

Teacher's Guide

Natural Resources

Part 3

Based on the Karnataka State Board Curriculum for
Standard VIII



JANAAGRAHA CENTRE FOR CITIZENSHIP & DEMOCRACY

Janaagraha's initiative to improve citizen engagement in India's democracy through their civic learning program

Developed in collaboration with Young Leaders for Active Citizenship (YLAC)

Natural Resources | Teacher's Guide (3/3)

Part 3

Class VIII

Board – Karnataka State Board

Subject – Science

Textbook – Science Textbook for Class VIII (Karnataka State Board)

Chapter 1 – Natural Resources

Number of parts – 03

Length – 80-100 minutes (estimated, for a class of 40-45 students)

Note: Teachers may divide the lesson plan into as many periods as they see fit

Section I: What are we going to learn and why is it important

Learning Objectives:

Students will:

- Understand the formation of coal and petroleum.
- Be introduced to minerals as a natural resource.

Learning Outcomes:

Students will be able to:

- Understand the impact of human actions on natural resources.
- Contribute to conservation of these resources.

Key terms include minerals and mining

Fossil Fuels	Peat	Lignite	Sub-bituminous coal	Bituminous coal
Anthracite	Reduce	Recycle	Reuse	Minerals
Mining				

Materials Needed

- Slips of paper with names of two resources written on each for activity human impact on resources.

- Three sheets of paper- with 'Reduce', 'Recycle', and 'Reuse' for closing activity.

Section II: How are we going to learn

1. Opening discussion

Time: 5 minutes

Note to the teacher: Since the last 2 lessons have involved detailed discussion of resources, the idea of the opening discussion is to create some energy in class. The teacher asks the following questions in a very quick manner and randomly selects students to answer the following:

- What are the resources that we have discussed so far? (Water, forests, soil, and wildlife)
- Which of these are living? (forests and wildlife)
- Which of these are renewable? (forests, wildlife, water)
- Which of these can be polluted? (water and soil)
- Eroded? (Soil)
- Depleted? (Forests)
- Can become extinct (wildlife)
- Which of these are extremely important for the human body to survive? (water)
- Which of these are also a home for another resource? (forests for wildlife)
- Okay great, now let's get on to discussing the last two resources in this chapter.

2. Fossil Fuels

Time: 15-20 minutes

Facilitation notes:

- How many of you have read in the papers that the price of petrol has suddenly jumped? Or that people are complaining to the government to reduce the price of petrol? (Most of the class raises their hand)
- Why do you think the price of petrol has such a great impact on our lives? Every time it goes up, everyone starts talking about it, there are protests, debates, discussions and so on. Why do you think that is? (The teacher takes a few answers)
- This is because every country is so heavily dependent on fossil fuels (including petrol, diesel, etc.) as a source of its energy that every time the price of oil rises, nearly everyone and everything in the economy is impacted.
- One direct impact is that it leads to higher expenses for everyone who owns any automobile. But indirectly, many other industries incur more expenses due to higher transportation costs like in the food industry, tourism industry, etc. As a result, this leads to a rise in a variety of products, which in turn creates problems for people in an economy.

- Petroleum, from which petrol is made, is also used to manufacture a host of other products. So, when petroleum prices rise, petroleum-based products automatically become more expensive.
- Apart from petrol, coal is another very important fuel that we use for power generation.
- Trains run on coal. In many states, thermal power plants use coal to generate electricity.
- Coal and petroleum are among the two most important **fossil fuels** that we use to generate energy for various uses.
- Let's talk about both these in detail:

Coal	Petroleum
 <p data-bbox="449 976 659 1003">Source: Unsplash</p>	 <p data-bbox="1402 976 1612 1003">Source: Unsplash</p>
<p data-bbox="92 1013 338 1040">How is coal formed?</p> <ul style="list-style-type: none"> • Thousands of years ago, the trees and large plants that existed on Earth died and got buried in the ground. • With time, more and more layers of Earth and dirt accumulated over them, increasing the heat and pressure these dead plants were subjected to. • Depending on the layer at which these plants were, they underwent chemical and physical changes and turned into coal. <p data-bbox="92 1338 527 1365">What are the types of coal present?</p>	<p data-bbox="1041 1013 1398 1040">How was petroleum formed?</p> <ul style="list-style-type: none"> • Petroleum and its products (petrol, diesel, kerosene, lubricating oils and naphtha) account for about 40% of the total energy consumed on Earth. • Over millions of years, marine plants and animals died and sank to the ocean floor. • Under the heat and pressure from the sea, these dead organisms kept accumulating. • They underwent physical and chemical changes that removed oxygen and water from their remains and led to an accumulation of carbon, hydrogen and small amounts of sulfur, nitrogen, oxygen etc. leading

Coal is a natural resource with high carbon content. Depending on its carbon content, coal is classified into the following types:

- **Peat** is of the lowest quality. It is not even classified as proper coal, has the lowest content of carbon and is found closest to Earth.
- **Lignite** is the lowest quality of coal. It is basically peat that has been transformed into a rock, and is brown-black in color. It has about 60-70% carbon content.
- **Sub bituminous coal** is the second lowest variety of coal. Due to the greater pressure it is subject to, the coal has lesser content of oxygen and water and higher carbon content of around 70-77%.
- **Bituminous coal** is the most widely used variety of coal and has carbon content between 77-87%.
- **Anthracite** is the best quality of coal. It is also the rarest type of coal with carbon content of over 87%.

The deposits of coal that were buried deeper had more time to transform and, therefore, had more carbon content. The ones on top have less carbon content and therefore of poorer quality.

(Note to the teacher: the order mentioned in the textbook is incorrect. The plan was made after checking several sources. Please refer to this [source](#) for further clarification)

to the formation of petroleum which was later extracted and refined into various products including coal.

- In addition to petroleum, natural gas was also formed on the top layers of these remains. It is the least polluting fuel of all due to its low sulphur content.

- Both coal and petroleum are very important sources of energy but burning them results in their carbon being converted into carbon dioxide, which is one of the most important causes of global warming.

3. Minerals

Time: 10 minutes

Facilitation Notes:

- Haven't we all seen our mothers, elderly women around our homes wear gold and silver jewelry? Gold and silver are examples of two precious minerals.
- A mineral is a substance that is naturally found in the earth's crust and is not formed from living matter. Minerals are formed due to earth's geological processes over millions of years.

- Hence, minerals are also non-renewable resources.
- There are hundreds of minerals that are used for a variety of purposes. Let's see if you know the uses of a few minerals:
 - Gold (used to make jewelry, expensive utensils, electricity conducting circuits in very sophisticated machine)
 - Silver (used to make utensils, ornaments, electric circuits)
 - Copper (used to make utensils, electric wires, construction equipment)
 - Iron (used to make buildings, iron rods, gym equipment, automobiles, machines, steel)
 - Limestone (chalk, concrete, building material)
- **Mining** is the process of extraction of the minerals from the earth's crust. Every time a mineral is mined, large areas of land are dug up. As a result, plant and animal habitats are cleared up and the process generates a lot of waste leading to deterioration of the land quality.
- Mining has become more intense and widespread in recent years causing serious environmental problems.

4. Human impact on resources

Time: 15-20 minutes

Materials needed: Slips of paper with names of two resources written on each. The resources can be in any random order on the chits. Make multiple chits so that every student gets at least one chit.

Facilitation notes:

- Throughout this chapter we talked about the various resources in our environment and how each of them is incredibly precious to us.
- Some of them are renewable while others took hundreds and thousands of years to form and are, therefore, non-renewable.
- Even when resources are renewable, if we do not use them cautiously and take care of them, there is a good chance that we can exhaust them. Can you give an example of such a resource? (Forests)
- Almost every resource that is at our disposal has been threatened by human actions. We are causing pressure on them and as a result, there is a good chance that their quality will deteriorate so much that no one will be able to use them.
- (distribute the chits of paper to the students) All of you have chits of paper with two resources written on them.
- I am writing the names of all the resources on the board as well.
- In your notebook, I want you to tell me human actions that can lead to damage to the resource (on your chit) and what can be the potential consequence of those actions.
- Take 5-7 minutes to complete this.
(The teacher to solve one on the board and students to complete the rest.)

Resource	Human Action	Consequence
Water	Disposal of human waste in the water	Water pollution- spreading of germs in the water.
Soil		
Forest		
Wildlife		
Fossil Fuels		

- (The teacher now calls out each resource and asks which student got them on their chit. She/he then asks them for their answers and fills the table up.)

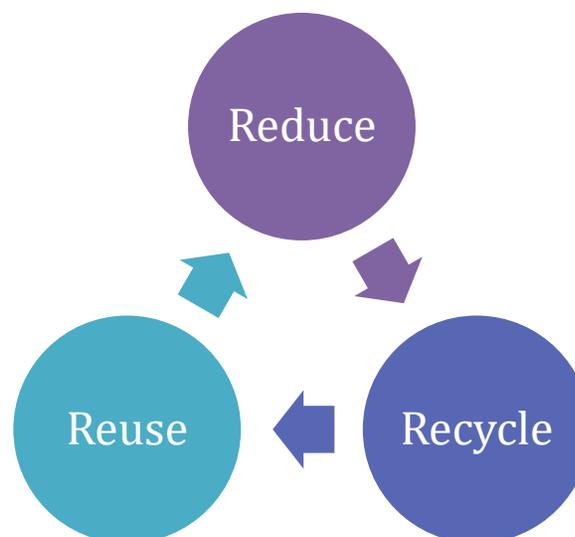
Solution Table:

Resource	Human Action	Consequence
Water	<ul style="list-style-type: none"> • Disposal of human waste in the water. • Disposal of agricultural and Industrial waste. • Over use of ground water. 	<ul style="list-style-type: none"> • Water pollution- spreading of germs in the water. • Water scarcity- not enough water for everyone's use.
Soil	<ul style="list-style-type: none"> • Deforestation. • Over irrigation. • Dumping of waste on land. • Pollution by plastic and other garbage. 	<ul style="list-style-type: none"> • Pollution of soil making it unfit for plants and animals. • Soil erosion leading to lack of vegetation.
Forest	<ul style="list-style-type: none"> • Deforestation • Over use of forest products 	<ul style="list-style-type: none"> • Loss of habitat for plants and wild animals. • Loss of oxygen. • Loss of biodiversity.
Wildlife	<ul style="list-style-type: none"> • Hunting and poaching. • Deforestation to make space for agriculture. • Pollution of rivers and lakes close to the forests. 	<ul style="list-style-type: none"> • Loss of habitat for animals. • Endangerment. • Extinction. • Adverse impact on their health due to pollution caused by humans
Fossil Fuels	<ul style="list-style-type: none"> • Over burning of fossil fuels 	<ul style="list-style-type: none"> • Exhaustion of fossil fuels due to over consumption. • Pollution caused by burning of fuels. • Increasing amount of CO2 in the

		atmosphere leading to global warming.
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5. Closing Activity: Reduce, Recycle, and Reuse

Time: 15- 25 minutes



Materials Needed: Three sheets of paper- with 'Reduce', 'Recycle', and 'Reuse' written on each of them.

Facilitation Notes:

- And before we close this chapter, let's recap one very important learning: all the resources around us are extremely valuable for our well-being and the well-being of other living plants and animals.
- I believe that a discussion about natural resources is absolutely incomplete without us talking about conserving them and protecting our environment. For us to be able to do this activity, I will split the class into three groups.
- I will start from the student sitting on the first bench, he will say number 1, the student next to him will say number 2, the next will say number 3. After number 3, we will go back to number 1, number 2, number 3 etc.
- Like this, every student will have a number.
- Let's start from you: 1...2...3...1 and so on
- (After all students get their numbers) I want all the 1s to be in one corner, the 2s to be in one and the 3s to be in another corner.

- (All the students formulate their groups)
- The activity we are about to do is called Reduce, Recycle, and Reuse.
- For us to be able to save and conserve resources, we can do this in three ways:
 - Group 1 is **Reduce**: This group will list down all the ways in which we can reduce the amount of resources we use. Think about all the different resources that you consume in a single day and come up with some resources.
 - Group 2 is **Recycle**: This group will list down all the resources we can recycle in easy ways at home to make new and innovative things with them.
 - Group 3 is **Reuse**: This group will brain storm ways in which we can reuse old things so that we do not need to be buy ones.
- Before we start, can someone tell me the difference between recycle and reuse. **Recycling** is the process of converting waste materials into new materials and objects. For e.g.: recycling old clothes to make completely new clothes. Reuse means to use the same thing as it again and again so that one does not need to buy new things).
- You now have 10 minutes to come up with as many ways to reduce, recycle, and reuse resources to help protect the environment.
- (After 10 minutes, each group selects 2 members to come and present to everyone in class).
- A few possible measures:

Reduce	Recycle	Reuse
<ul style="list-style-type: none"> • Switch off fans and lights when not in use. • Use notebooks completely before throwing them away. • Use stationery completely before buying new one. • Switch off the car on red lights. • Use a bucket instead of a shower. • Not waste paper unnecessarily. • Use of plastic. Use ecofriendly materials like jute/cloth bags, paper or steel straws etc. 	<ul style="list-style-type: none"> • Use old boxes to make new storage boxes to store other things. • Staple together waste paper to make a notepad. • Cut bottle tops to make pen stands. • Use old chart papers as notebook covers. • Give plastic material and newspapers at home for recycling. 	<ul style="list-style-type: none"> • Reuse kitchen water for plants. • Instead of throwing food, give it to animals. • Donate old clothes. • Use the unused side of notepads to make rough notes. • Not buy a new school uniform every year. • Reuse our books for our younger siblings.

De-brief:

- On our level, we are all doing something to damage the environment and each of us needs to do something to protect it.

Section III: Assessment

Time: 10 minutes

Match the following: (the number of resources in column B are eight on purpose. So that it's not obvious for students to match column A and B)

Column A	Column B
1. High carbon content 2. Renewable resource 3. Low sulfur content 4. Formation of soil	<ul style="list-style-type: none"> • Lignite • Bituminous • Wind • L.P.G. • Weathering of rocks • Anthracite • Natural gas

Questions:

- a. Which fossil fuel formed on land? And which are formed in the ocean? (coal on land and petroleum in the ocean)
- b. What is the poorest quality of coal called?
- c. Differentiate between renewable and non-renewable resources.
- d. What happens if too much of fossil fuels are used?

Homework

Conservation Pledge

Think of three ways in which you can save natural resources. Make a pledge to do these five things. Write them in the front page of your science notebooks so that you see them often.

Section IV: Closure

Time: 10 minutes

Summary by students and the teacher

(Pick a student to summarise fossil fuels and another to summarise minerals)

The summary should cover the following points:

- Coal, petroleum, and natural gas are fossil fuels. They are non-renewable sources of energy.
- Coal was formed over millions of years when plants got buried and were exposed to heat and pressure.
- There are the following types of coal deposits:

- Peat
- Lignite
- Sub- bituminous coal
- Bituminous coal
- Anthracite
- Petroleum was formed on ocean floors when aquatic plants and animals died and settled on it. Exposed to the oceanic pressure, their bodies decomposed and formed petroleum.
- Petroleum and its products account for about 40% of the total energy consumption of the world.
- Minerals are substances that form in the Earth's crust over millions of year. They are formed from non-living matter. Gold, silver, copper are examples of prominent minerals we see in our day to day lives.
- The process of extraction of minerals from the Earth's crust is called mining.

Section V: Additional resources

Resources for students:

1. Video: How can we make coal cleaner?
The informative video talks about how coal can be made cleaner to cause lesser environmental damage.
Link: [YouTube](#)
2. Article: Types of Coal
The article details the formation of different types of coal and their uses.
Link: [National Geographic](#)
3. Article: Human impact on forest
The article shows through very interesting visuals how forest patterns have changed around the world in the past few decades.
Link: [Visual Capitalist](#)

Resources for teachers:

1. Article: The hidden costs of fossil fuels
The article talks about the disastrous impacts that fossil fuels have on our environment.
Link: [Union of concerned scientists](#)



2. Article: Formation of Petroleum

This informative article mentions in detail how petroleum was formed.

Link: [National Geographic](#)

3. Video: Freedom from fossil fuels

This video shows the research by a school student on how we can reduce our dependence on fossil fuels.

Link: [YouTube](#)

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