Sri SAI RAM ENGINEERING COLLEGE
INSTITUTE OF TECHNOLOGY
West Tambaram, Chennai - 44

Sairam INSTITUTIONS

SAIRAM
DIGITAL RESOURCES

YEAR II | SEM IV

GE8291

ENVIRONMENTAL SCIENCE AND ENGINEERING

UNIT NO III

NATURAL RESOURCES

3.1 Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people

SCIENCE & HUMANITIES

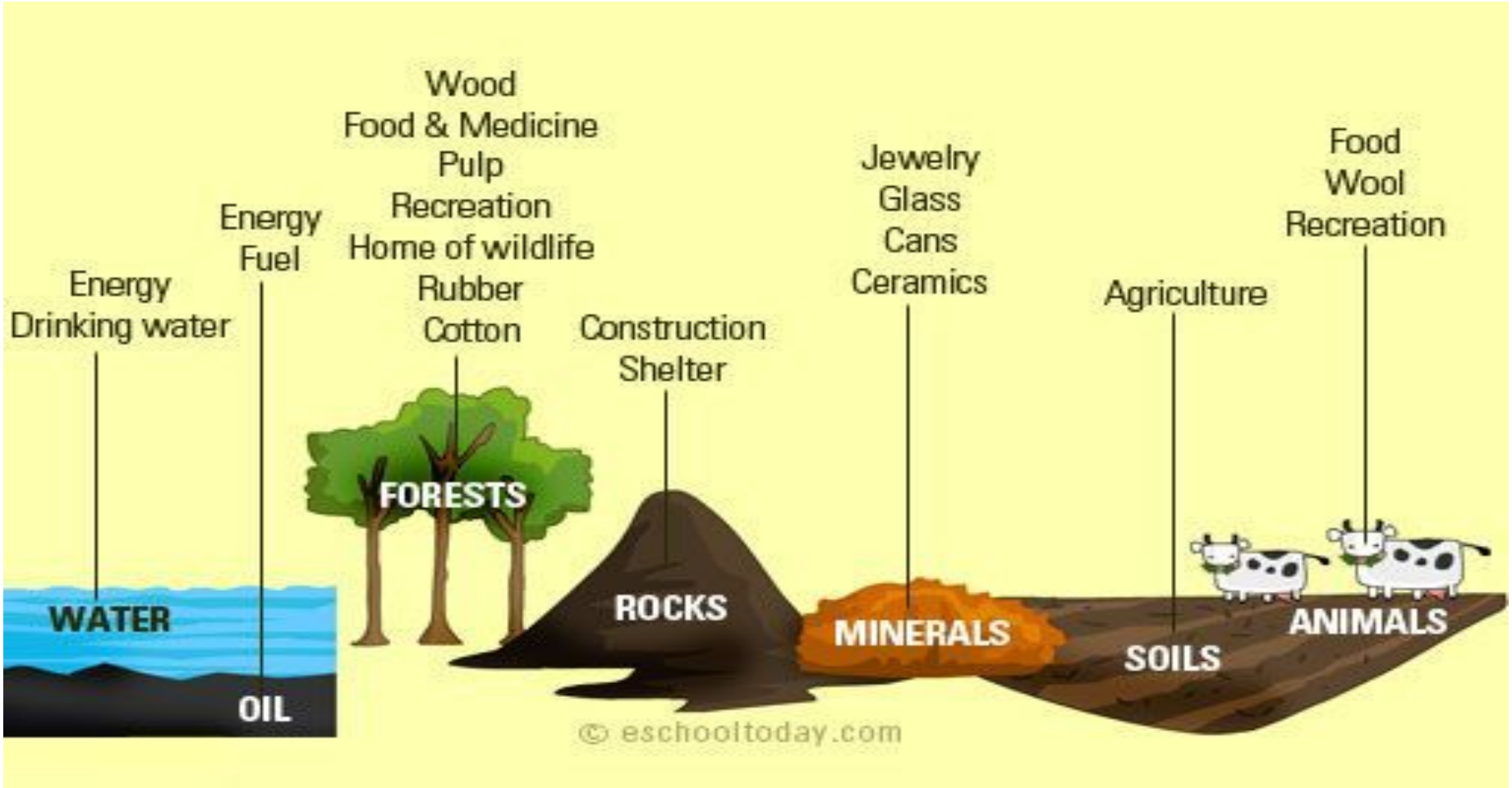
4 QUALITY EDUCATION

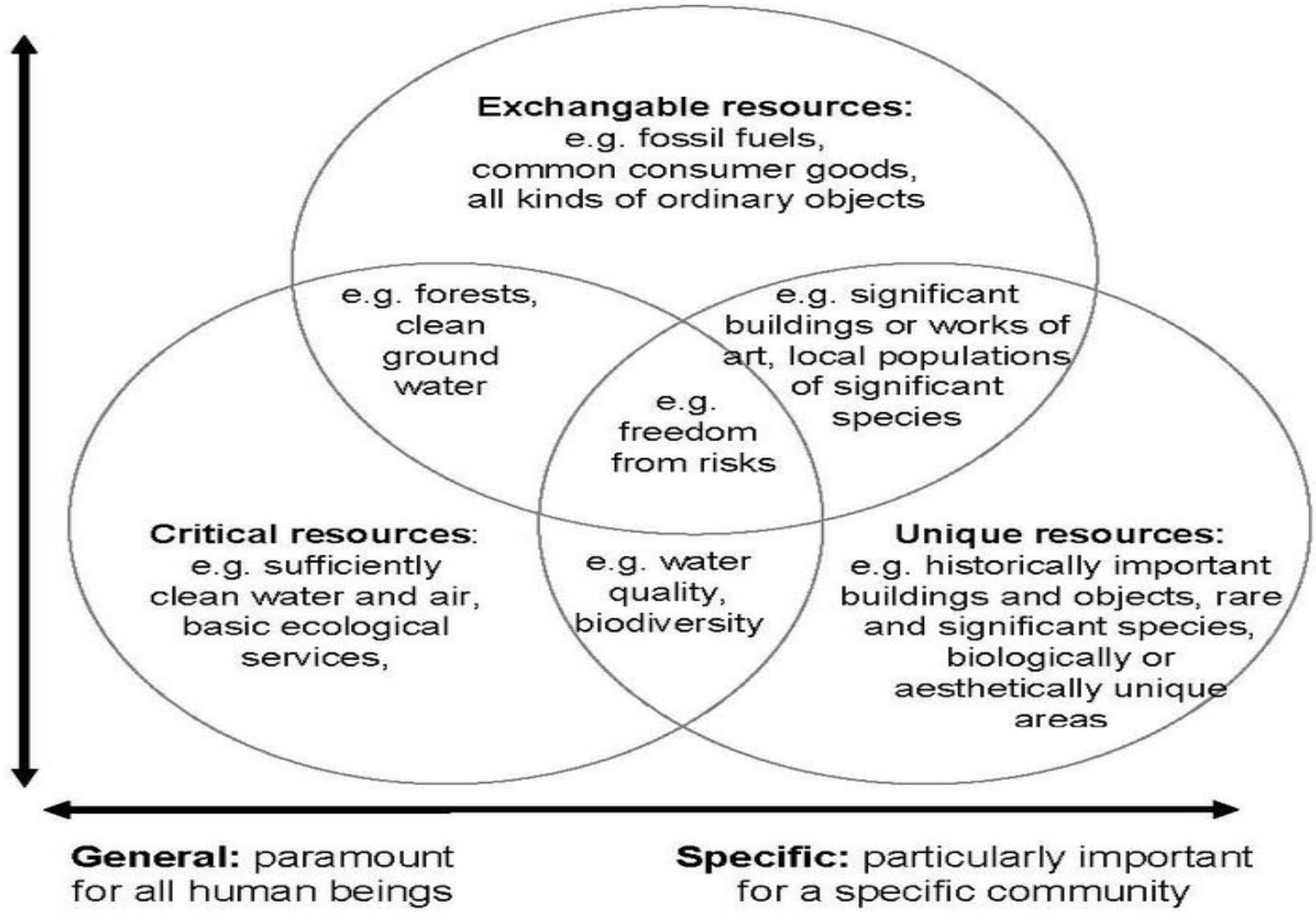
A resource is a source or supply from which a benefit is produced and that has some utility. Resources can broadly be classified upon their availability — they are classified into renewable and non-renewable resources. An item becomes a resource with time and developing technology.

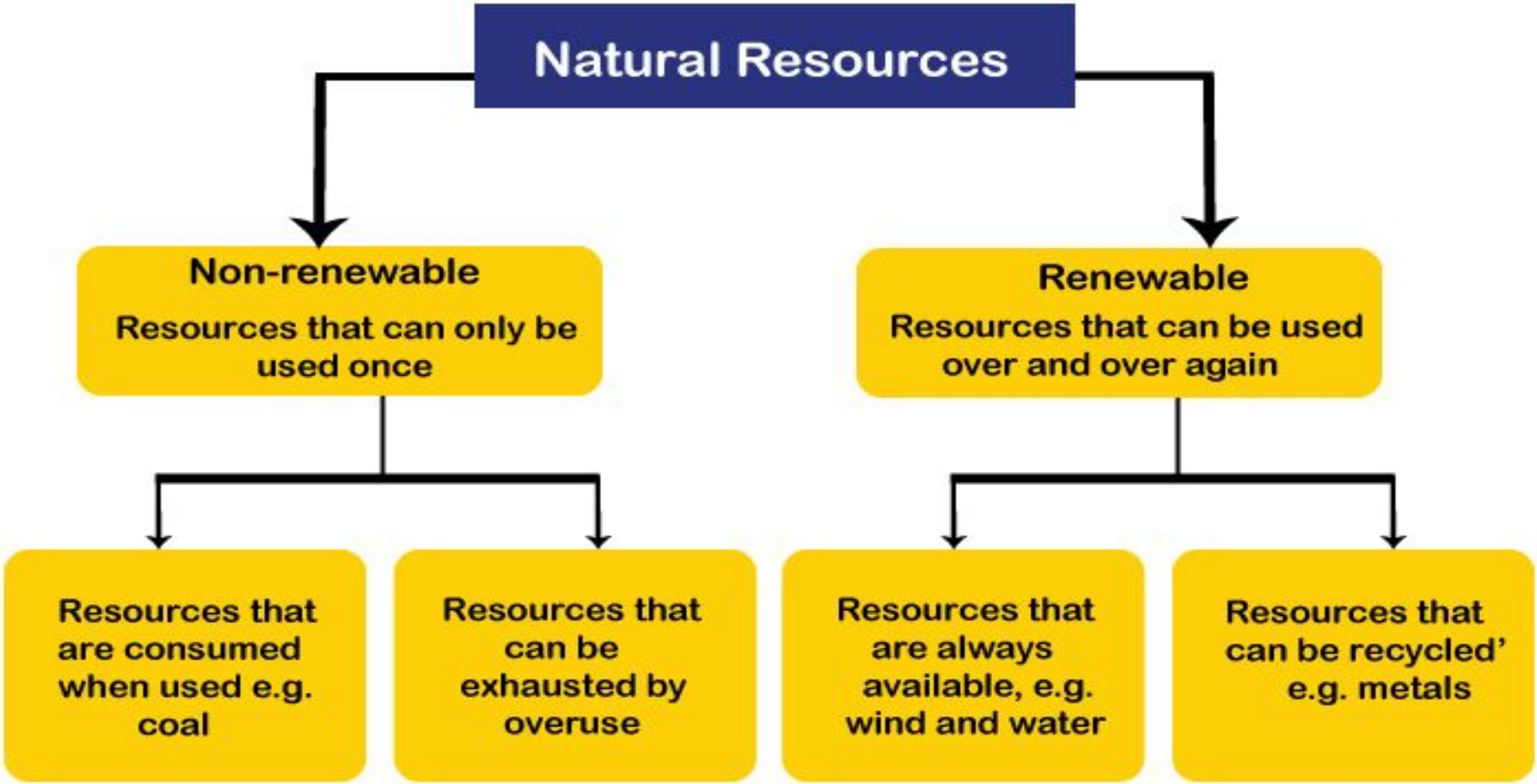
Natural resources are materials from the Earth that are used to support life and meet people's needs. Any natural substance that humans use can be considered a natural resource. Oil, coal, natural gas, metals, stone and sand are natural resources.

Natural resources can be classified as potential, actual, reserve, or stock resources based on their stage of development. Natural resources are either renewable or non-renewable depending on whether or not they replenish naturally.

https://www.youtube.com/watch?list=SREvergreen+Resources-The+South+Resource+&v=UHpnyRHRVg4



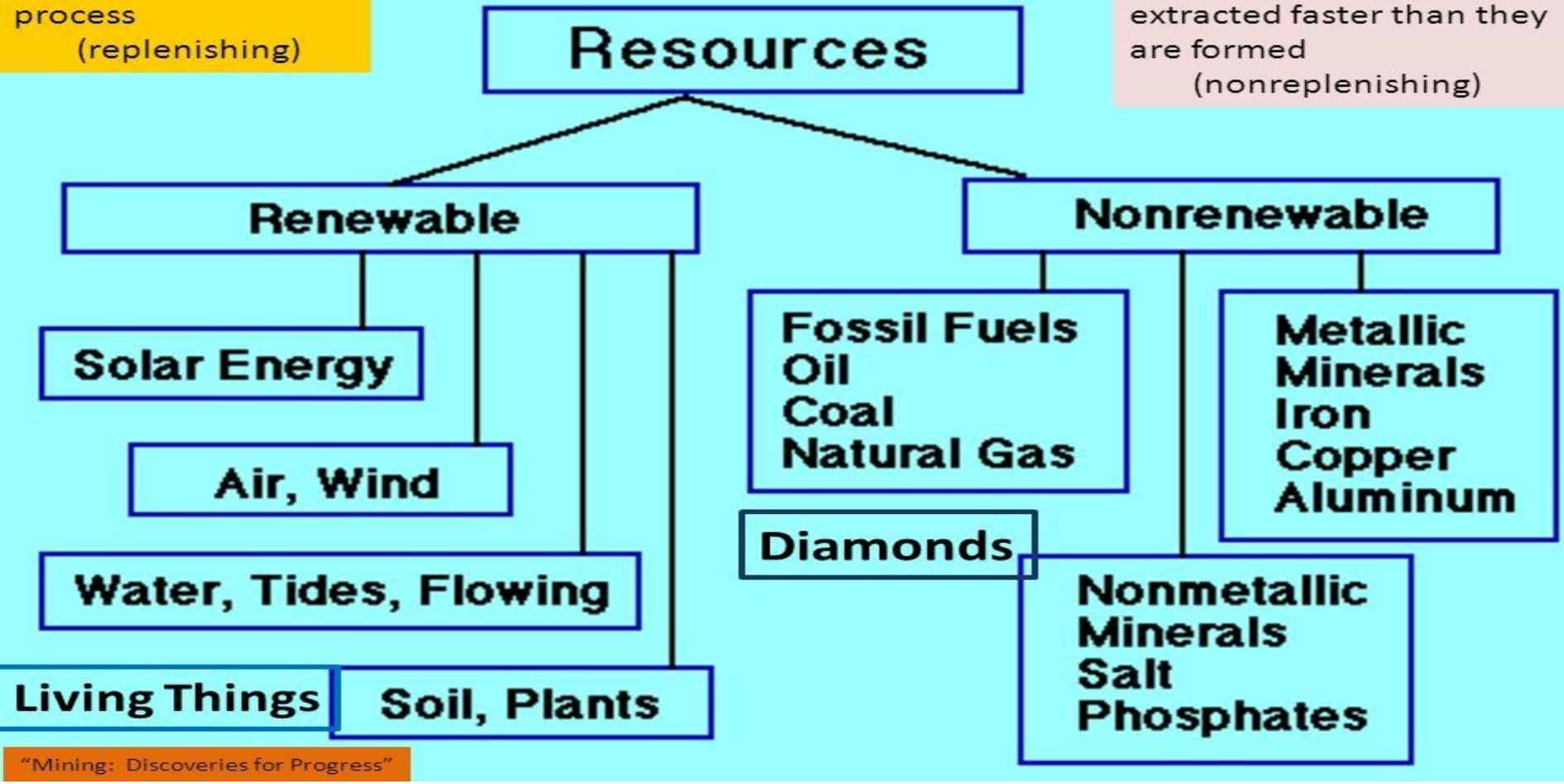

Soft values: Transitory individual needs and preference
Hard core values: Survival, health and identity
Exchangable resources: e.g. fossil fuels, common consumer goods, all kinds of ordinary objects
e.g. forests, clean ground water
e.g. significant buildings or works of art, local populations of significant species
e.g. freedom from risks
Critical resources: e.g. sufficiently clean water and air, basic ecological services,
e.g. water quality, biodiversity
Unique resources: e.g. historically important buildings and objects, rare and significant species, biologically or aesthetically unique areas
General: paramount for all human beings
Specific: particularly important for a specific community


Natural Resources
Non-renewable
Resources that can only be used once
Renewable
Resources that can be used over and over again
Resources that are consumed when used e.g. coal
Resources that can be exhausted by overuse
Resources that are always available, e.g. wind and water
Resources that can be recycled' e.g. metals

Renewable: replaced through natural process (replenishing)

If all natural resources are provided by nature, why aren't they all considered "renewable"?

Nonrenewable: exhaustible, extracted faster than they are formed (nonreplenishing)

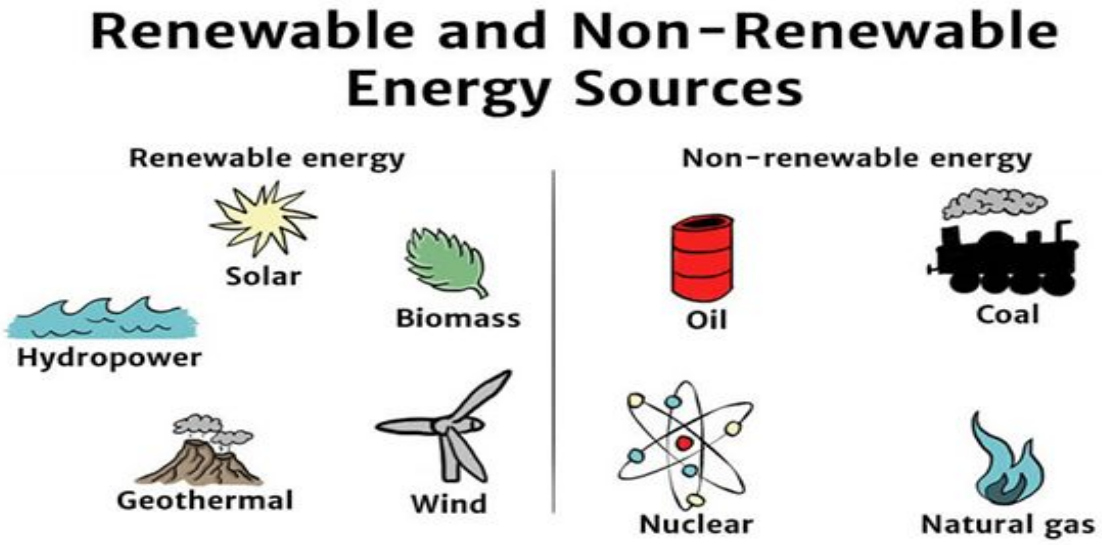


"Mining: Discoveries for Progress"

The resources capable of being regenerated by ecological processes within a reasonable time period are called renewable resources.

Examples: Soil, water, natural vegetation etc.

Nonrenewable resources: oil, natural gas, coal, and nuclear energy. Oil, natural gas, and coal are collectively called fossil fuels. Fossil fuels were formed within the Earth from dead plants and animals over millions of years—hence the name "fossil" fuels.



FOREST RESOURCES

Forests are renewable natural resource capable of providing several major and minor forest products and contribute substantially to economic development.

Forest cover: Includes all lands having trees more than one hectare in area with tree canopy density of more than 10%, irrespective of ownership, legal status of the land and species composition of trees.

Forest canopy cover, also known as canopy coverage or crown cover, is defined as the proportion of the forest covered by the vertical projection of the tree crowns.

There are broadly five categories of forests in India. They are named as Tropical evergreen forests, Tropical deciduous forests, Tropical thorn forests, Montane (mountain) forests, and Swamp (mangrove) forests.

TYPES OF FORESTS IN INDIA

Very Dense Forest: All lands with tree canopy density of 70% and above. The relative composition of forest cover under this category is 3.02%

Moderately Dense Forest: All lands with tree canopy density of 40% and more but less than 70%. Forest cover under this category is 9.39%

Open Forest: All lands with tree canopy density of 10% and more but less than 40 %. Forest cover of 9.26% falls under this category.

Scrub Forest: Lands with canopy density less than 10%. Geographical area under this category is 1.41%.

Non-forest: Lands not included in any of the above classes (includes water). Geographical area under the non-forest category is 76.92%.

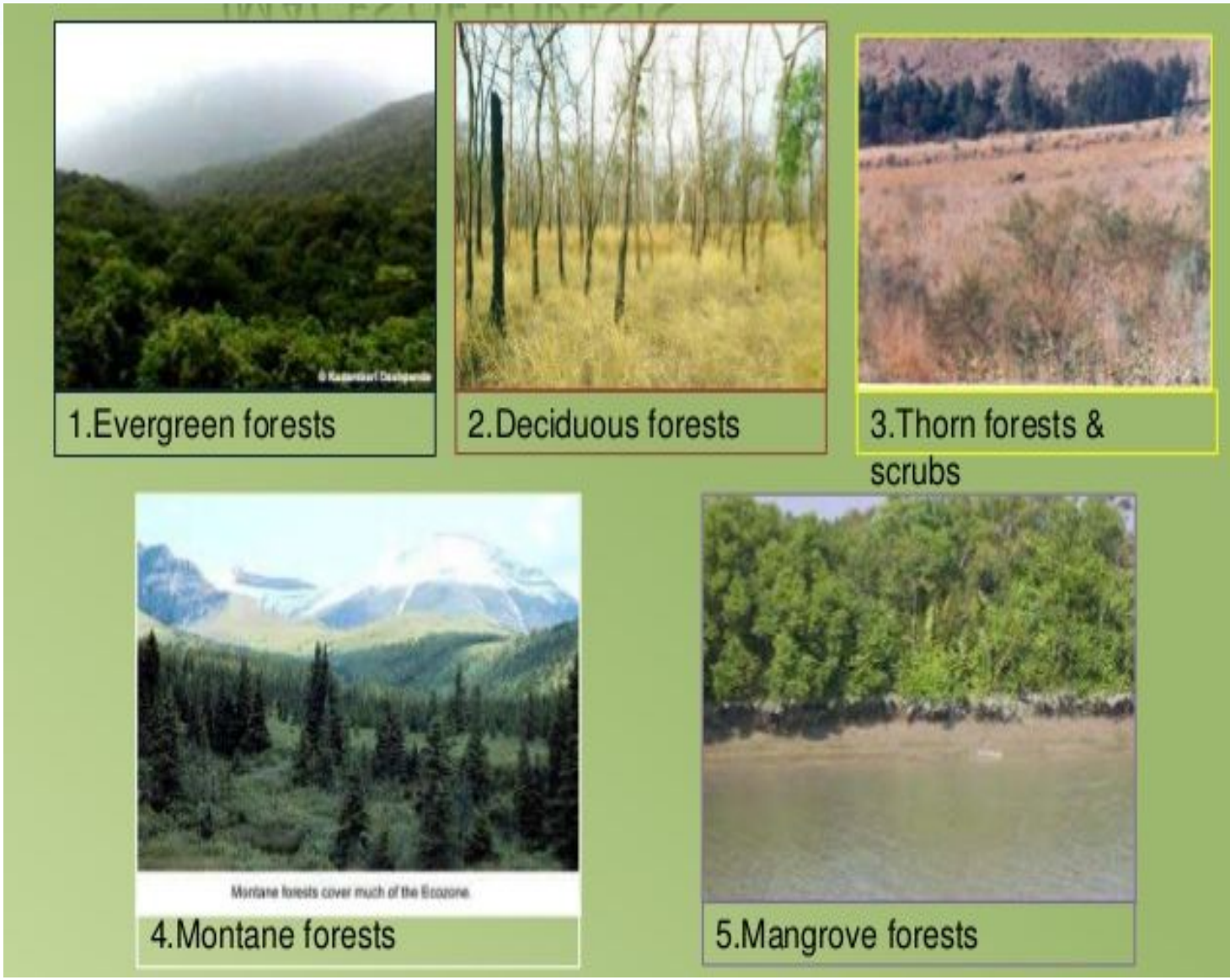

Very Dense forest (2.5% of India)


Moderately Dense Forest (9.5%)


Open Forest (9% of India)


Scrub (1.5% of India)

TYPES OF FORESTS IN INDIA



Functions of forest

Forests act as a natural habitat for a variety of flora and fauna. Without the forest cover, a number of species would have no place to survive. Thus, by supporting so many species, forests also protect biodiversity. Due to deforestation activities, a large number of species of flora and fauna are endangered.

Forests help maintain the climatic environment of the Earth. They regulate climatic temperature.

The trees in these forests absorb the carbon dioxide that is released into the atmosphere. Since forests remove carbon dioxide, they help to bring down the pollution level in our surroundings and reduce global warming.

Trees in the forests give out oxygen in the environment. Oxygen is vital for life on earth to continue.

Forests act as a natural cover for the soil's surface. These natural catchments do not allow the rainwater to take away surface soil. Thus, they prevent soil erosion on one hand and siltation in rivers and seas on the other hand.

Forests also control floods and their hydrological cycle avoids calamities like droughts.

A number of raw materials required by industries such as the paper and mining industries are found in the forests.

Forests provide for economic needs of human beings, such as fuel and food supplies.

Forests act as a source of livelihood for a number of people who depend on them for fruits, honey, medicinal plants, sometimes even shelter.

Functions of Forests

Productive

Various fragrant oils are obtained

Latex obtained from it is used for making synthetic rubber

Wood obtained is used for making furniture

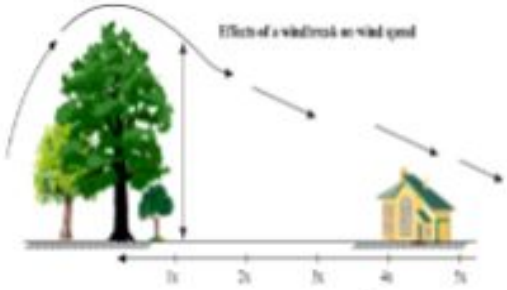
Jute fibre obtained used for making sacks, carpets etc.

Protective

Helps in water circulation

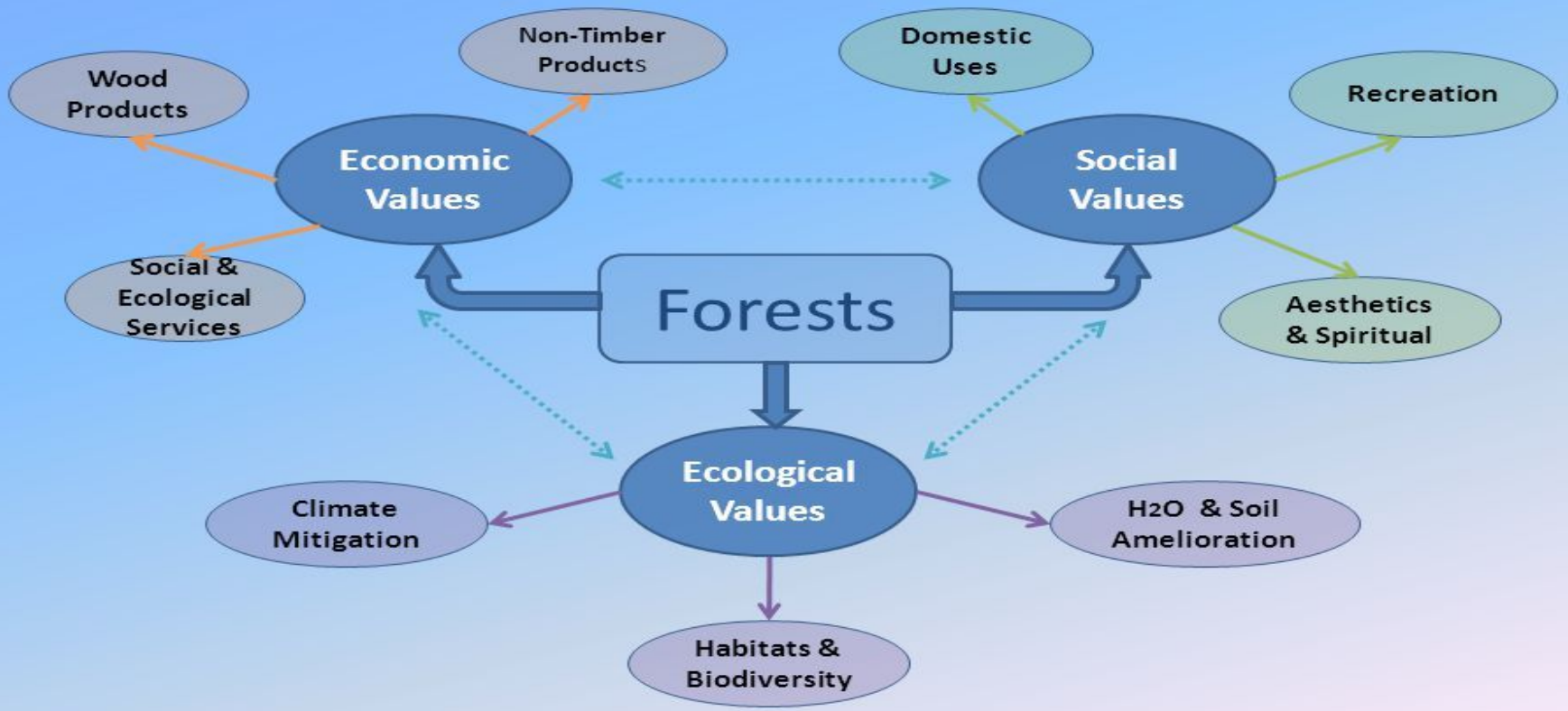
Prevent soil erosion by holding the soil with their roots

Home to wild animals



Acts as a windbreak for both hot and cold winds

Importance and Benefits from Forests



Commercial uses of forests :

Man depends heavily on a larger number of plant and animal products from forests for his daily needs.

The chief product that forests supply is wood, which is used as fuel, raw material for various industries as pulp, paper, newsprint, board, timber for furniture items, other uses as in packing articles, matches, sports goods etc. Indian forests also supply minor products like gums, resins, dyes, tannins, fibers, etc.

Many of the plants are utilized in preparing medicines and drugs; Total worth of which is estimated to be more than $300 billion per year.

Many forests lands are used for mining, agriculture, grazing, and recreation and for development of dams.

Ecological and economic services of forests:

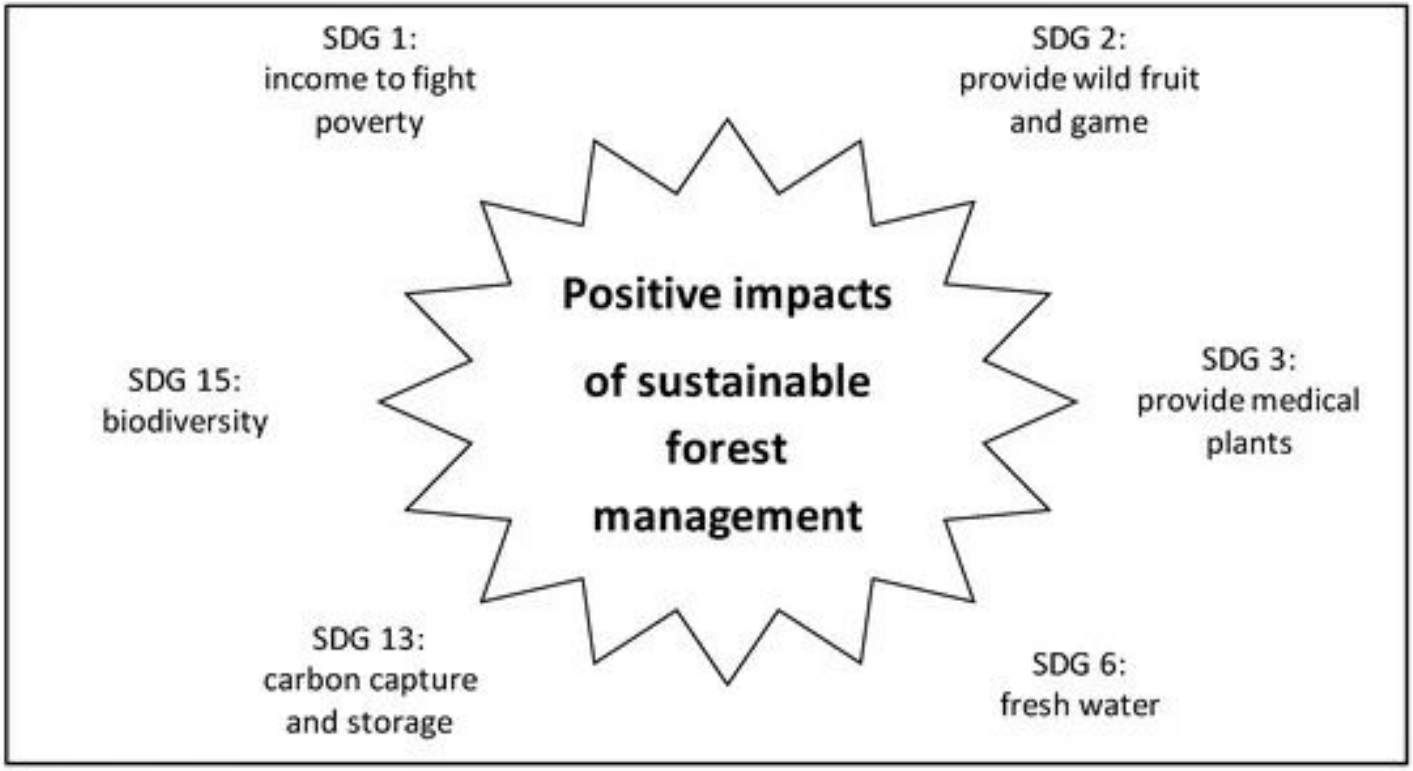
Forests provide major ecological and economic services. Ecological services include: support to get continuous rainfall, energy flow and chemical cycling, reduce soil erosion, absorb and release water, purify water and air, influence local and regional climate, store atmospheric carbon, and provide numerous wildlife habitats.

Forests play an important role in the economic development of a country. They provide several goods which serve as raw materials for many industries. Wood grown in forests serves as a source of energy for rural households. Forests are valued as a place for outdoor recreation.

Importance of Ecological Processes

Collectively, ecological processes produce organic matter, transfer carbon and nutrients, drive soil formation, and enable organisms to reproduce. Ecological processes, such as primary production, influence the extent, distribution, and biodiversity of systems.

Sustainable Development Goal (SDG)



Over Exploitation of forests - Deforestation

Deforestation is the permanent removal of trees to make room for something besides forest. This can include clearing the land for agriculture or grazing, or using the timber for fuel, construction or manufacturing. Forests cover more than 30% of the Earth's land surface, according to the World Wildlife Fund.

Causes of deforestation :

(i) Developmental projects

(ii) Shifting cultivation

(iii) Food and fuel requirements

(iv) Mining operations

https://www.youtube.com/watch?v=Hqwns1tyN0M

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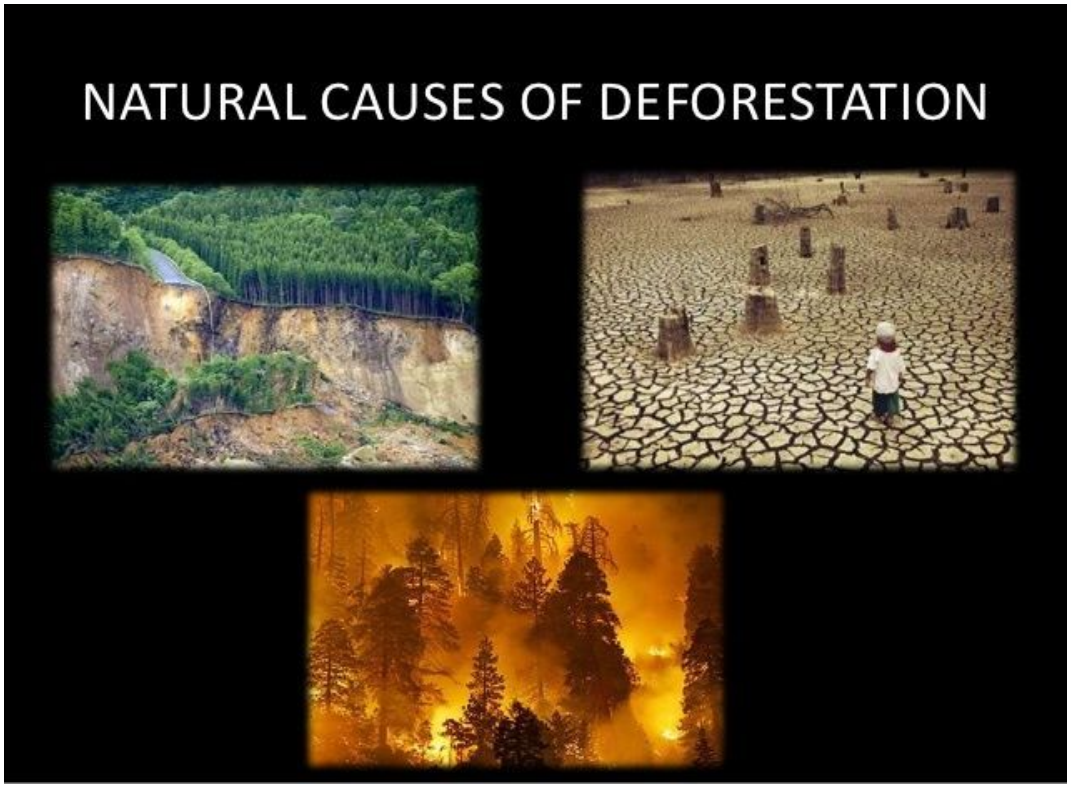

NATURAL CAUSES OF DEFORESTATION

Over Exploitation of forests - - - - Deforestation

Consequences or effects or impacts of deforestation:

a) Effect on climate

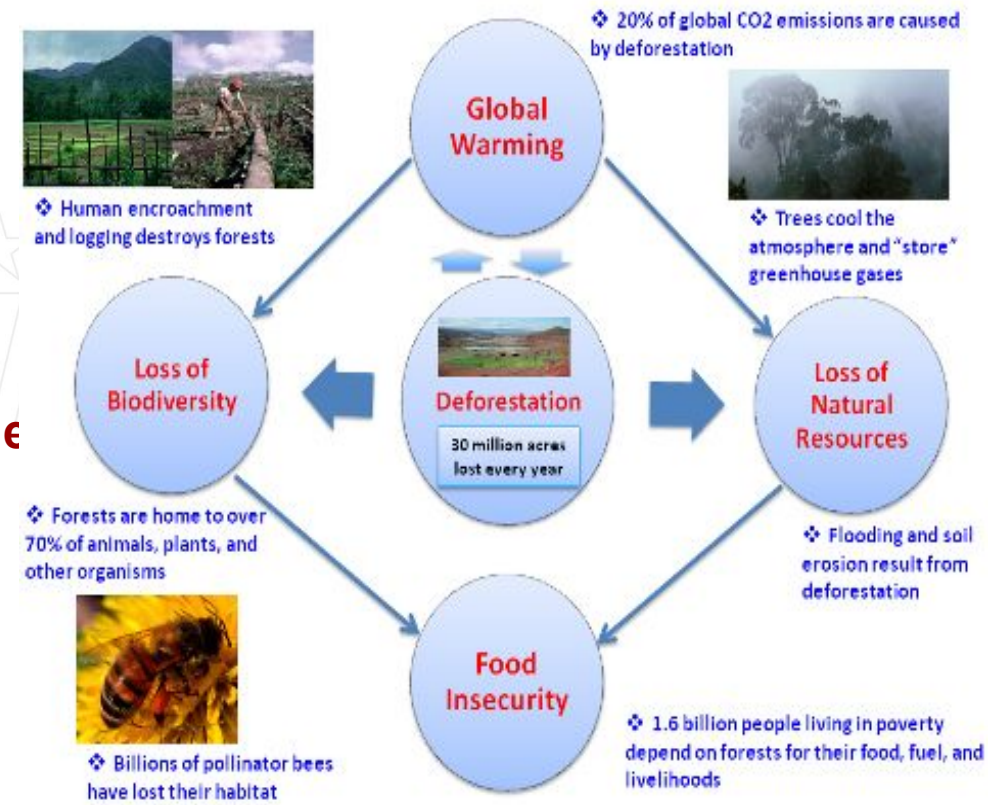
1. Global warming
2. Less rainfall
3. Hot climate and others.

b) Effect on biodiversity

1. Loss of medicinal plants.
2. Loss of timber, fuel wood and othe

c) Effect on resources

1. Loss of land resource
2. Loss of soil fertility
3. Soil erosion
4. Drastic changes in biogeochemical cycles

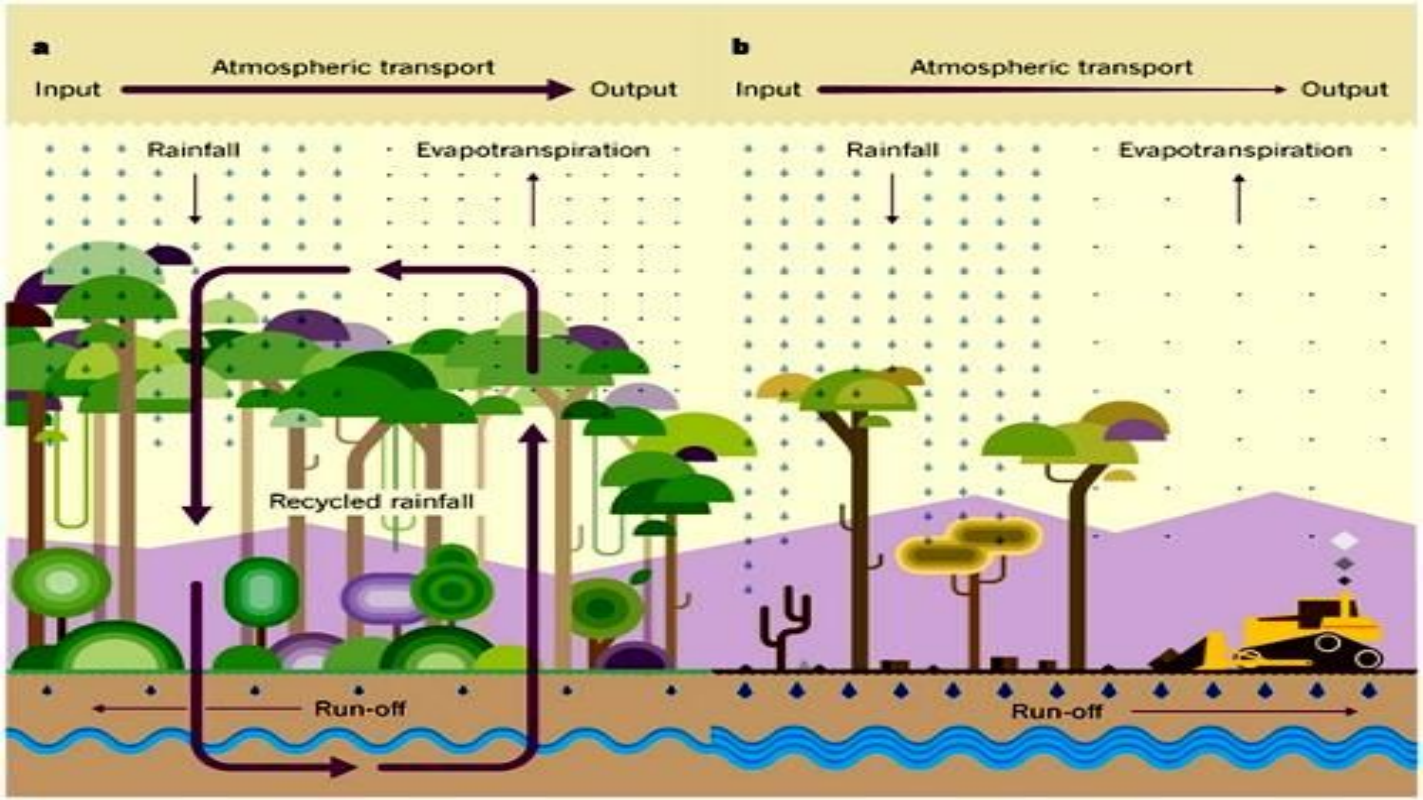


d) Effect on economy

1. Increase in medicinal values
2. Demand of industrial products and others

e) Effect on food

1. Loss of fruit production
2. Loss of root based foods



- Deforestation - Preventive measures
- Afforestation
- Shifting cultivation
- Minimising the developmental activities in the forest area
- Avoid cutting of trees
- Reduce paper usage
- Use 3R approach

Case studies on deforestation

Desertification in hilly regions of the Himalayas:

- Desertification in Himalayas, involving clearance of natural forests and plantation of monocultures like Pinus roxburghi, Eucalyptus camadulensis etc., have upset the ecosystem by changing various soil and biological properties.
- The area is invaded by exotic weeds. These areas are not able to recover and are losing their fertility.

Disappearing Tea gardens in Chhota Nagpur:

Following the destruction of forest rain fall declined in Chhota Nagpur to such an extent that tea-gardens also disappeared from the region.

Waning rain fall in Udhagamandalam:

- The rainfall pattern was found to fluctuate with wooded land area in the hills. When the Nilgiri mountains had luxuriant forest cover annual rainfall used to be much higher.

Over Exploitation of forests - Timber extraction

Extraction is the process of transporting cut timber from the place where it was growing to a point where it can can be removed from site. There are a wide range of different methods of timber extraction and they vary in their strengths and weaknesses, and in the sites where they are most appropriate.

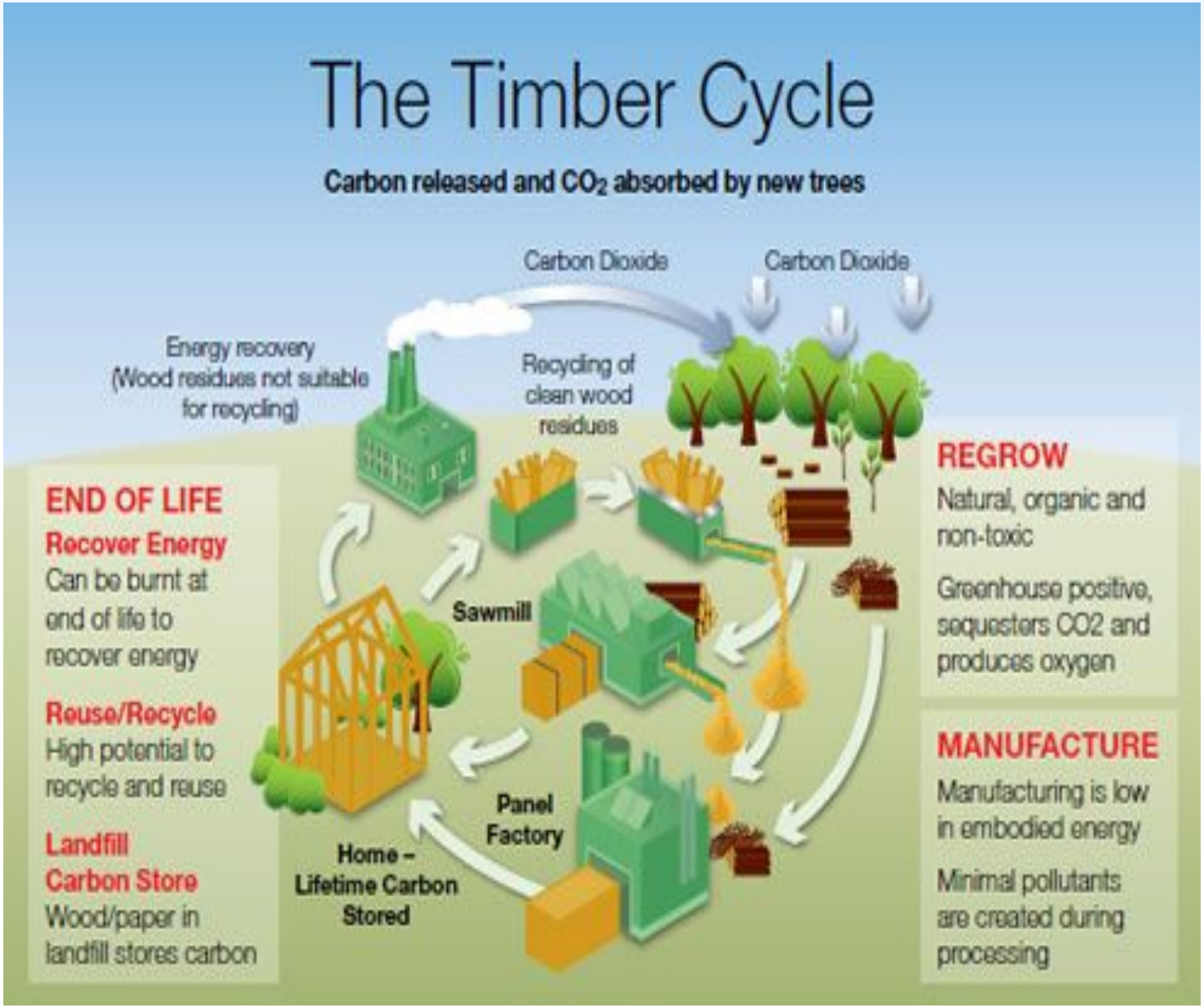
Timber is a valued natural resource that serves directly as a material for use in construction, paper manufacturing, specialty wood products such as furniture, and as a fuel source.

Effects of Timber extraction

- Thinning of forests
- Loss of biodiversity for tree breeding species
- Soil erosion and loss of soil fertility
- Migration of tribal people to new forest areas
- Extinction of tribal people and their culture

Silviculture is the practice of controlling the growth, composition/structure, and quality of forests to meet values and needs, specifically timber production. The name comes from the Latin silvi- ("forest") and culture ("growing"). The study of forests and woods is termed silvology.

Green method to be followed for cyclic timber extraction



Over Exploitation of forests - Mining

Mining is the process of removing deposits of ores from substantially very well below the ground level.

o Mining is carried out to remove several minerals including coal.

o These mineral deposits invariably found in the forest region, and any operation of mining will naturally affect the forests.

o Mining from shallow deposits is done by surface mining while that from deep deposits is done by sub-surface mining.

o More than 80,000 ha of land of the country is presently under the stress of mining activities.

Over Exploitation of forests - Mining

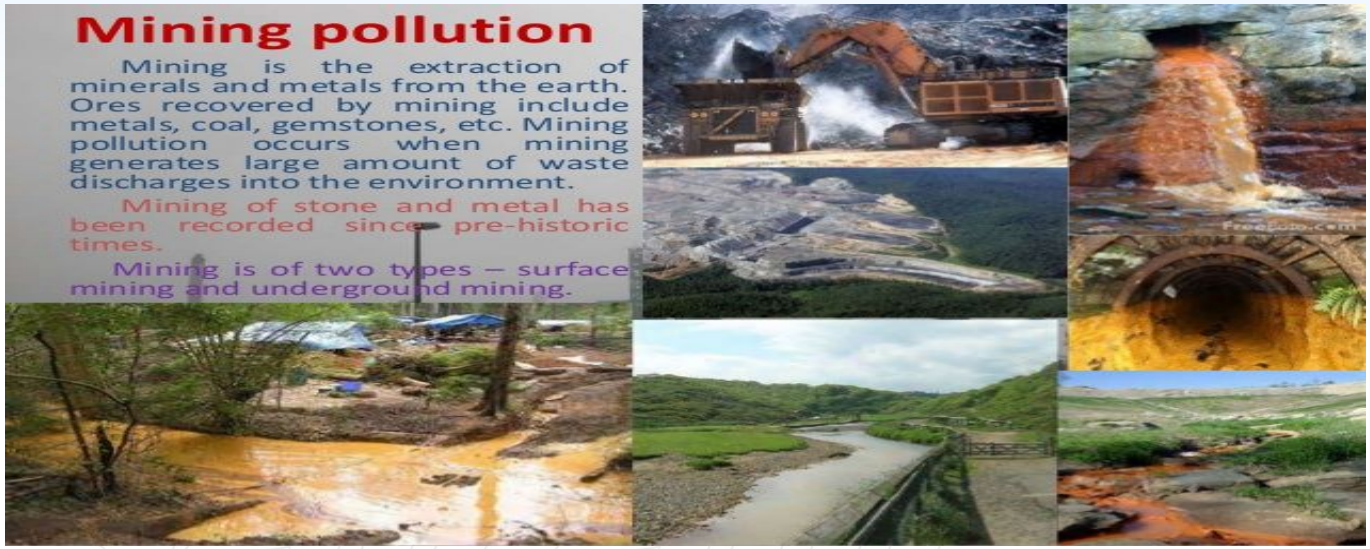
Environmental impacts / effects

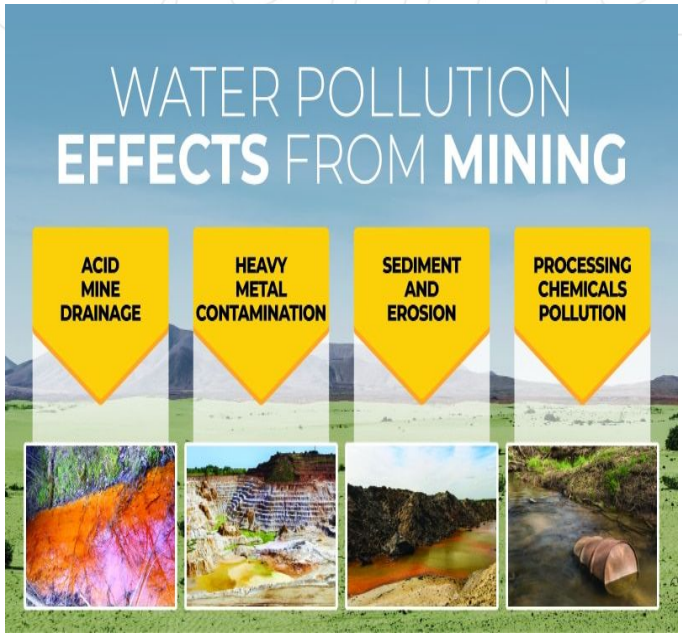
Air pollution

Water pollution

Soil pollution

Noise pollution





Over Exploitation of forests - Mining

Case Studies

· Mining operation require removal of vegetation along with underlying soil mantle and overlying rock masses. This results in destruction of landscape in the area.

· Large scale of deforestation has been reported in Mussorie and Dehradun valley due to mining of various areas.

· Indiscriminate mining in Goa since 1961 has destroyed more than 50,000 ha of forest land.

· Mining of radioactive mineral in Kerala, Tamilnadu and Karnataka are posing similar threats of deforestation.

Over Exploitation of forests - Dam construction

Dams are barriers, usually constructed across rivers, to hold back and contain water in a lake or reservoir.

Big dams and river valley projects have multi-purpose uses and have been referred to as "Temples of modern India".

India has more than 1550 large dams, the maximum being in the state of Maharashtra (more than 600) followed by Gujarat (more than 250) and Madhya Pradesh (130).

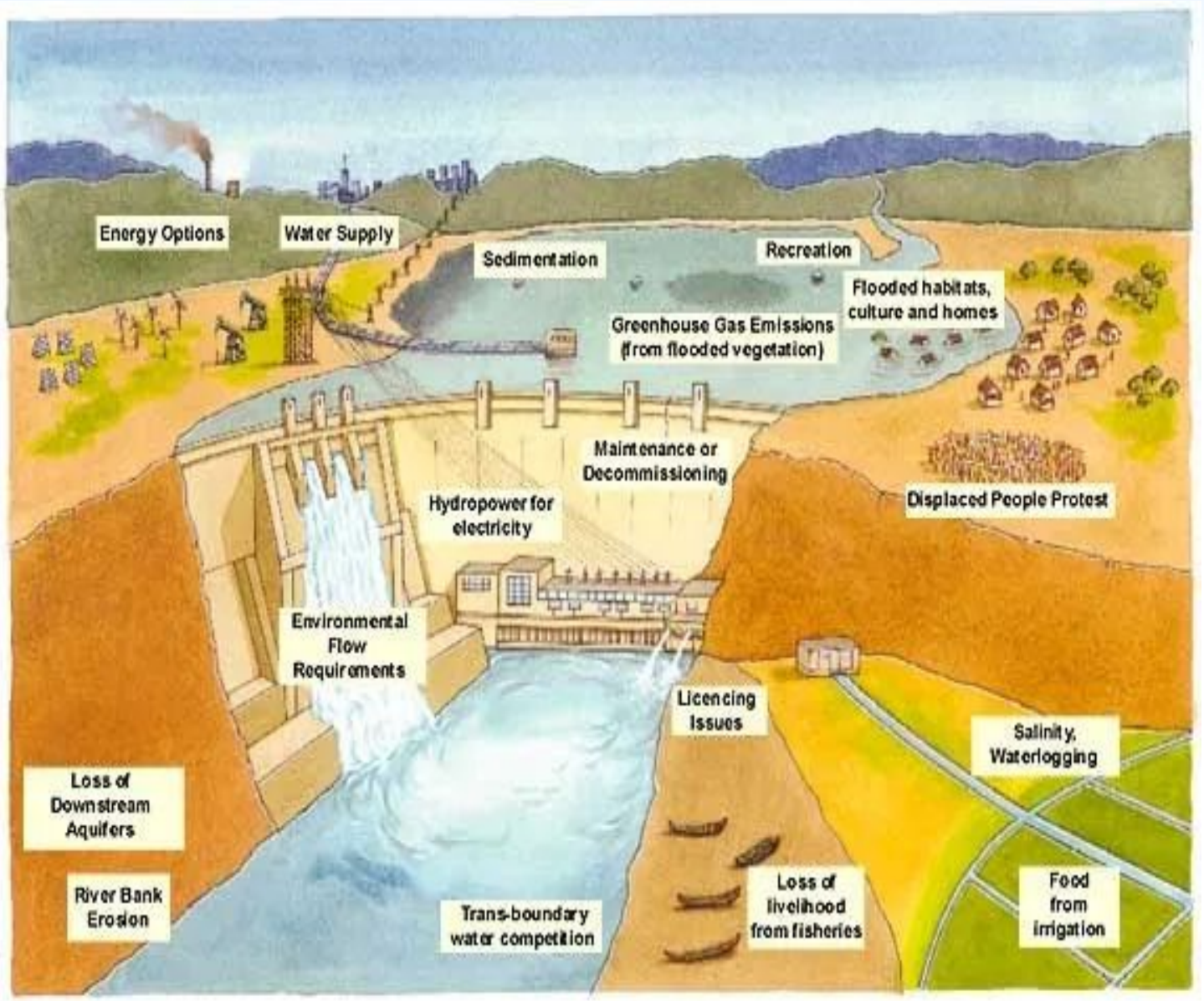
The highest one is Tehri dam, on river Bhagirathi in Utttaranchal and the largest in terms of capacity is Bhakra dam on river Sutlej.

Hydroelectric power Generation

Effects of Dams construction on forests

Upstream problems

Down stream problems



Effects of Dams construction on forests

Case studies

Thousands of hectares of forests have been cleared for executing river valley projects which breaks the natural ecological balance of the region. Floods, landslides become more prevalent in such areas.

For example

- The Narmada sagar project alone has submerged 3.5 lakh hectares of best forest comprising of rich teak and bamboo forests.
- The Tehri dam submerged 1000 hectares of forest affecting about 430 species of plants according to the survey carried out by the botanical survey of India.

Effects of Dam construction on tribal people

Case studies

The greatest social cost of big dam is the widespread displacement of local people.

- **It is estimated that the number of people affected directly or indirectly by all big irrigation projects in India over the past 50 years can be as high as 20 millions.**
- **The Hirakud dam, one of the largest dams executed in fifties, has displaced more than 20,000 people residing in 250 villages.**

https://www.youtube.com/watch?v=_dWJVHIE9S8

The Guarani community is living in makeshift camps because parts of the forest were cleared for sugarcane plantations, displacing these people from their homes in the tropical rainforest.

VIDEO LINK

Effects of Dam construction on tribal people

https://www.youtube.com/watch?v=_dWJVHIE9S8

Over Exploitation of forests - Deforestation

https://www.youtube.com/watch?v=Hqwns1tyN0M

https://www.youtube.com/watch?v=apSe8pWu0Ds

THANK YOU