known to be very bad for health of those working on them, and its use is now being banned all over the world.

Barytes: This is a group of ores from which an element called Barium is extracted. Barium is used for industrial and medical purposes. Barytes is also used in drilling deep holes for petroleum and natural gas.

Feldspar: It is one of the raw materials used in making of glass and ceramic ware (like wash basins etc).

Mineral Resources of Andhra Pradesh

Andhra Pradesh is very rich in mineral resources. It is a large producer of granites of various colours, Kadapa stones, etc used in buildings. It also produces limestone and dolomite used in cement industry. While the Krishna Godavari basin has great potential for mineral oil and gas. AP is historically known for its famous diamond mines too and some of the largest diamonds in the world were found here.

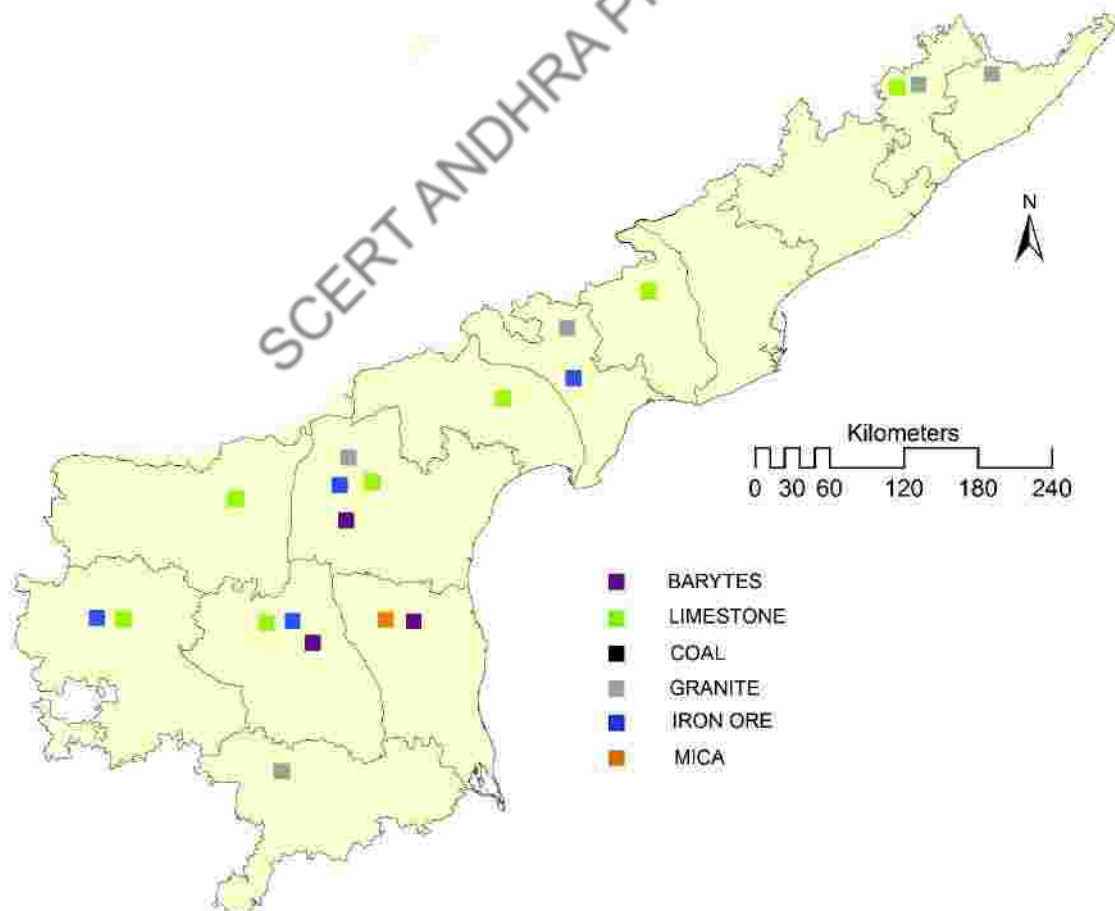
Diamond mines are there in Kolluru of

Guntur district and Vajra Karoor of Ananthapuram district. World famous Kohinoor diamond was first discovered at Kolluru of Guntur district.

In addition to these we have large deposits of asbestos, barytes, mica, feldspar, vermiculite, etc.

Look at the mineral map of Andhra Pradesh and fill this table:

District	Mineral



Mining the Minerals



Minerals can be taken out for use by humans through a process of mining or digging the earth. There are several ways of mining – we can just make a large pit and keep extracting the minerals. We can blast and remove granites, barytes etc. This is called ‘open cast mining’. We can build underground tunnels to mine minerals that lie very deep. This is called underground mining. Just as we use a well or drill a tube well to get mineral water, we can drive very deep tube wells to get crude oil or natural gas. In many places this is done by drilling into sea bed like in Bombay High near Mumbai.

Most of the mining practices result in disturbing the surface area – it can mean cutting down forests, destroying fields and habitations, creating large pits or mounds. Mines also need large amounts of water to wash the minerals. This results in polluting the nearby rivers and water sources. This usually means that older use of the land cannot be continued and farmers or tribal

people have to leave the land. Even people who live nearby face problems created by mining. At the same time mining employs a large number of people who come to live in nearby areas and build new townships. It thus provides livelihood for nearly ten lakh people in India and over one lakh people in Andhra Pradesh. The work of miners is also very hazardous, as they are constantly exposed to accidents besides breathing in poisonous substances which cause long term health damage.

- Look at the following pictures and guess which of them is open cast mine, underground mine and drill mining for oil (Fig. 6.1, 6.2, 6.3).
- If there is mining activity in your area find out about the people who work and live there and also about how it affects the environment around it. Also find out how many people benefit from it.



Fig 6.1



Fig 6.2



Fig 6.3

To whom do the Minerals Belong?

Minerals usually occur deep in the earth. They in fact do not belong to any particular owner but belong to all people of the country and have to be used in everyone's interest. That is why all mineral wealth of a state is considered the property of the government. The government uses the minerals keeping in mind the interests of all people of the country.

- How does the government use the minerals?

At the time of independence mines were mostly owned and operated by private owners and companies. They were interested only in getting as much as possible in short time and did not care for proper development of the mines or about the safety of the workers. In 1970s the government took over all mines. It owned and operated most of the mines and sold the minerals to various factories or traders or exported them. In this way it was able to control the extent of mining so that there is no over exploitation or use of methods which were dangerous or harmful to people, especially the workers. It could also ensure that the important minerals like fuels, precious metals etc., were mined for public benefit and were not under control of private companies which only cared for increasing their profits. However, the government was not able to bring in new and more sophisticated technologies for mining. It was not able to survey and find out about new deposits of minerals. Thus production of minerals stagnated. It was therefore felt that it is necessary for

government to allow private companies to mine minerals and sell them, subject to the regulation and control of the government. A New National Mineral Policy was announced in 1993, and the government allowed private companies to lease mines and operate them. The companies were to pay a royalty to the government for the minerals they extracted and sold. In this way the government could retain regulatory control over the mining, get income from them and at the same time encourage private companies to invest money and bring in new technologies. However, the government continues to control mining of all minerals relating to atomic energy.

As a result of this policy there has been a boom in mining during the last twenty years. There has been a major increase in the number of mines, the minerals mined, and the employment in the mining sector.

On the other hand, there has also been uncontrolled mining by the private companies far in excess of the permits given to them and disregard for environmental and safety measures. Excess mining means that more quantity is mined than is sustainable on a long term. It also means that the minerals are taken away by companies without paying royalty to the government – thus the people to whom the minerals really belong to do not get anything. It can also be environmentally very harmful. For example when more sand is mined from river beds, it can affect the flow of the rivers causing flooding and early drying up. Similarly, the new mining companies do not want to do underground

mining as it costs more money and instead prefer 'open cast mining'. This is much cheaper way of mining. But unless the pit and the mound of rubble which is created is properly disposed off it can create serious environmental problems like choking of rivers.

- Discuss the pros and cons of allowing private companies to mine our minerals. How do you think they can be regulated? How do you think the environmental concerns can be taken care of?
- If all people of the country are the real owners of the mineral resources, how can we ensure that they are used for the benefit of all?
- Do you think the generations to come, that is our children and our grand children too should be able to use these resources? How can we ensure that they are available to them too and not exhausted?

Singareni Coalfields (SCCL)

There are extensive coal deposits in the four districts of Khammam, Karimnagar, Adilabad and Warangal. These mines are operated by the Singareni Collieries Company Limited (SCCL). This company was initially set up by a private British mining company in 1886, which was purchased by the Nizam of Hyderabad in 1920. After independence, the government of India took over this company. Today SCCL is jointly owned by the government

of India and state government of Telangana. SCCL is currently operating 15 open cast and 35 underground mines in 4 districts of Andhra Pradesh and employs around 65,000 people (2012).

The students and teachers of ZP High school, Kongatam of V.Kota Mandal, Chittoor district visited a coal mine in the famous Singareni Coalfields. Let's listen to them.

We reached Hyderabad from Chittoor. We boarded a bus to Kothagudem from Hyderabad bus stand. On reaching Kothagudem we visited the office of SCCL and took permission to visit the mines. We then travelled 40 Km from Kothagudem to Yellandu. Here again we went to the office of SCCL and took per-



Fig 6.4: No. 21 Incline, entrance to the mine mission to go down the **No.21 Incline**.

We then crossed an iron bridge over a railway track on which a goods train was standing. We reached the entrance of the mine where the Safety Officer received us. The officer explained that coal is found as

thick layers under the ground. If one dug from the ground level, first there will be some soil, after which there will be rocks and water. If we go further deep for about 200 or 300 feet we will reach the coal layer. In one area there can be several layers of coal separated by rock or loose soil.

Danger and Safety Measures

The safety officer also explained us that it was always a risk to go down as accidents may occur. A tunnel may fall down or get flooded by water or there can be fire and suffocation due to poisonous gases. He explained that the mine administration has developed elaborate safety arrangements to prevent such accidents and that we should also take necessary precautions. He also explained how to face such accidents with the help of the safety kit. We put on the safety kit and got ready to go down. We reported at muster point for online registration.

- Can you name these instruments?
- What is the use of the stick?



Fig 6.5: Safety instruments used by miners

- Why is there a light on the helmet?
- Did you identify the lamp in the picture? What purpose does it serve?

Now we reached the entrance of the mine. Actually this is a lift that carries people in and out of the mine. The two of us and the safety manager along with three miners entered the lift. The lift in-charge closed the sides and gave signals to Under Ground lift operator by ringing a bell using a code.

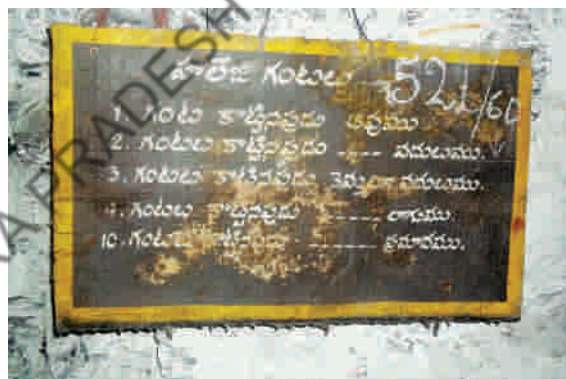


Fig 6.6: Picture of bell code board

Inside the mine

Our lift went down about 500 feet below the ground level. It was like going deep down a well. We were gripped by fear as the lift rapidly slid down and we kept hearing water falling somewhere. The safety Officer who was with us explained: "It is ground water. You know that when we dig, we find water. We have to pump this water out, otherwise it will flood our mine tunnels. All the

water is directed to a pool from which it is pumped out of the mine.” He further told us that the company has a Project and Planning Wing which takes care of designing these aspects of the mines. The lift stopped and we stepped into a narrow tunnel called mine shaft. As we walked we noticed electrical lines, hose pipes carrying water, a narrow rail track on the ground etc. When coal is mined it is loaded onto



Fig 6.7: Dolomite painted coal wall

small wagons which are pulled on these rails till the lift from where it is taken to the ground level. Our guide pointed out that we were actually walking through a coal layer (also called ‘coal seam’) and that there was coal on both sides and above and below us! We were surprised to see walls of the mine to be bright and not black. Our guide explained that this is because they are painted with dolomite to prevent oxidation and degradation of coal and also to enhance reflection and give us light.

Blasting the coal



Now we were approaching to the coal drilling area or ‘face’. Every day the supervisors inspect the coal seam and give instructions for that day’s mining – where the mining is to be done, and what safety measures had to be taken. Different groups of people are assigned different tasks. One group was drilling holes with

pneumatic air compressor to plant the explosive rods. Resin packets were inserted to keep them in place. These explosives will be set off (detonated) by an electrical device. Strong rock like coal is broken in this manner so that it can be cut and transported. This process is called ‘blasting’. It is a hazardous process as sometimes, the blast can bring down the entire mine face causing death of the miners. It has to be therefore done with great care and calculation.

Another group of miners was arranging wooden and iron supports to support the roof so that it may not fall down on the heads of the miners. One group was ready with flexible movable motor known as drilling machine. This would be used to cut the coal after the blast. Now the blasting hole is ready, as you can see in Fig 6.8.

When the entire preparation for blasting was complete, everyone withdrew to safe places. Then a warning whistle was blown and then the detonator was set off. Suddenly, the whole mine



*Fig 6.8:
(left) Detonator;
(right) Battery,
(bottom left) filling hole
with explosives,
(bottom right) explosives*



resounded with the boom of an explosion. The walls and the ground shook and it seemed as if an earthquake had hit the spot. There was smoke and dust everywhere. After some time the whistle sounded again and we moved once more towards the face. Slowly the dust settled. Two or three miners entered the dust cloud coughing. They walked over the coal that had fallen in the explosion using their rods to inspect the places from where the coal has fallen. At one spot the roof was weak so, it was supported with wooden beams and posts.

Transporting coal

In this mine coal is transported through conveyor belts. Earlier miners had to

physically load the coal onto small wagons which carried the coal. Now dumper machines load the coal onto the conveyor belts which carry the coal to the ground level. Then the coal is graded and loaded onto trucks and railway wagons. Singareni mainly supplies coal to thermal power plants of the government. Remaining coal is purchased by other companies.

Welfare

Singareni Collieries provides quarters with roads, drinking water, utilization water. It gives electricity at nominal charges. It establishes schools and hospitals.

Safety and Health Checkups



Director General of mines safety monitors safety aspects and periodical medical examination. The workers underground are not only exposed to accidents, but constantly inhale coal dust which causes the dreaded 'Black lung disease', a form of TB. There are detailed guidelines for medical check up of the miners and their treatment. Employees below 45 years will have thorough routine checkups every 5 years. Employees above 45 years will have thorough routine checkups every 3 years. Miners with black lung disease are usually transferred to a different department over the ground.

New trends in Mining industry and miners

Recently there has been a great increase in demand for coal, especially for thermal power plants. However, our mines are not able to cater to this demand due to low productivity. Hence the SCCL is devising plans for increasing production by shifting to open cast mining. It has therefore set up about 15 open cast mines and introduced fully automatic machines through private contractors. These will be producing much more coal but employ very few people. It is also said that the coal reserves of these open cast mining areas will be exhausted in 10 to 15 years after which there can be no mining in this area.

Read a news report of 29 June 2009:

Singareni coal mines open wounds

By Our Correspondent

WARANGAL June 28: Singareni Collieries Company Limited (SCCL) has decided to adopt open cast mining (OCM), to meet the demand for coal. The decision could render 20,000 people homeless and affect 200 villages. The mines will also affect an estimated 3,000 hectares of forests.

"If the mining underground produces 1,500 tonnes of coal a day, open

cast mines produce 10,000 tonnes per day and obviously at a much lesser cost," said a senior SCCL official.

While that is so, the open cast mining will displace thousands of families, destroy scores of habitations and cause loss of livelihood to locals. According to the company official, the company will pay compensatory afforestation charges and develop forests

on an equal amount of land where it has lopped off the jungles. It will pay Rs. 4.38 to Rs. 10.43 lakh per hectare, he said. The local people also complained that due to these mines which dig up the earth and create huge artificial hills of loose earth, rivers and streams are getting choked and ground water is getting polluted and there is acute scarcity of even drinking water.



Fig 6.9: Barytes mine monument at Mangampet,
YSR Kadapa District

- How do you think this dilemma can be resolved? Is it fair to produce coal at a low price when it causes the loss of livelihood, lands and damages the environment?

Mangampeta Barytes Open Pit Mines

Mangampeta is in YSR Kadapa district and has one of the largest reserves of barytes mineral in the world. The barytes reserves were discovered in 1960 and it has been mined since 1967. Nearly 1200 families lived in this village, which were shifted to a new site and rehabilitated by Andhra Pradesh Mineral Development Corporation (APMDC, a government company) which now owns and operates the mines. The Barytes mines are the pride of APMDC as it earns huge profits from these mines.

- Find out about the uses of Barytes from the box given in page 64. Why

do you think demand for barytes is increasing?

The mines here are not underground but the open pit type. Look at Fig 6.9 to get an idea of how this mineral is mined. In the picture you can see a section that has been left un-dug. This is a monument of this mine and it also indicates how deep the mine is. Barytes available in the upper layers are of lower grade while those mined from a depth are of higher grade. Quality is determined by the grain size of the stone. Upper layer barytes are in grey colour while at lower levels it is white or cream white. Once the mineral deposit was discovered, it was tested in the labs and found to be of high quality. Surveys showed that it is available in very large quantities. A plan for mining barytes in the village was developed and the villagers who lived there were rehabilitated.



In the open pit mines almost all work is done by machines. Shovel, bulldozers are used to remove over burden or the top soil and rocks which are a waste. Six metre high benches are made (benches are vertical section of a mine from where the mineral is



Fig 6.10: Loading barytes in to a truck

removed) next to a ten metre road. The road goes all the way down to the bottom of the pit connecting all the benches. Mineral and waste rocks are removed from the sides by blasting. This is loaded by huge machine dumpers onto ten tonne capacity tipper trucks. This is how one lakh tonne of barytes are mined in one month in Mangampeta.

waste in such a way that it does not damage the environment too much. You must have seen a large whitish hill above the small building in Fig 6.9. This hill was made by the waste materials deposited from the mine. Compare the vegetation growing there and in the actual mine area. Plants and grasses adapted to this kind of soil have to be grown on them and watered constantly to the soil from flying and spreading all around.

- Describe what is happening in Fig 6.10. How many people do you think would be employed for this operation?
- Can you see the collection of underground water in the top left corner of the picture? What will happen to this water?

Every day 16,000 tonnes of waste material and 3,000 tonnes of barytes are mined and transported. It is a major challenge to dispose off the



Fig 6.11: Women drilling holes for blasting



Fig 6.12: Crushing and packing plant

Look at the women working in the mines in Fig 6.11. They are drilling holes for blasting with explosives. You can see the wires of the blast detonator. Do you see the women wearing any protective gloves or shoes? What are they wearing on their heads?

The ore is transported by the trucks to above the ground where it is crushed into fine powder and packed in large bags and sent off in trucks and railway wagons. See Fig. 6.12. This is the crushing and packing plant.

There are about 600 workers in this mine. Of these about 152 are regular employees of the APMDC who get regular salary and benefits as per government norms. The rest are contract workers and trainees who are paid minimum wages only.

- Compare the mining in the coal belt with the mining in Mangampeta. What are the similarities and what are the differences?

You must have got an idea of how we mine our precious resources, what kind of livelihood people get from it and how it is necessary to control the damage done to the environment by mining?



- | | | |
|------------------------|----------------------------|--------------------|
| 1. Minerals | 2. Underground mining | 3. Open pit mining |
| 4. Renewable resources | 5. Non renewable resources | 6. Coal |
| 7. Barytes | | |

Improve your learning

1. Create a flow chart showing the visit to the underground mining. AS₁
2. Create a table to classify major health challenges; precautions; and care taken towards protecting mine workers as follows: 1. While working in the mines 2. While being employed. AS₃
3. Janaki is currently a farm labourer. She wants to become a miner. Can you explain what changes will occur in her nature of work; employment scenario; health risks etc. AS₁
4. Narrate the difference in requirement of labour in mine while using machines and human labour. AS₁
5. How has been the contribution of mining to economy identified in this chapter? AS₁
6. See the map of Andhra Pradesh showing minerals in this chapter and identify the minerals found in your district. AS₅
7. Read the paragraph under the heading 'To whom do the minerals belong' and answer the following:
The minerals do not belong to any particular person but they belong to all people. How do you justify? AS₂
8. Look at the image below. There are two different statements made by two different people. What aspect of mining are they talking about? AS₁



9. How are minerals helping the country in development? AS₆
10. Prepare a table showing different minerals and their uses. AS₃