19 Sustainable Use of Natural Resources

Name several things that you can see in your classroom. Find out and tabulate the basic things that used to make them. Compare the table you made with the table 19.1.

Table 19.1

Things in the classroom	Basic things used to make them
Wall	Bricks, cement, lime
Table and chairs	Timber, iron
Pens	Plastic, metal, ink
Pencils	Wood, graphite
Books	Paper
Bags	Cloth, metal, plastic
Water bottles	Glass, plastic

Find out about the natural substances that were based to make the things in the classroom. Tabulate your findings and compare your table with Table 19.2 given below.

Table 19.2

Substance	Natural substances based to make them
Bricks	Clay, water
Lime	Limestone
Cement	Limestone, clay, gypsum
Timber (Wood)	Plants
Iron	Iron ore
Plastic	Petroleum (mineral oils)
Paper	Plant fibre
Cloths	Plant material, petroleum
Glass	Silica sand (minerals)

Study well, the things given in the second column of the table 19.2. Those are known as **natural resources**.

Natural resources are the substances generated naturally, without the influence of human activities.

There are some basic natural resources.

- Water
- Minerals and rocks
- Plants
- Timber

The conservation of water for the future generation while we are using water today is known as sustainable utilization of water.

Now let us find out about these resources in detail.

19.1 Water

Man cannot live without air more than few minutes. Further, he cannot survive without water more than a week. Thus, the second most important resource on the Earth is water.

The base of life on the Earth is water. When finding life on other planets, scientists find whether there is water on them. The reason for this is that the life we know is based on water.

Figure 19.1 – Some uses of water

Assignment 19.1

Make a list of some other uses of water, that can be added to the above diagram and present it creatively.

How water is used sustainably in the past

The natural way that the Earth's surface gets water is the rain. If rain water is not properly used, it flow through rivers and streams upto the sea. It was the slogan of great king 'Parakramabhahu', that "Even a single drop of water should not be allowed to flow into sea without being used by man or animals".

A water tank can be introduced as a great creation of our ancient ancestors, used for conservation and sustainable use of water.

Figure 19.2 (a) - 'Parakrama samudraya'

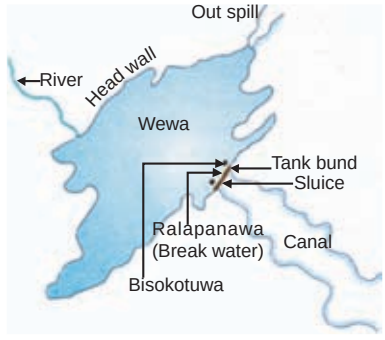


Figure 19.2 (b) - Important parts of a tank

A reservoir or a water body that is constructed by building a dam across a river or a stream is known as a 'wewa'.

There are evidences to prove that Sri Lanka had a unique irrigation technology, uncomparable to any other country in the world. Even now we have more than 12 000 large and small 'wewa' and embankments that irrigate the farmlands of our country.

Assignment 19.2

Find the special terms used for the components related to 'wewa' and make a report.

If there is no air pollution, the purest water that we can receive, is the rain water. Now in Sri Lanka, as well as in some other countries, rain water is collected to be used.

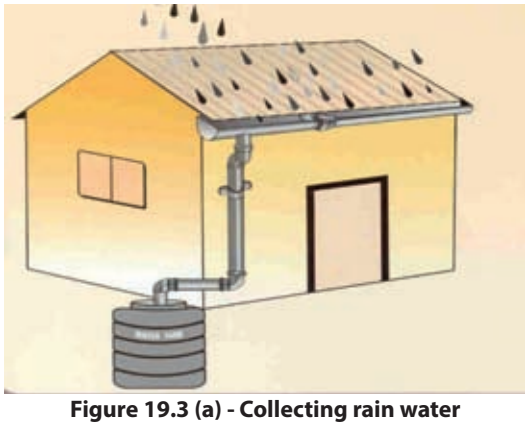


Figure 19.3 (a) - Collecting rain water

Figure 19.3 (b) – Using collected rain water

Rain water collection in domestic level is very important for the people in small islands like maldive islands, where there are no natural reservoirs.

Activity 19.1

Create a model to collect rain water, draining from the roof into a tank. Use the Figure 19.3(a) for this.

In dry zone, for the economical use of water in agriculture, clay pots filled with water are buried near the plants.

Try this method in your home garden also.

Scientist forecast that pure water will not be available for the people in the world in near future if recycling and reuse of water is not put into practice.

Figure 19.4 – Economical use of water in agriculture

Assignment 19.3

Construct a poster or make a booklet including the steps that can be followed to use tap water in an economical way.

Now let us study about minerals and rocks which can be considered as another natural resource.

19.2 Minerals and rocks

A mineral is an inorganic solid substance with a definite chemical composition having a crystalline shape. Minerals occur naturally in our environment.

Figure 19.5(a) – A crystal of gem

Figure 19.5(b) – A giant crystal of quartz

Some useful minerals found in Sri Lanka are graphite, quartz, ilmenite, rutile, zircon, feldspar, apatite and silica sand.

A rock is a collection of minerals

e.g. Gneiss, Granite

Some rocks are made of a single mineral.

e.g. Limestone, Quartz

The map in figure 19.6 shows the locations of largely found minerals resources of Sri Lanka.

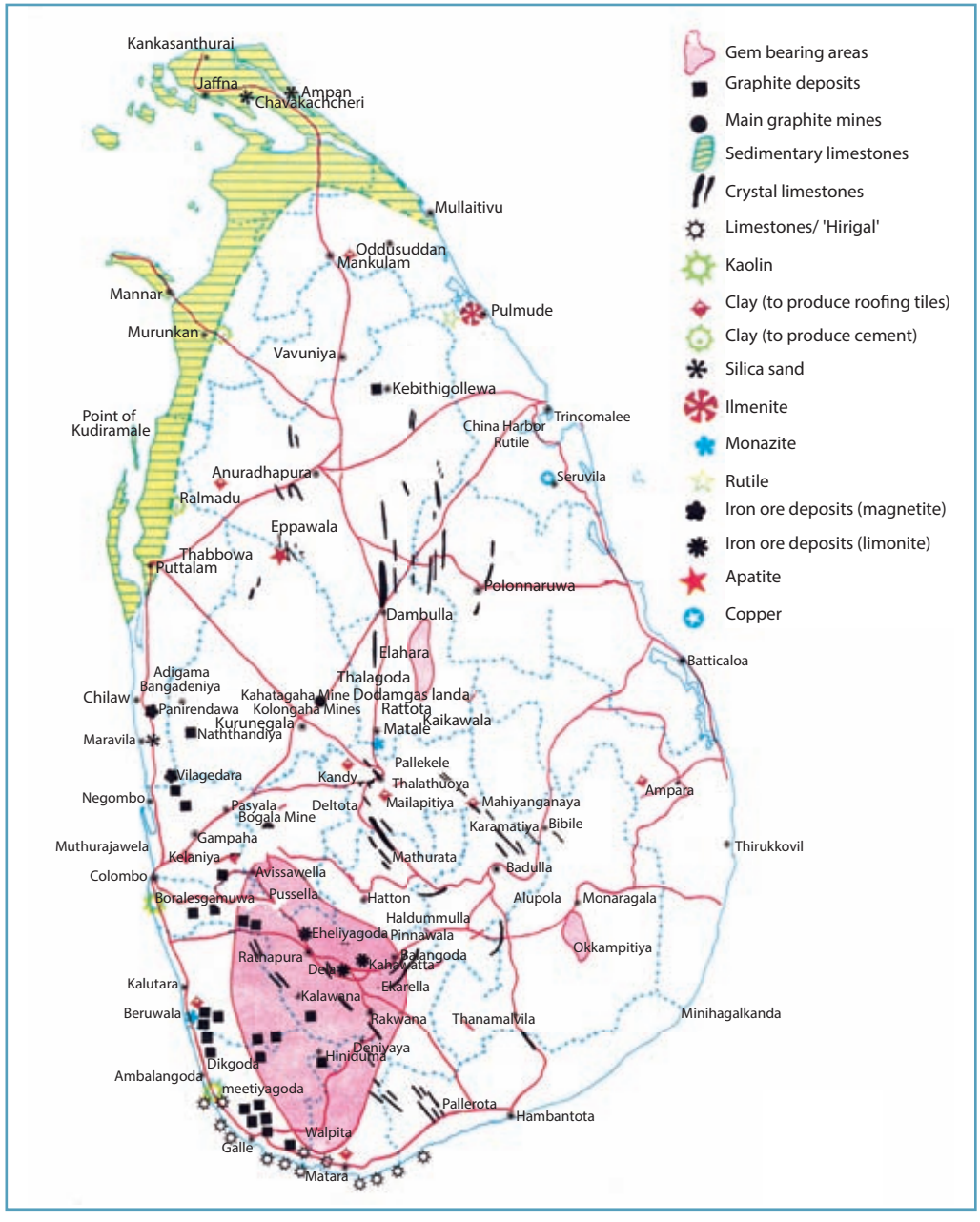


Figure 19.6 – The map which display the location of minerals in Sri Lanka

Source - The National Map Collection of Sri Lanka, School Edition, Survey Department

Assignment 19.4

Study the map carefully. Name 10 sources of minerals and rocks found in Sri Lanka. Mention the places where each of those resources are found. State an industry where each of those resources are used.

For extra knowledge

There are about 5 300 minerals identified in the world up to date. Number of minerals registered in the International Union for Minerals is about 5 070.

Sri Lanka exports most of its mineral resources not as end products, but as raw materials. Therefore, we get only the raw material value of those minerals, though our country is rich in minerals.

Now let us study about gems which are very important among the minerals found in Sri Lanka.

19.2.1 Gems

Gems are a sort of mineral crystals which are used in making jewellery after cutting and polishing.

Gem industry in Sri Lanka has a history of more than 2 500 years. There are more than 200 kinds of gems identified in the world. It is amazing to mention that, more than 70 types out of them are found in our small island.

Blue Sapphire is named as the national gem of Sri Lanka.

Figure 19.7 - Blue Sapphire

Assignment 19.5

Make a list of the kinds of gems found in Sri Lanka.

Sri Lanka is the only country that export high quality large blue sapphire with natural colour to the world market.

Gem mining

Gems are formed in the Earth, attached to large rocks. As the rocks in the mountains get eroded, gems detach from them. Those gems then carried away with rain water and are buried in plains of down hill. The deposit of gems and other pieces of rocks is known as the vein of 'illama'.

First a proposed place for gems is selected and the mine, which is like a pit is dug. When the vein or 'illama' is found, horizontal tunnels are excavated. Mixture of substances collected from the vein is taken out of the mine and is sifted to separate gems.

Figure 19.8(a) – A gem mine

Figure 19.8(b) – Sifting of gems using a sifting pan

Activity 19.2

Demonstration of gem sifting method

Method :-

Get a milk strainer woven of bamboo peels as a small substitute for a gem sifting pan. Using it, sift a mixture of soil, sand and small pieces of pebbles, to separate the pebble from the rest (even a separating pan made of clay can be used for this).

Characteristics of gems

Some important characteristics of gems are mentioned below.

- Hardness
- Resistance to be worn out
- Colour
- High refractive index

An unerasable streak can be drawn on a sheet of glass using a piece of quartz. The reason for this is that the hardness of quartz is higher than that of glass. Mohr's Scale is prepared to compare the hardness of minerals. Hardness index 10 is assigned for diamond, which is the hardest mineral. Hardness index 01 is assigned for talc, which is the least hard mineral.

Table 19.3 - Mohr's Hardness Scale

Hardness index	Substance
01	Talc
02	Gypsum
03	Calcite
04	Fluorite
05	Apatite
06	Feldspar
07	Quartz
08	Topaz
09	Corundum
10	Diamond

Study the Table 19.3 and answer the following questions.

1. Hardness index of finger nail is 2.2. Name two minerals that can streak a finger nail.
2. Hardness index of a pile is 6.5. Name three minerals that cannot be streaked by a pile.

Gems like blue sapphire, Ruby, Topaz and yellow sapphire found in Sri Lanka belong to the Corundum family.

Gems do not ware out because of their hardness. Gems are used as bearings in mechanical watches because of their resistance to be worn out.

Figure 19.9 – Gems used in a mechanical watch

Figure 19.10 – Gems of various colours

Gems found in Earth are of various colours. Gems acquire their characteristic colour because of the trace impurities trapped in them, while they are forming in the Earth. Colour is a main factor that increase where an impurity caused to increase the value of a material. Hence, this is rare instance, where the value of a material increases when mix impurities.

Refractive index of gems is used to identify them scientifically.

When a light ray enters from one transparent medium to another transparent medium, its pathway changes at the interface. Refractive index is a measurement of that change. Refractive indices of some transparent substances are given in the table 19.4.

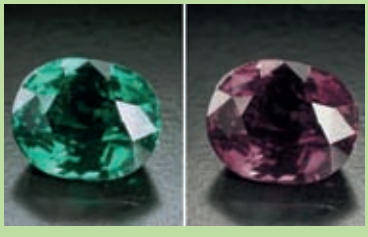
Table 19.4 – Refractive indices of some substances

Substance	Refractive index
Water	1.3
Glass	1.5
Topaz	1.6
Blue sapphire	1.7
Diamond	2.4

Because of high refractive index of gems, light rays are reflected repeatedly when they are entered through the cut and polished gems. This gives a shine to the gem.

For extra knowledge

Gems with special characteristics



Alexandrite
Emit green colour in natural light and red colour in artificial light.

Cat's eye
When this gem is cut in a special pattern, it looks like a cat's eye in light.

Star sapphire
When this gem is cut in a special pattern, six lines of light are visible in it.

Though gems are beautiful and attractive, various problems have raised because of gem industry.

Problems associated with gem industry

- Soil erosion because of irregular mining.
- Mud deposition and water pollution in streams and water bodies, which are used for gem sifting.
- Sudden depression of land and land slides occur due to over mining in some areas.
- Extinction of fauna and forest cover depletion due to mining in forest areas.

- Reduction of crop production as most of gem mining is done in paddy fields.
- Collapsing of river banks due to mining near river banks.
- Spreading of some diseases like dengue, because of the breeding of mosquitoes in abandoned gem pits.
- Decreasing of the population of certain trees like coconut, rubber and bamboo because of their usage in gem mines to avoid collapsing of fits and tunnels.
- Existence of social discrimination between the owners and the workers of gem mines, because of the difference of their income level.
- Absence of a permanent way of income for the labourers as gem mining industry is not done uniformly through out the year.
- Deterioration of educational status of relevant area due to the attraction of youngsters to gem industry.

National Gems and Jewellery Authority has taken certain measures to solve some of the above problems associated with gem industry. When issuing permits for gem mining, a cash deposit has to be made. If gem pits are abandoned without filling government utilize the money deposited to fill the abandoned gem pits.

19.3 Trees

Voluntary contribution of school children is taken for replanting those areas.

Plants as a natural resource from cradle to grave, man extensively uses plants. Some services rendered by plants to man and environment are shown in figure 19.11.

Study figure 19.11 well and answer the following questions.

1. Mention five **material benefits** provided to man by plants which are shown in the figure.
2. Mention five **non-material benefits** shown here.
3. Write three **benefits** provided to man by plants, which are **not mentioned in the figure**.

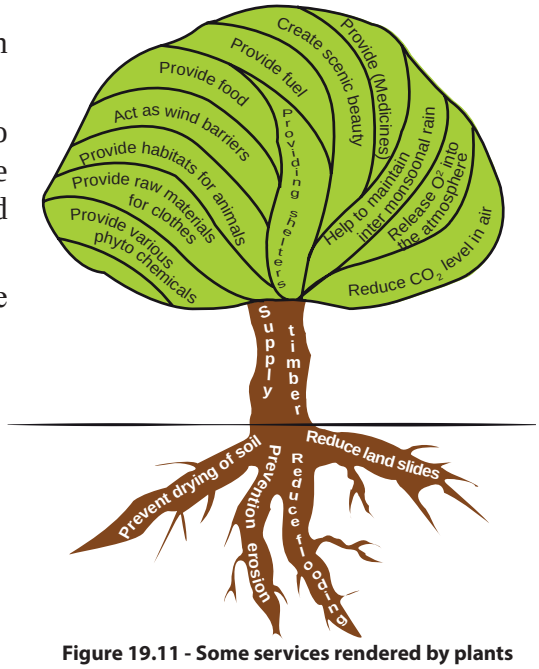


Figure 19.11 - Some services rendered by plants

Some services given in figure 19.11 are provided by all plants.

e.g. Release oxygen to the atmosphere, removal of carbon dioxide from air

There are specific plants for certain activities or services. Information on such plants are given in table 19.5.

Table 19.5

Supply food	paddy, wheat, corn, pulses, yams, fruits, vegetables
Provide drinks	tea, coffee, 'Polpala'/'Thengapookeerai', 'Ranawara'/'Ponnawarasu', wood apple
Supply fuel	coconut, rubber, *Gliricidia*
For scenic beauty	Flowers and other horticultural plants
For medicine	'Aralu'/'Kadukkai', 'Bulu', 'Nelli'/'Nellikkai', 'Katuvelbatu', 'Venival'/'Maramanjal', margosa etc.
Chemicals	'Kekuna'/'Pakkili pal', pinus, 'Gammalu'/'Thanakku', agarwood (Vallapatta)
Raw materials for clothes	cotton, jute, malberry
To manufacture paper	paddy, pinus
Supply spices	coriander, curry seed, turmeric, 'Goraka'/'Koraka puli', cumin seed
Beauty cultural substances	turmeric, 'Cocum', sandle wood, *Aloe*

Assignment 19.6

Display common names and scientific names of plants/trees grown in school garden, in a suitable manner. Do not harm trees when labelling them.

19.3.1 Timber

The oldest building material is timber. Timber is the only building material that is recyclable and renewable. Some special characteristics of timber are as follows.

- Durability
- Resistance to heat, electricity and sound
- Ability of creating attractive patterns due to the streak and the colour

Ancient times, Sri Lanka was famous for valuable timber. Timber like ebony, satin wood and calamander wood which were in the dry zone of our country, were extensively used by colonial rulers to manufacture furniture. Now such types of timber are very rare in the country.

Therefore, the existing amount of timber should be used with maximum efficiency. Selection of timber, according to the durability, which is needed for different uses of timber, will lead to a sustainable utilization of timber that brings economical advantage.

Diversity of timber in Sri Lanka is very high. We have more than 400 kinds of plants in our country, that can be used for timber.

Assignment 19.7

Take leaves of plants in your area that can be used for timber. Insert the leaves between two pages of paper to press. Make a booklet using pressed leaves (make sure not to harm the plants when taking leaves).

For extra knowledge

State Timber Corporation has more than 250 samples of Sri Lankan timber.

Satin wood | 'Nedun'/ 'Samandalei' | 'Colon'/ 'Mansal kadampu' | 'Kumbuk'/ 'Marudha' | Mango

Activity 19.3

Study of various types of timber

Method :-

- Collect samples of various types of timber.
- Note down their colour.
- Test whether they have any odour.
- Find out the uses of those types of timber.
- Find out whether there is any specific use of any of those types of timber.
- Present your findings attractively.

Specific use of some types of timber

Each types of timber is used for specific purpose according to its properties. Some examples are given below.

- **Jak** timber is used for front doors of houses because of its strength, durability and shine.
- **Persian lilac ('Lunumidella')** timber is used for ceilings because it is very light.
- **'Panakka'** timber is used for making umbrellas because the stem of panakka is thin and strait.
- Ancient times pegs made of **agar wood ('Vallapatta')** timber are used to split granite rocks.
- **'Hora'** timber is used for underwater structures because it last long under water.

- **'Rukattana'/'Elilaippalai'** timber is used to carve masks because of the lightness and workability.
- **'Paaramara'** timber is suitable to make the frame of "rabana" because of its lightness and sonorousness.
- **Alexandrian lawrel ('Domba')** timber is resistant to vibrations, bending and twisting. Therefore it is used for masts of yachts, neck-pole of bullocks carts and yoke pole of ploughs.

For extra knowledge

Wooden bridge of Bogoda

This bridge is located at Hali-Ela in Badulla district. Even though it is about 400 years old, still it is in use.

Wooden bridge of Bogoda

Jak and **'Kumbuk'** timber were used to construct this bridge. Wooden nails were used to connect its beams. **Ebony** and **'Milla'/'Kattamanakku'** timber were used for its wood carvings.

Assignment 19.8

Prepare a collection of information about plants used for specific purpose. Get the assistance of the elders of your area for this task.

Decaying of timber

Fungi can grow inside the timber. Timber is decayed because of the degradation of complex carbohydrates which timber are made of due to the activity of enzymes secreted by those fungi.

Fungi can retain inactively, even for many years inside timber. They grow when favourable conditions are available. Such favourable conditions are the presence of oxygen, moisture and nutrients. Out of those, the most important factor is the moisture. Though other factors are available, fungi do not grow in the absence of moisture.

Food is stored in some cells of tissues of timber. Timber can be destroyed by termites and weevils who come in search of food.

Figure 19.12 (a) – Fungi that grow on timber

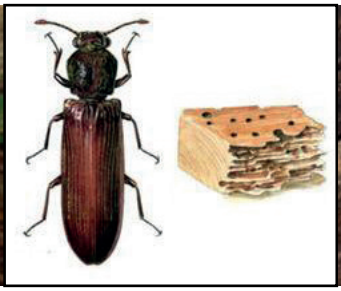


Figure 19.12 (b) – Weevil that bores timber (enlarged)

Figure 19.12 (c) – Termites that make timber decay

Prevention from timber being decayed

Long lasting types of timber were abundant in ancient Sri Lanka. Therefore, timber preservation methods are not necessary.

With the increase of human population and human needs, such types of timber have become very rare, due to over usage.

For example timber like ebony, 'Nadun' and Teak are now classified as luxurious types of timber.

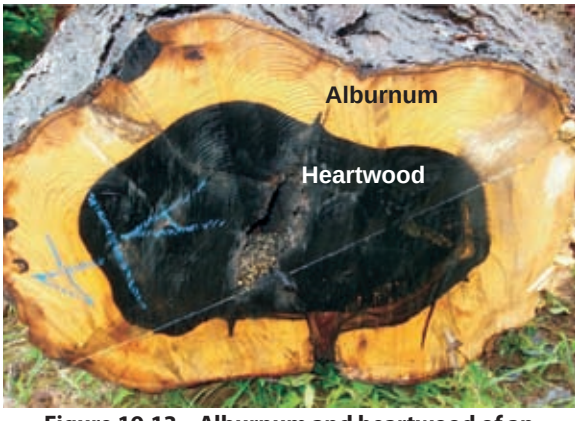


Figure 19.13 – Alburnum and heartwood of an Ebony tree

Therefore, we are compelled to use fast growing types of timber like rubber, Persian lilac, mango, alstonia, eucalyptus and pinus. But, such types of timber do not last long in the environmental conditions of our country. They are easily damaged by insects and fungi. Therefore, we have to use wood preservative methods.

Generally the heartwood of a tree lasts longer than its alburnum. Therefore, heartwood of a tree should be used when making furniture to minimize them from decaying.

Now let us find out how decaying of timber can be prevented.

Methods of preventing the timber decay

- Prevention of absorbing moisture into timber
- Seasoning of timber
- Usage of wood preservatives

Prevention of absorbing moisture into timber

Moisture absorption into timber can be prevented by applying enamel paint on them.

e.g. Enamel paints are applied on school desks and chairs to prevent decay.

Seasoning of timber

Timber can be seasoned by allowing it to dry slowly in controlled conditions. Timber can be kept for long time by reducing the moisture content below 20%.

You can get a knowledge of this method by observing a timber stores or a carpenters workshop.

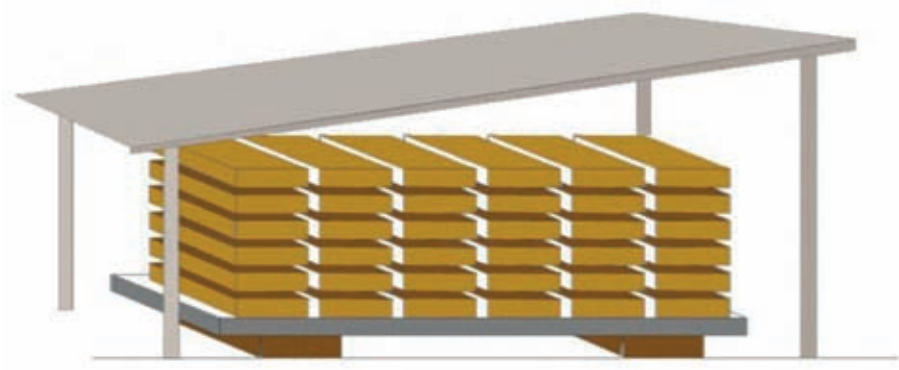


Figure 19.14 – Seasoning of timber

Usage of wood preservatives

Timber can be preserved for a long time by soaking in suitable chemicals.

One such chemical is creosote, which is extracted from coal. This chemical is used by State Timber Corporation when they are treating sleepers for railway lines and wooden electrical posts.

Figure 19.15 (a) – Sleepers on railway line

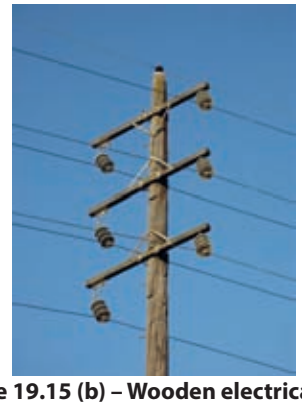


Figure 19.15 (b) – Wooden electrical posts

Boron treatment is done for the longer life of rubber and pinus timber. Here the timber is soaked in a mixture of boric acid, borax and a fungicide.

Forest conservation is promoted by proper usage and preservation of timber. Increasing the lifetime of timber can be reduced tree felling.

Water, minerals and rocks, plants and timber are ours valuable resources. Therefore, it is our responsibility to use them sustainably, while leaving their potential of existence for the generations to come.

Summary

- Water, minerals and rocks, plants and timber are some examples for natural resources.
- Construction of 'wewas' and using rain water collected in tanks are two methods practiced by man for sustainable use of water.
- Minerals like gems are separated from other soil particles by sifting.
- Hardness, resistance to be worn out and high refractive index are some identical properties of gems.
- Gem pits have adversely affected the environment and man.
- A large number of plants that can be used for various purposes are found in Sri Lanka.
- Hundreds of timber plants are found in Sri Lanka and are used for various purposes.
- Timber is destroyed by fungi and insects.
- There are several methods to prevent decaying timber.
- Natural resources should be used sustainably for the fulfilment of the future generations.

Exercises

(01) Select the correct or most suitable answer.

1. What can be a mineral, out of those given below?
   1. Coal 2. Mineral oil 3. Apatite 4. Gneiss
2. The uses of graphite are,
   1. Manufacturing pencil rods 2. Manufacturing electrodes of electrical cells
   3. Using as a lubricant 4. All the above
3. Gems are valuable natural resource obtained from the Earth of our country, which one below is not a cause for its high value?
   1. Its beauty 2. Its hardness
   3. Its rareness 4. Being a mineral
4. What is the national gem of Sri Lanka?
   1. Blue sapphire 2. Yellow sapphire 3. Tourmaline 4. Cat's eye

5. Which one is the order, when graphite, gems and quartz are arranged in the descending order of their hardness?

1. Gems, graphite, quartz
2. Gems, quartz, graphite
3. Quartz, gems, graphite
4. Quartz, graphite, gems

(02) Give short answers.

1. What are natural resources?
2. Why scientists pay attention to water, when they are in search of life on a certain planet.
3. What is the purpose of building tanks ('wewas') in dry zone?
4. What is the type of water that exists in nature in its purest form?
5. Mention three characteristics of pure water?
6. Is granite a mineral or a rock? Give reasons for your answer.
7. What is the special property of gems, that leads to its separation method of sifting?
8. Mention three adverse effects to the environment caused by the gem industry?
9. What is the plant in Sri Lanka, that a maximum number of uses can be obtained from? Mention five plant parts of it and their uses.
10. Mention one specific use that can be obtained from each of following types of timber.

i. Agar wood ('Wallapatta') ii. 'Paremara' iii. Alexandrian laurel ('Domba')
iv. 'Rukattana' v. Persian lilac ('Lunumidella')

11. Write one difference that you can observe between the heartwood and alburnum of the stem of a plant.
12. Persian lilac ('Lunumidella') timber floats on water while ebony timber sink. Thus arrange persian lilac timber, ebony timber and water according to the ascending order of their densities.

Technical Terms

Natural resources	- ස්වාභාවික සම්පත්	- இயற்கை வளம்
Sustainable use	- තිරසර භාවිතය	- நிலைபேண் பயன்பாடு
Hardness	- දැඩිබව	- வன்மை
Refractive index	- වර්තනාංකය	- முறிவுச்சுட்டி
Recycling	- ප්‍රතිචක්‍රීකරණය	- மீள்சுழற்சி
Regenerative	- පුනර්ජනනීය	- மீளுருவாக்கம்
Seasoning of timber	- දැව පදම් කිරීම	- மரம்பதனிடல்
Wood preservatives	- දැව ආරක්ෂක	- அரிமர நற்காப்பு பதார்த்தங்கள்
Wood preservation	- දැව ආරක්ෂණය	- மரக்காப்பு