

The background features abstract, overlapping green geometric shapes. On the left, a solid green trapezoid points towards the center. On the right, a complex arrangement of various shades of green triangles and polygons creates a layered, dynamic effect. The central text is positioned between these two main graphic elements.

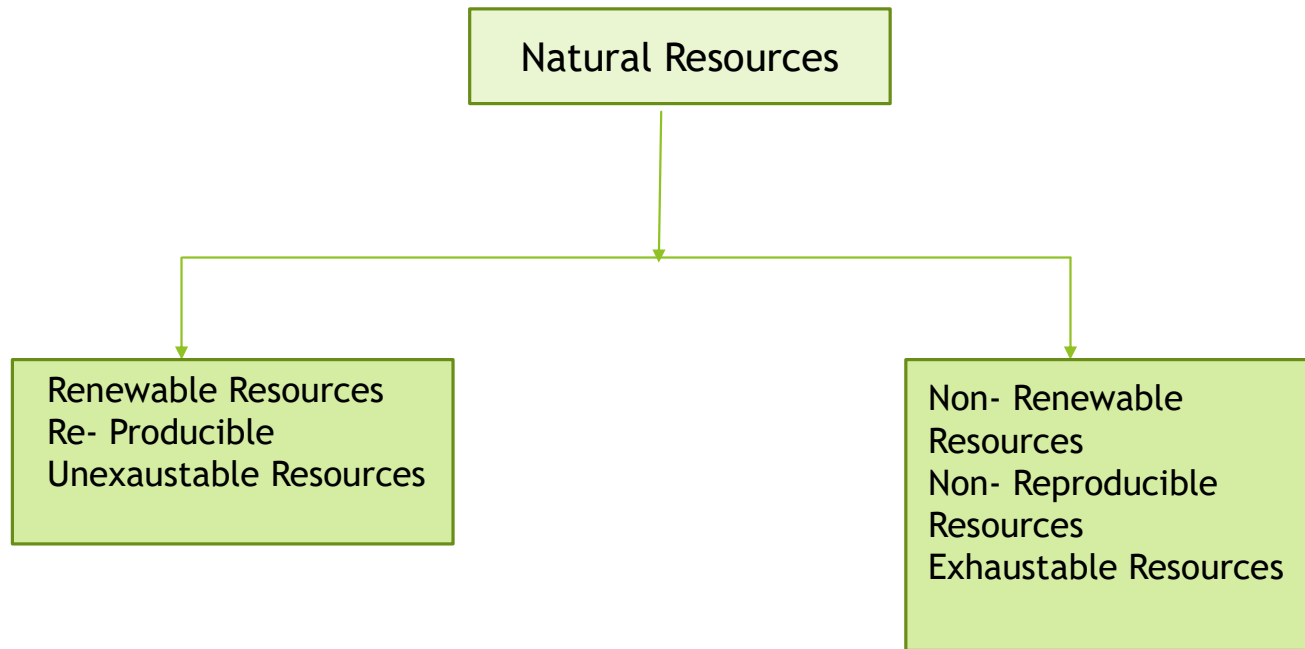
ENVIRONMENTAL STUDIES

Module- 2

Natural Resources & Associated Problems

- ▶ Forest Resources.
- ▶ Water Resources.
- ▶ Mineral Resources.
- ▶ Food Resources.
- ▶ Energy Resources.
- ▶ Land Resources.





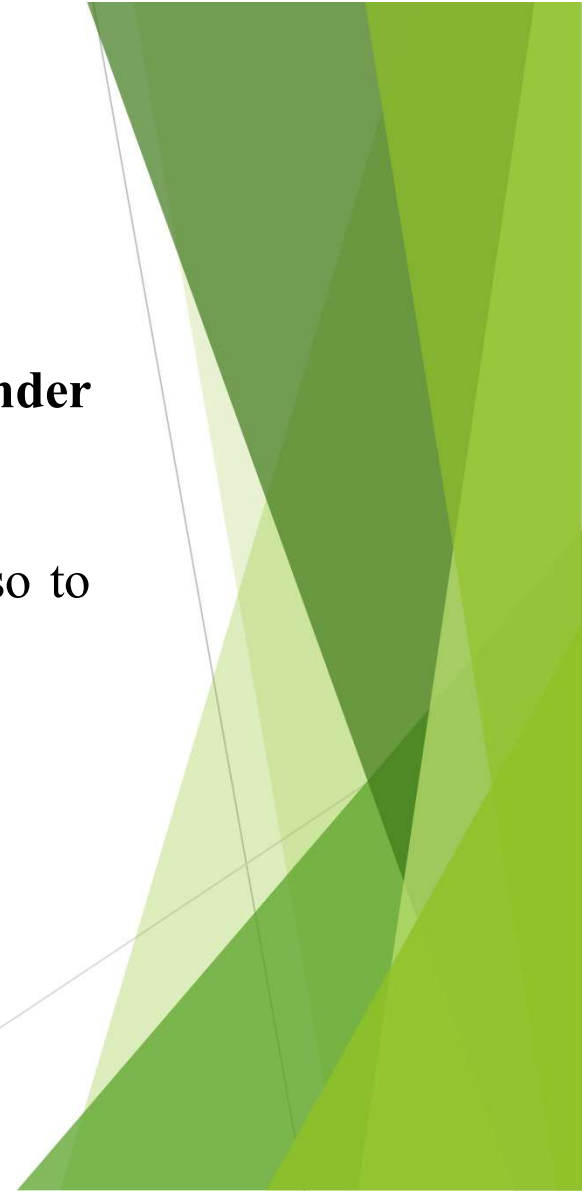
A photograph of a lush green forest with tall trees and ferns. The text "FOREST RESOURCES" is overlaid in a large, black, serif font with a white outline. The background of the slide features abstract green geometric shapes on the right and bottom edges.

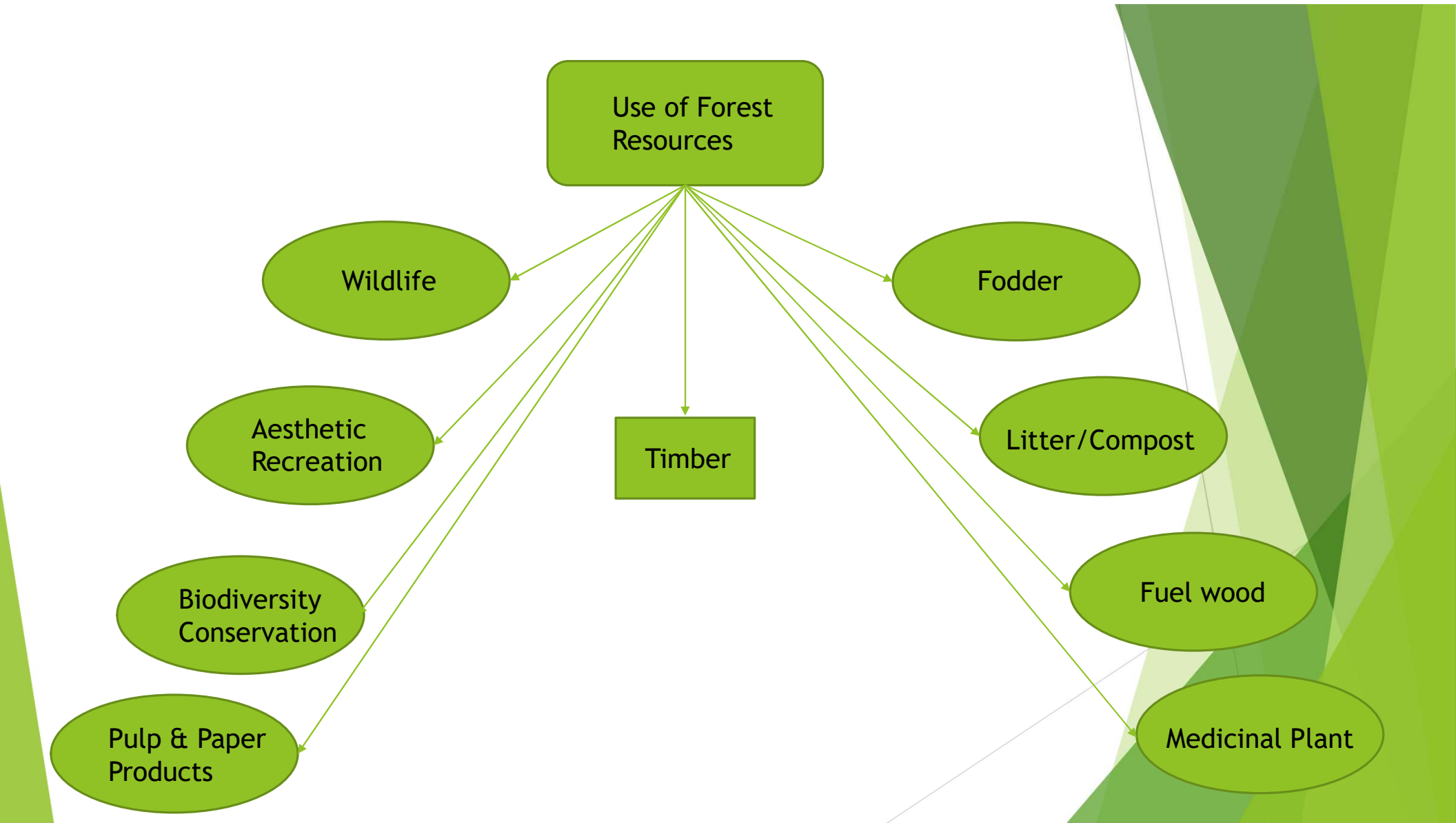
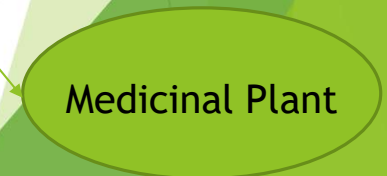
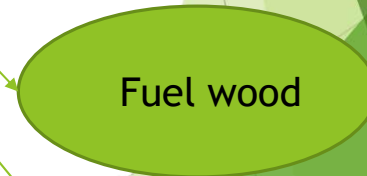
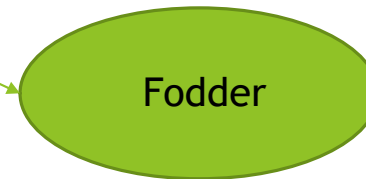
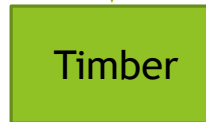
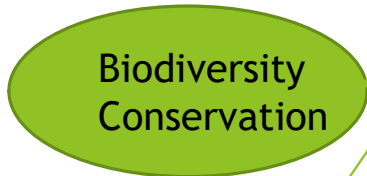
FOREST RESOURCES

India : Fact

India should ideally have **33 percent of its land under forests**. Today we have only about **23 percent**.

Thus we need not only to protect existing forests but also to increase our forest cover





Causes of Exploitation

- ▶ Forest land to agriculture.
- ▶ Commercial and Industrial Exploitation.
- ▶ Fuel wood Extraction.
- ▶ Cattle Ranching.
- ▶ Irrigation & Hydroelectric Projects.



Over Exploitation & Use

- ▶ Deforestation.
- ▶ Timber Extraction.
- ▶ Mining.
- ▶ Dams & their effects.
- ▶ Tribal People.



DEFORESTATION

- ▶ Removal of Natural vegetation for development
- ▶ Major sensitive areas are Western Ghats, Himalayan Parts etc.
- ▶ Ecological Imbalance.
- ▶ Disturbance in Hydrological cycle.
- ▶ Major deforested areas- Gujarat & Rajasthan.



TIMBER EXTRACTION

- ▶ House construction & agricultural implementation.
- ▶ For Boat making- Teak & Sal.
- ▶ Demand from Urban.
- ▶ Invention of Mono Culture.



MINING

- ▶ Location specific & one time exploitation activity.
- ▶ Permanent Environmental Disturbance.
- ▶ Transportation + settlement of workers + Workshops + Industrial machinery create Noise and Pollution.
- ▶ Flora & Fauna Degrade.



Dams & Effect

- ▶ Location is at origin of River in upper catchments & are cleared for construction of projects.
- ▶ Planning, Earth Moving, Road construction, Labor Colonies & fuel requirement reduces vegetation.
- ▶ Project attract tourism & associated problems
- ▶ Permanent damage & no possibility to regenerate and recover

TRIBAL PEOPLE

- ▶ Closely associated with forest & fully dependent on the forest resources.
- ▶ Loose traditional habitat & life based on local resources & on Ecosystem.
- ▶ Difficult to rehabilitate them.



MITIGATION

- ▶ Afforestation
- ▶ Volunteer organizations: Chipko Andolan
- ▶ Implementation of Stricter laws
- ▶ Water shed management.
- ▶ Building small dams for channeling.



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Water Resources

WATER - INDIA FACTS

India is facing a fresh water crisis. India has just 4% of the world's fresh water — but 16% of the global population.

- 76 million are without access to safe drinking water
- 21% of country's diseases are water related
- Over 329, 000 children under five die due to diarrhea in India in 2015
- A large part of the water withdrawals are happening for agriculture. Therefore, greater discussions and interventions also need to be made in the agricultural sector.

Water Resources

- ▶ Water is an important natural resource on earth on which all life depends.
- ▶ It decides the weather
- ▶ It shape the land surface and regulate the climate
- ▶ Hydrological cycle is the process by which water from the land and oceans vaporize in to atmosphere by solar energy, the vapor in turn condenses as the result of cooling and return to land in the form of precipitation.

Water Resources

- ▶ Use of water includes agricultural, industrial, household, recreational and environmental activities.
- ▶ 97% of the water on earth is salt water, only 3% is fresh water and 75% of it is frozen as glacier and ice bergs and remaining unfrozen is groundwater is available as fresh water.
- ▶ Water resources are under threat from water scarcity, water pollution, water conflict and climate change. Fresh water is a renewable resource, yet the world's supply of groundwater is steadily decreasing

Importance of water

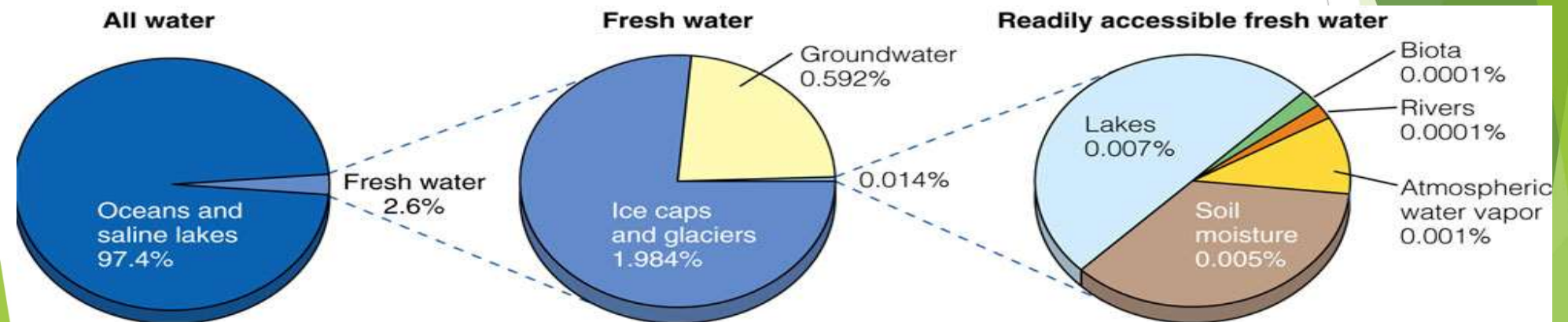
- ▶ Life began in water and is basic component of every living cell
- ▶ Fresh water less than 1% salt is used for drinking
- ▶ Water moves through different biotic and abiotic components of earth in water cycle called hydrological cycle.
- ▶ Calcium and magnesium salts causes hard water and is not suitable for drinking, bathing, cooking and washing clothes.

Importance of water

- ▶ Water is basic input for agriculture
- ▶ Industries consumes water for cooling, heating and other purposes.
- ▶ Electricity can be generated using hydal power
- ▶ Waterways are used for inland transport
- ▶ Water is used to get common salt
- ▶ Water provides habitat for flora and fauna



Sources of Water



Sources of water

- ▶ Groundwater – comes from deep percolation of rainwater and supplies water to wells, springs and to rivers and streams. It is less polluted and less water is lost due to evaporation.
- ▶ Surface water – the water that does not percolate and does not evaporate, does not return to atmosphere or transpiration and enters in rivers, streams, lakes, ponds, wetlands is surface water.

Surface water

- ▶ Surface water is water in a river, lake or fresh water.
- ▶ It is replenished by natural precipitation and lost through discharge to ocean, evaporation, transpiration and seepage.
- ▶ Total quantity of water stored in watershed depends on precipitation, storage capacity, permeability of soil, runoff characteristics of land, timing of precipitation, local evaporation rate.

Surface water

- ▶ Human activities increases runoff quantities by paving areas and channelizing stream flow, draining wetlands and increases due to constructing reservoirs.
- ▶ Canals and pipelines are used to import water from one watershed to other.
- ▶ Human causes surface water to be lost due to pollution.

Ground water

- ▶ Water in pore space of soil and rocks and aquifers is ground water or subsurface water
- ▶ It can be used unsustainably for long time without severe consequence.
- ▶ Input is surface water and outlet is springs and seepage to ocean.

Ground water

- ▶ If surface water is subjected to heavy evaporation, then ground water will become saline. In coastal areas soil is also saline.
- ▶ The subsurface water can also be polluted due to human activities.
- ▶ Human can increase input to ground water by recharge of GWT through rain water harvesting.

Frozen water

- ▶ Water entrapped in icecaps and glaciers is called frozen water. (68.7% of fresh water)
- ▶ Glaciers runoff is surface water.
- ▶ The roof of the world, Himalaya contains most extensive area of glaciers.
- ▶ Ten largest rivers flow from Himalaya and billions peoples live on it.

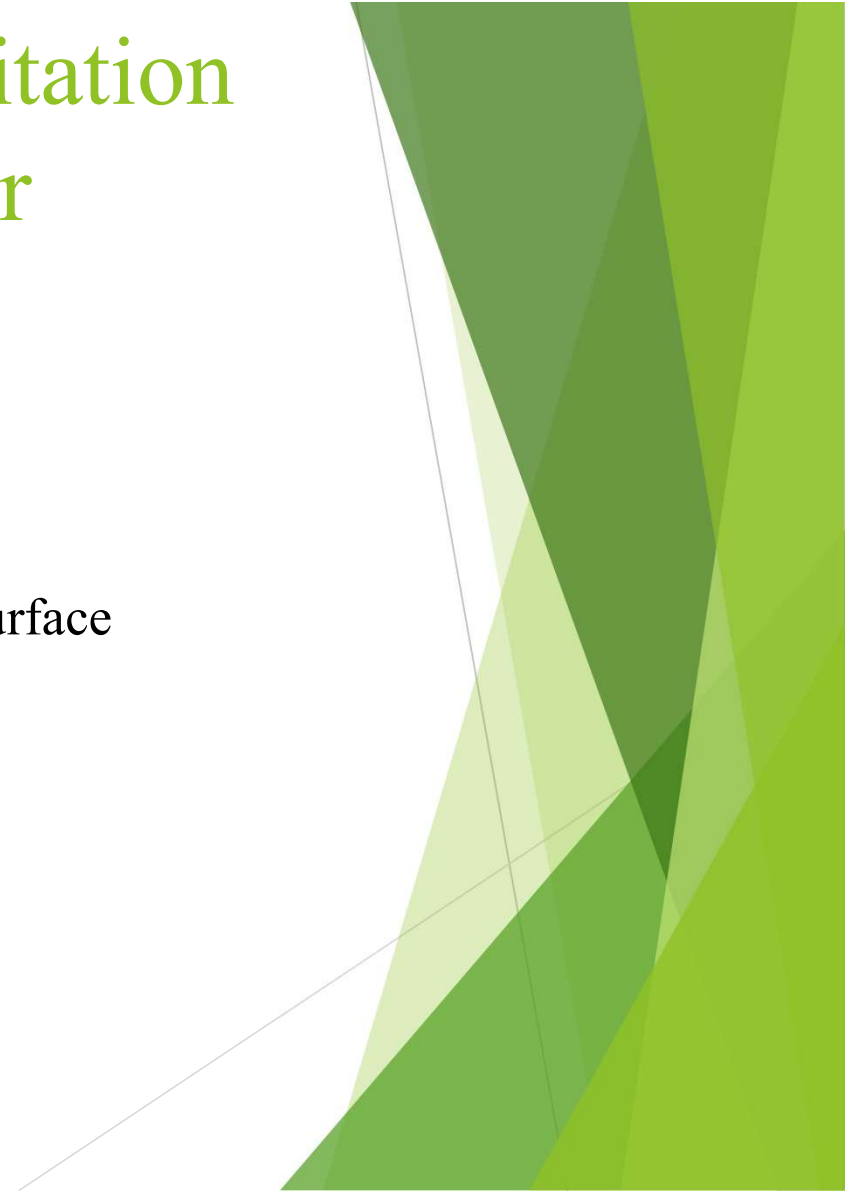
Use and overexploitation of Surface and Ground water

- ▶ Overexploitation means rate that exceeds recharge rate.
- ▶ Recharge comes from streams, rivers and lakes.
- ▶ Forest enhance the recharge of aquifers.



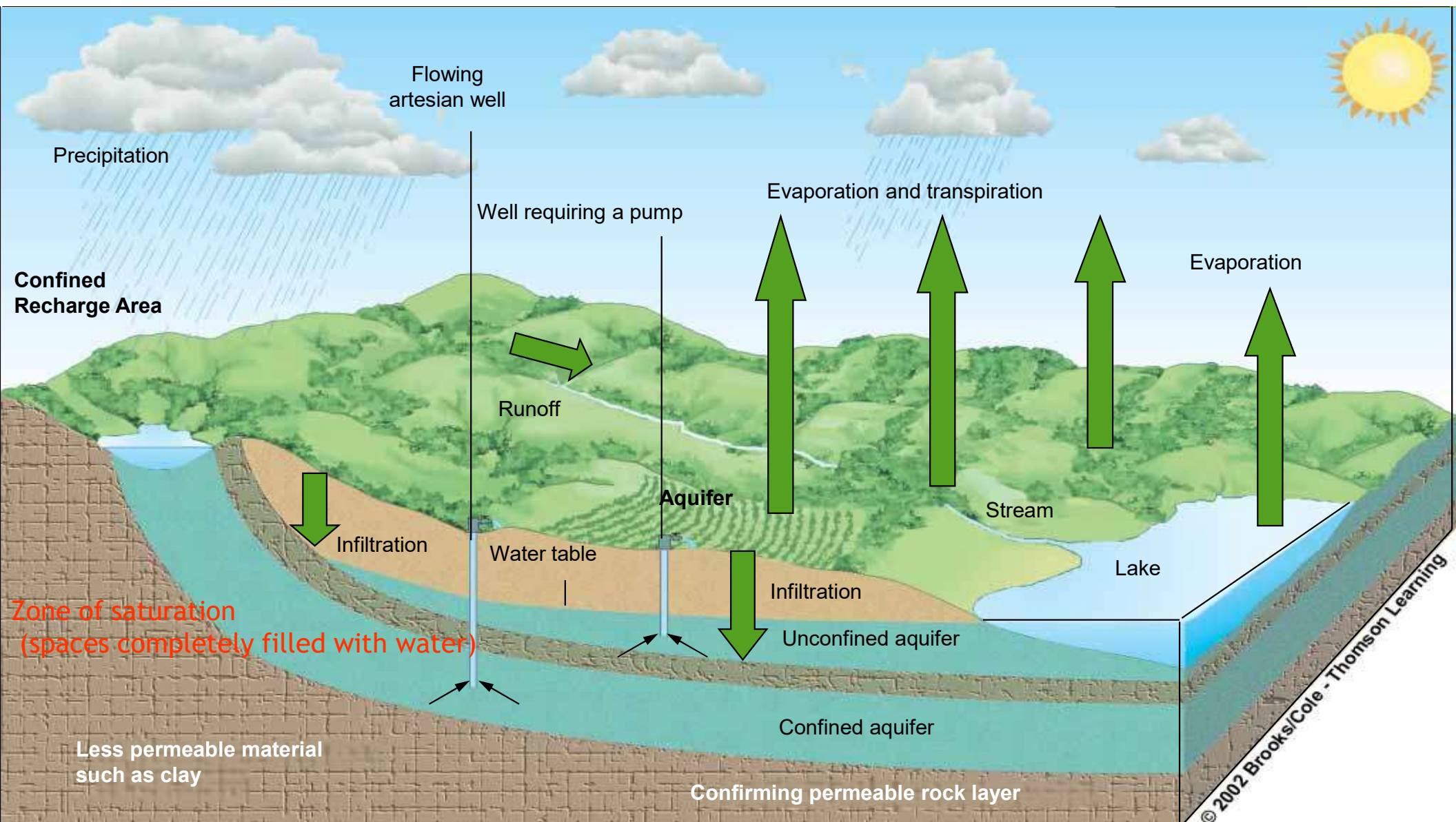
Effect of over exploitation of ground water

- Reduced surface water flow
- Lowering of ground water table
- Ground subsidence : Sudden sinking of the earth's surface
- Degradation of water quality
- Increased salt content
- Increased power cost.



Water Cycle - continuously collected,
purified, recycled and distributed





Use of Water Resources

Humans directly or indirectly use about 54% of reliable runoff

- ▶ Agriculture – 70%
- ▶ Industry – 20%
- ▶ Domestic – 10%

Could use up to 70-90% of the reliable runoff by 2025



Effects of floods, droughts and dams



Effects of floods, droughts and dams

- ▶ The prolonged drought and widespread flooding become disaster for the community having risk of poverty, poor sanitation, limited health care and other services
- ▶ Unable to restore normally after water emergency, whether emergency turns in to disaster, or they take effective measures .
- ▶ Construction of dams causes adverse effects on environment and society, interruption in natural cycle, scour river bed, remove sedimentation, loose nutrients and habitat, stop fish migration, cause erosion, large settlement problem and climate change.

Effects of flood

- ▶ A flood is overflow of excess water that submerges land.
- ▶ The primary effects are damage to all structures, bridges, cars, buildings, sewerage systems, roads and canals.
- ▶ The secondary effects are contamination of water, scarcity of clean water.
- ▶ Unhygienic conditions, spread of water borne diseases, shortage of food, silting of low lands, loss of tree species.
- ▶ Loss of transportation system and difficult to get emergency aid.
- ▶ The tertiary effects are economic hardship, decline in tourism, rebuilding cost, price increase due to less food.

Effects of Droughts

- ▶ Increased desertification and diseases
- ▶ Loss of endangered species and plant species.
- ▶ Loss of human life from food shortage, heat, suicides and violence.
- ▶ Mental, physical stress and water conflicts.
- ▶ loss of cultural sites with reduced quality of life.
- ▶ Increased poverty and migration of populations.
- ▶ Increased predation and plant diseases.
- ▶ Damage to fish and fishery production.
- ▶ Unemployment and reduced production.
- ▶ Loss of hydroelectric power and tourism



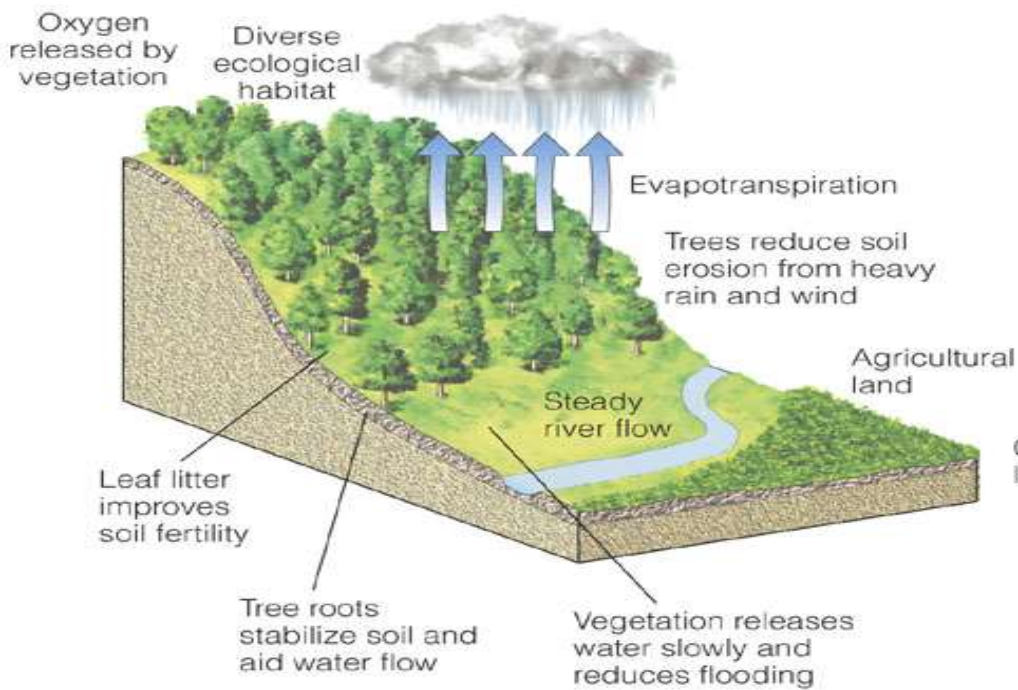
Effects of Dams

- ▶ Erosion of riverbeds, stripping organic material, sediments, vegetation and macro invertebrates.
- ▶ It alters the plant and animals reproductive cycles.
- ▶ Puts nutrient from land to river.
- ▶ Vegetation depends on regular cycles of flood but due to dam they changes forever.
- ▶ Leads to scouring of riverbeds.
- ▶ Increase in sedimentation, causing bursting of dams.
- ▶ Loss of debris causing loss of nutrients and habitat of most animals.

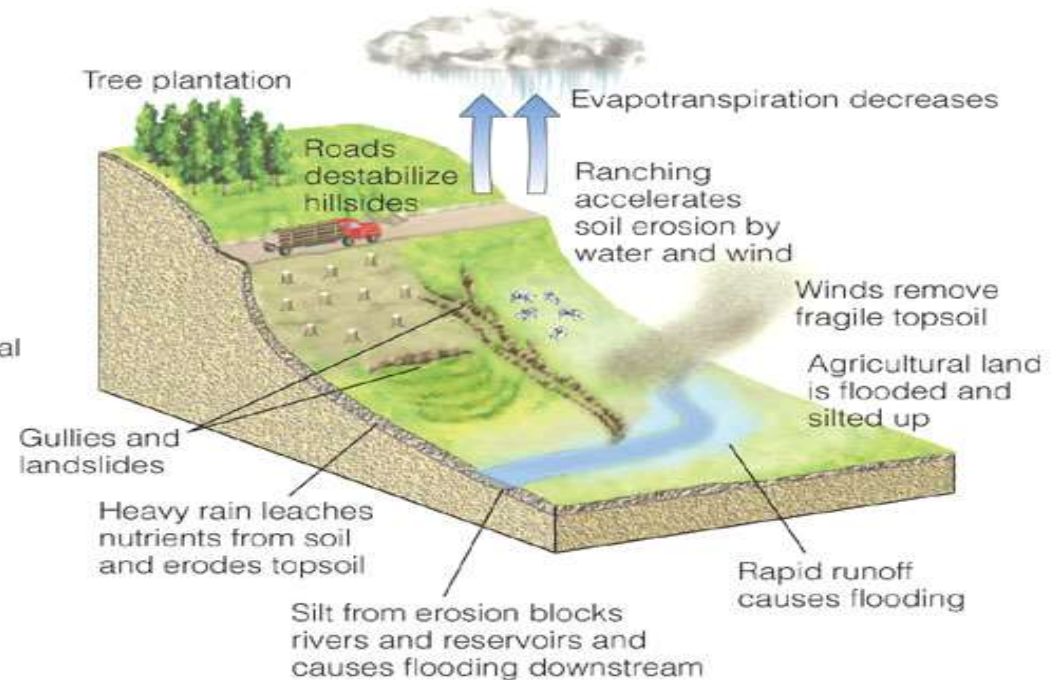
Effects of Dams

- ▶ Stopping of fish migration
- ▶ Displacement of peoples left without land, homes and livelihoods.
- ▶ Decrease in floodplains, agricultural productivity, decrease nutrients for fish and aquatic plants.
- ▶ Increase incidence and transmission of malaria, breeding of mosquitoes
- ▶ Destroys historical significance, cultural life
- ▶ The change is temperature cause loss of macro invertebrates.

Deforestation and flooding

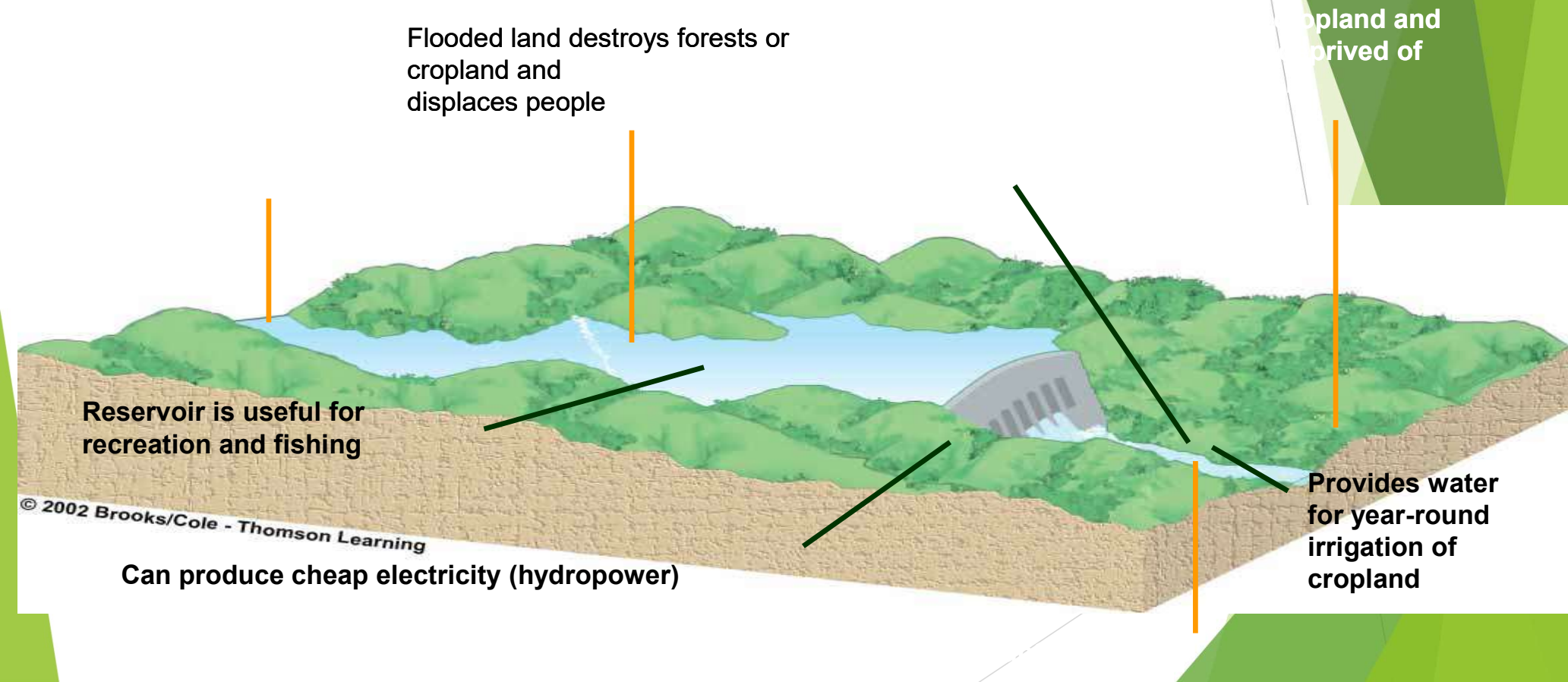


Forested Hillside



After Deforestation

Using Dams and Reservoirs to Supply More Water



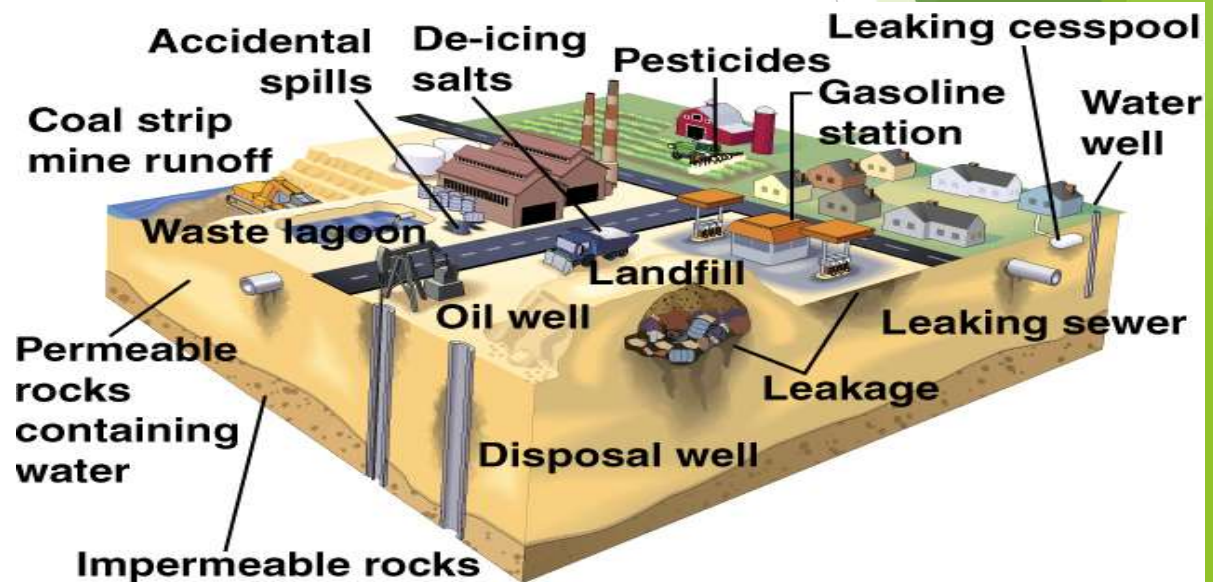
Groundwater

- ▶ No evaporation losses
- ▶ Often less expensive
- ▶ Potential Problems:
 - Water table lowering – too much use
 - Depletion – groundwater being withdrawn at 4X its replacement rate
 - Saltwater intrusion – near coastal areas
 - Chemical contamination
 - Reduced stream flows



Groundwater Pollution

- ▶ Agricultural products
- ▶ Underground storage tanks
- ▶ Landfills
- ▶ Septic tanks
- ▶ Surface impoundments



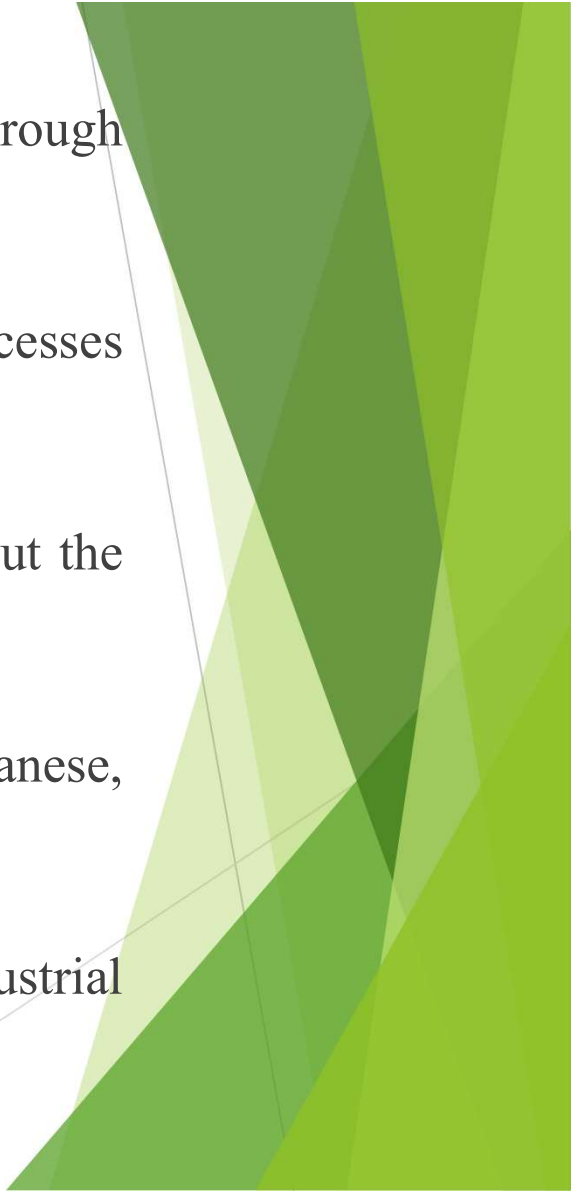


Definition

- ▶ Mineral resources are the one , from which usable material are extracted economically from the concentrated elements, compounds, minerals or rocks from the earth.
- ▶ Minerals are site specific and finite.

TYPES

- ▶ Metallic Minerals- Iron, copper, gold, bauxite, manganese, etc.
- ▶ Non-Metallic Minerals- limestone, mica, gypsum, coal, dolomite, phosphate, salt, granite, etc.

- 
- ▶ Minerals are naturally occurring chemical compounds formed through inorganic processes under the crust of the earth.
 - ▶ Their presence in the Earth's crust is the result of geological processes operating over a long period of time.
 - ▶ The distribution of these minerals resources is uneven throughout the Earth.
 - ▶ India is rich in 35 minerals such as iron, aluminum, manganese, chromium, limestone, mica, etc.
 - ▶ Minerals have important contributions in the economic & industrial development of a country.

TYPES OF MINERALS

Metallic Minerals

Pure Metals are obtained by chemical process.

11 metallic minerals are available in India.

EX. Iron, Lead, Zinc, Copper, Manganese etc.

Non- Metallic Minerals

Used in their naturally occurring state.

52 non metallic minerals are found in India.

EX. Diamond, Marble, Granite, Salt, Mica, Asbestos etc.

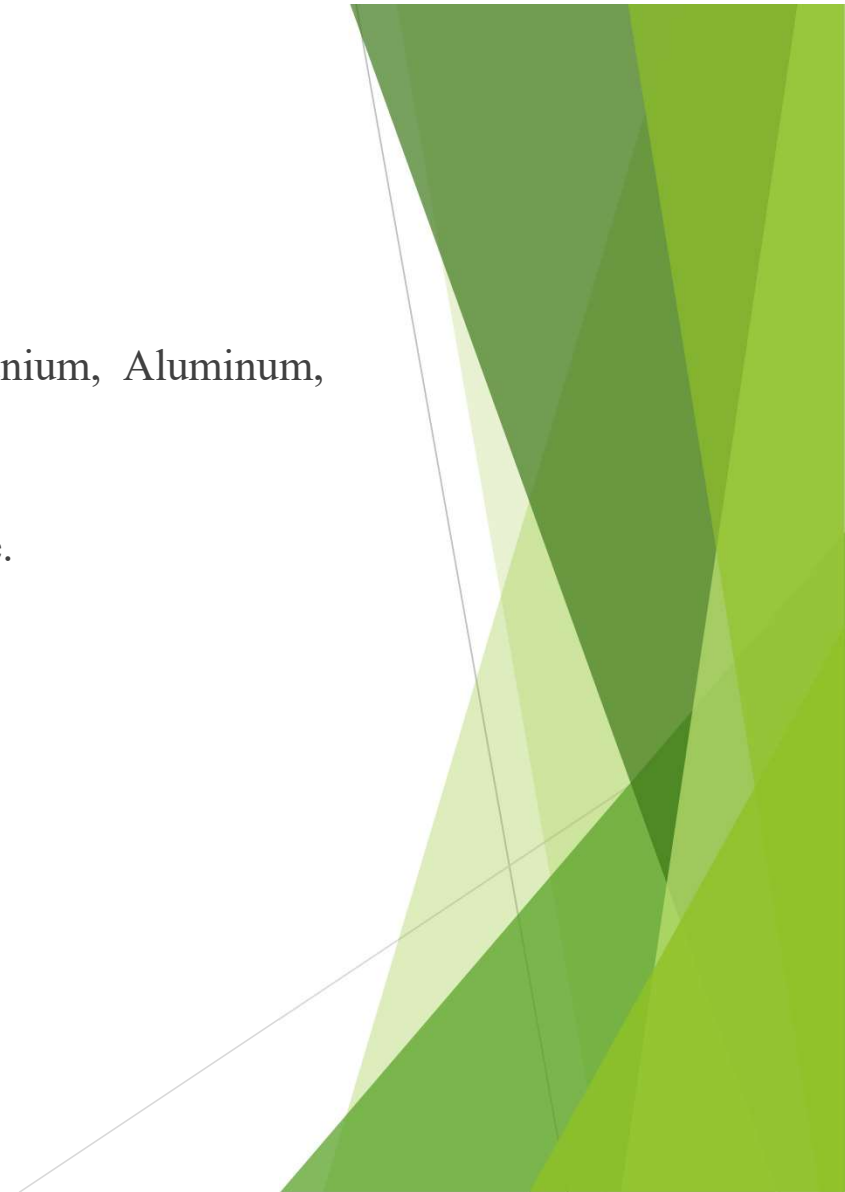
Fuel Minerals

Are utilized as fuel.

EX. Coal, Petroleum, Natural Gas, etc.

Uneven Distribution of metals

- ▶ Bihar & Orissa- Iron, Manganese, Copper, Thorium, Uranium, Aluminum, Chromium, Mica, Phosphate, Coal.
- ▶ Madhya Pradesh- Iron, Manganese, Coal, Limestone, Lignite.
- ▶ Karnataka- Gold mines, Iron, Porcelain, chromium.
- ▶ Kerala- Limestone, monazite, zircon, zinc, gemstone.
- ▶ Gujarat & Assam- Petroleum & coal
- ▶ Maharashtra- Petroleum, bauxite.
- ▶ Andhra Pradesh- Low grade coal, Diamond & gems.



TYPES OF MINING

Surface Mining

- ▶ A mine in which ore lies near the surface & can be extracted by removing the covering layers of the rock & soil.
- ▶ Almost all surface mining operations are exposed to the elements & require no roof support.
- ▶ EX. Coal, Copper, Iron, Crushed Stone, Aluminum etc.

Sub Surface mining

- ▶ Digging tunnels or shafts into the Earth to reach ore deposits.
- ▶ Ore, for processing, & waste rock, for disposal, are brought to the surface through the tunnels & shafts.
- ▶ EX. Natural Gas, Petroleum,

Metals & Non Metals



SURFACE MINING



SUBSURFACE MINING



USE & OVEREXPLOITATION

1. Mining is hazardous occupation
2. Rapid depletion of high grade minerals
3. Wastage of upper soil layer and vegetation
4. Environmental problems
 - ▶ Productive land into mining and industrial areas.
 - ▶ Air, water and land pollution.
 - ▶ Consumption of energy resources like coal, petroleum, natural gas etc.
 - ▶ Directly degrades the fertile soil surface thus affects ecology and climate.

EFFECTS

- ▶ Deforestation and desertification
- ▶ Extinction of species
- ▶ Rapid depletion of high grade minerals
- ▶ Forced migration
- ▶ Wastage of upper soil layer and vegetation
- ▶ Soil erosion and oil depletion
- ▶ Ozone depletion
- ▶ Greenhouse gas increase
- ▶ Environmental pollution
- ▶ Natural hazards, etc.



CASE STUDY

Bauxite deposits of Kolhapur.

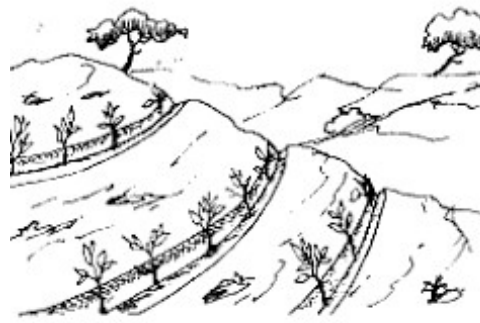
- ▶ Started in 1968 by Kolkata based Indian Aluminum Company, later became HINDALCO.
- ▶ Bauxite and laterite from aquifers in ground water thus change the ground water conditions.
- ▶ Loss of vegetation.
- ▶ Rehabilitation and afforestation became essential.



STATUS OF MINES IN INDIA

- ▶ India produces as many as 86 metals & minerals.
- ▶ 80 % of mining in India is for coal.
- ▶ India has over 3500 legal mines.
- ▶ Illegal mines is the major problem in the country. i.e.180000
- ▶ Over 1 million people are employed in this industry.
- ▶ Mining has adversely affected biodiversity, ecosystem, local culture and community.

PROTECTION PLAN



- ▶ Afforestation on mining site.
- ▶ Formation of contour trenches in mining site.
- ▶ Formation of green belt along the roads.
- ▶ Parks & gardens in the township area & green belt around it is developed.





FOOD RESOURCES

Facts

- About 15 percent of India is undernourished
- One-third of food gets lost or wasted
- Women account for 60 percent of India's hungry population
- 3,000 children die every day from hunger.
- Around 30 percent of newborns die from lack of nutrition.
- According to FAO estimates in 'The State of Food Security and Nutrition in the World, 2019' report, 194.4 million people are undernourished in India.

Facts

- Over **931 million tonnes** of food – or **17% of global food production** is wasted each year. About 61% wasted food comes from households, 26% From food service and 13% from retail globally
 - Upto **10%** of global greenhouse gases emissions are due to food that isn't consumed – *if food waste were a country, it would be the third biggest source of GHG emissions on Earth.*
 - **570 million tonnes** of food are wasted at the household level
- low income Indian households wasted 63 kgs, medium income homes 68 kgs and high income households wasted 90 kgs of food.

FOOD RESOURCES

- ▶ Natural or artificially produced materials, which are used as food to derive metabolic energy, are called as food resources.
- ▶ Food refers to ‘any substance that is Ingested & utilized by the body for growth of life.’
- ▶ Food is the ultimate source of metabolic energy required for, Growth, Body repair, Body heat balance, Daily activities.

TYPES OF FOOD RESOURCES



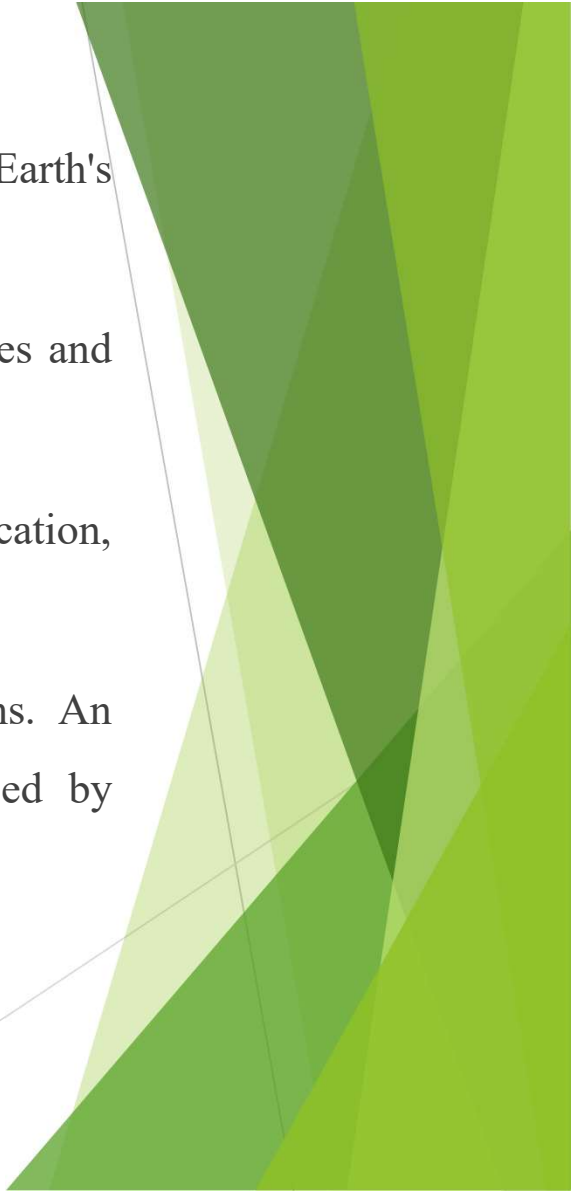
→ Agricultural
Products

Livestock Food →



→ Fish



- 
- ▶ **The global food problem** consists of the lack of **food** provision for the Earth's population.
 - ▶ Poverty trap. People living in poverty can't afford nutritious food for themselves and their families.
 - ▶ Hunger and poverty go hand in hand. It can be divided into 4 categories: health, education, migration & social, and economy.
 - ▶ **food crisis** is a long and extreme **shortage** of **food**, which results in deaths. An example of a **food crisis** is the current global **food crisis** which is caused by high **food** prices caused by poor growing conditions and the rising costs of fuel.

➤ Increased demand on the **food** supply has **caused** the price of **food** to rise. The numerous contributors to the rise in cost and the reduction in supply include biofuels, bad weather, the historically high cost of oil and transportation, increased demand for meat and dairy, and population growth.

Changes caused by agriculture and overgrazing

- Rising incomes are accompanied by a diversification in diet which generates great demand for wheat, meat, dairy products, fish, vegetables, fruits and processed foods.
- Changing agricultural crops as per demands and supply policy are also highly appreciated and accelerated due to the tremendous research like green house plantation, tissue culture, bio-fertilizer crops etc.

WORLD FOOD PROBLEM

- ▶ Insufficient Productivity.
- ▶ Lack of Irrigation facility.
- ▶ Under nutrition & malnutrition.
- ▶ Pesticide and fertilizer problem
- ▶ Black marketing



CAUSES OF FOOD PROBLEMS

- ▶ Increased Population.
- ▶ Unfavorable Climate.
- ▶ Adverse geographical conditions.
- ▶ Infertile soil.
- ▶ Disasters.
- ▶ Lack of transportation.
- ▶ High Cost of grains.
- ▶ Insufficient distribution system.



Effect of Modern Agriculture

- ▶ Agriculture is way of life for human race, because increasing population evokes pressure on agriculture to increase production to match demand.
- ▶ With agriculture development food production has increased but failed to serve growing population.
- ▶ Modern agriculture is possible due to development of modern scientific techniques, expansion of irrigational facilities.
- ▶ Modern agriculture is possible due to use of chemical fertilizers, pesticides and insecticides, development of high yielding seeds, changing agriculture practices, mechanization of agriculture, varying crop sequences and land ownership and land tenure.

Effects of Modern Agriculture

- ▶ Modern systems of agriculture use large amounts of fossil fuel energy, water, chemical fertilizers and pesticides to produce huge quantities of crop or live stock.
- ▶ Mechanized and chemical based farming, commercial farming, contract farming and genetic farming are the types of modern agriculture.
- ▶ The new diverse demands of exotic species of crops, vegetables and fruits have introduced changes in the traditional agriculture pattern and practices.
- ▶ Demand for more animal products in the changes diets have resulted into increased production of farm animals.

Sustainable Agriculture

- ▶ Method of growing crops and raising livestock based on organic fertilizers, soil conservation, water conservation, biological control of pests, and minimal use of nonrenewable fossil fuel energy
- Sustainable agriculture consists of environment friendly methods of farming that allow the production of crops or livestock without damage to human or natural systems.
- Elements of sustainable agriculture can include organic farming, agro forestry, mixed farming, natural farming, precision farming, multiple cropping, and crop rotation.
- Sustainable agriculture **conserves energy and reduces greenhouse gas emissions**. It also conserves water, decreasing vulnerability to drought.



Fertilizers & Pesticide (Biocides) Problems

- ▶ Short – term impact.
 - ▶ Endocrine disruption : can cause cancerous tumors, birth defects and other developmental disorders.
 - ▶ Acute dangers.
 - ▶ Chronic health effects.
 - ▶ Can cause many types of cancers.
- ✓ Cow dung manure, compost, Vermicompost when applied to seed or soil, they enhance availability of nutrients and also offer an ecofriendly, economically viable, socially acceptable means of reducing pollution and water pollution caused due to agricultural runoff.



DISADVANTAGES OF PESTICIDES

20% of Indian food products contains pesticides

- ▶ Reduction of beneficial species (natural pest enemies and friendly organisms)
- ▶ Outburst of secondary pests
- ▶ Drift of sprays & vapor.
- ▶ Residues in food.
- ▶ Ground water contamination.
- ▶ Slow Poisoning hazards.
- ▶ Health effect.
- ❑ Bio Intensive Integrated Pest Management (BIPM)

WATER LOGGING & SALINITY

- ▶ Inadequate surface Drainage.
- ▶ Seepage from canal system.
- ▶ Over irrigation of fields.
- ▶ Obstruction of natural drainage.
- ▶ Impermeable clay layer below the soil.



Salination

- ▶ In regions of scarce rainfall, the soil contains a large amount of unleashed salts.
- ▶ Excessive irrigation brings those salts to the surface and leaves behind a residue when the water evaporates.
- ▶ It can also cause unleashed salts to accumulate in the upper layer of the soil. This excessive salt build-up in the soil is called salination.



ENERGY RESOURCES



Facts

India has set an ambitious target to achieve a capacity of 175 GW worth of renewable energy by the end of 2022, which expands to **450 GW by 2030**. This is the world's largest expansion plan in renewable energy.

As of 31 June 2021, the total installed capacity for Renewables is 96.95 GW

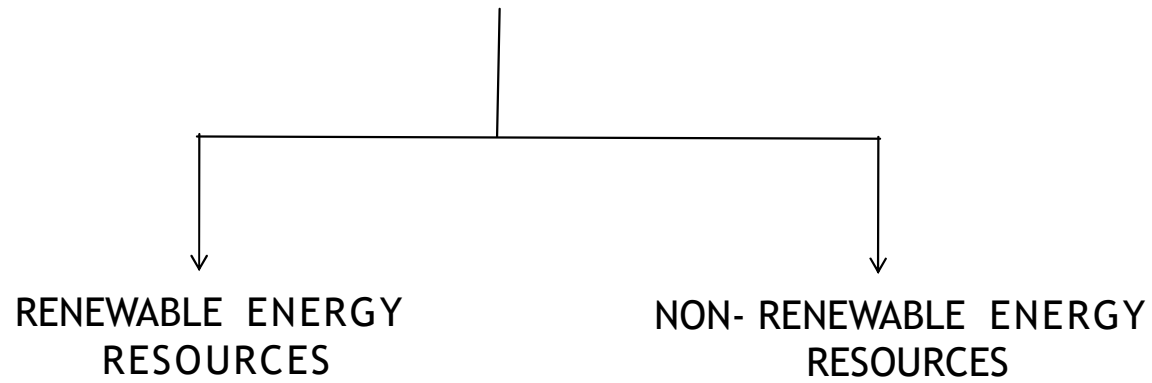
The following is the break up of total installed capacity for Renewables, as of 31 May 2021:

- Wind power: 39.44 GW
- Solar Power: 41.09 GW
- BioPower: 10.34 GW
- Small Hydro Power: 4.79 GW

GROWING ENERGY NEED

- ▶ Energy is an important input for development.
- ▶ It aims at human welfare covering household, agricultural transport & industrial complexes.
- ▶ Due to population explosion the demand for various forms of energy has got increased many folds.
- ▶ Fossil fuel is a major form of energy widely used in the world.

ENERGY RESOURCES



RENEWABLE ENERGY RESOURCES

- ▶ Renewable Resources can be generated continuously in nature & are inexhaustible.
- ▶ These resources can be used again & again in an endless manner.
- ▶ Environmentally cleaner as they produce less pollutants than fossil fuels
- ▶ Ex. Wind Power.

Hydropower.

Tidal Energy.

Solar Energy.

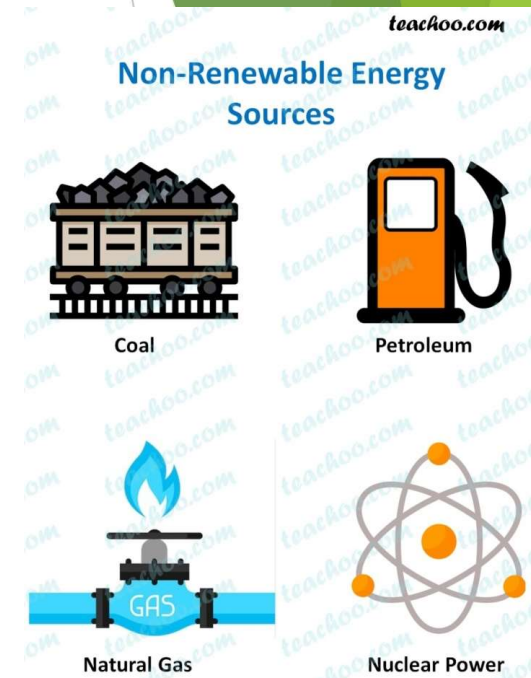
Geothermal Energy.



NON- RENEWABLE ENERGY RESOURCES

- ❑ The energy resources which cannot be renewed.
- ❑ These sources are limited and will exhaust eventually as their stocks are limited and depleting fast.
- ❑ Use of fossil fuels is causing adverse impact on the environment by air pollution, global warming, acid rain, oil pollution and many other associated problems.

- ▶ Coal
- ▶ Petroleum
- ▶ Natural gas
- ▶ Nuclear energy

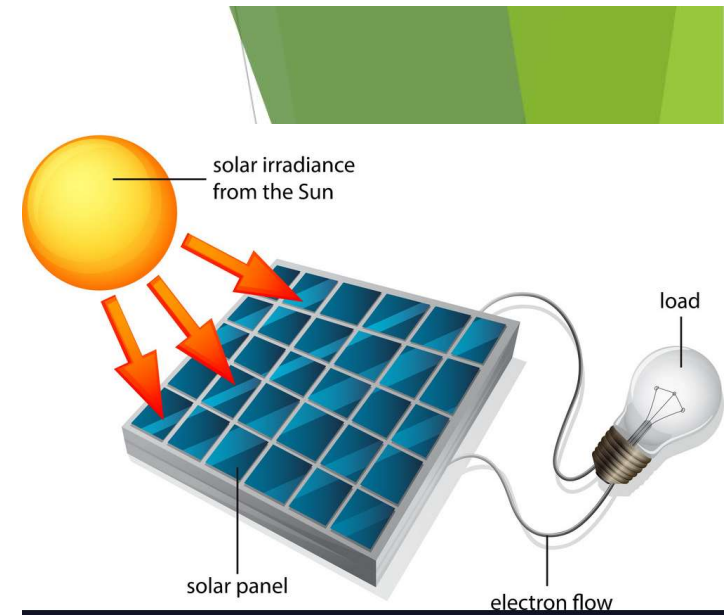


SOLAR ENERGY

- ▶ **10 sq meter area** for a 1 kW solar system capacity is needed.
- ▶ The solar radiation is made incident on semi conducting materials to produce electricity directly.
- ▶ Such materials are used in the production of photovoltaic cells.

Applications

- ▶ Solar heat collectors.
- ▶ Solar cells.
- ▶ Solar cookers.
- ▶ Solar water heaters.
- ▶ Solar power plant.
- ▶ Solar furnace, etc.



WIND ENERGY

- ▶ Winds blow with high speed, due to atmospheric temperature difference caused by different fluxes of sunlight
- ▶ Harnessed by making use of wind mills, No. of wind mills installed in cluster are called wind farms.
- ▶ Windmills can be constructed from materials like bamboo, wood and metallic materials.
- ▶ . The basic **principle** of every **windmill** is to convert kinetic energy of wind into mechanical energy which is used to rotate the turbine of electrical generator to produce electricity.
- ▶ Wind energy is free from any kind of pollutant emission except noise and threat to the wildlife.



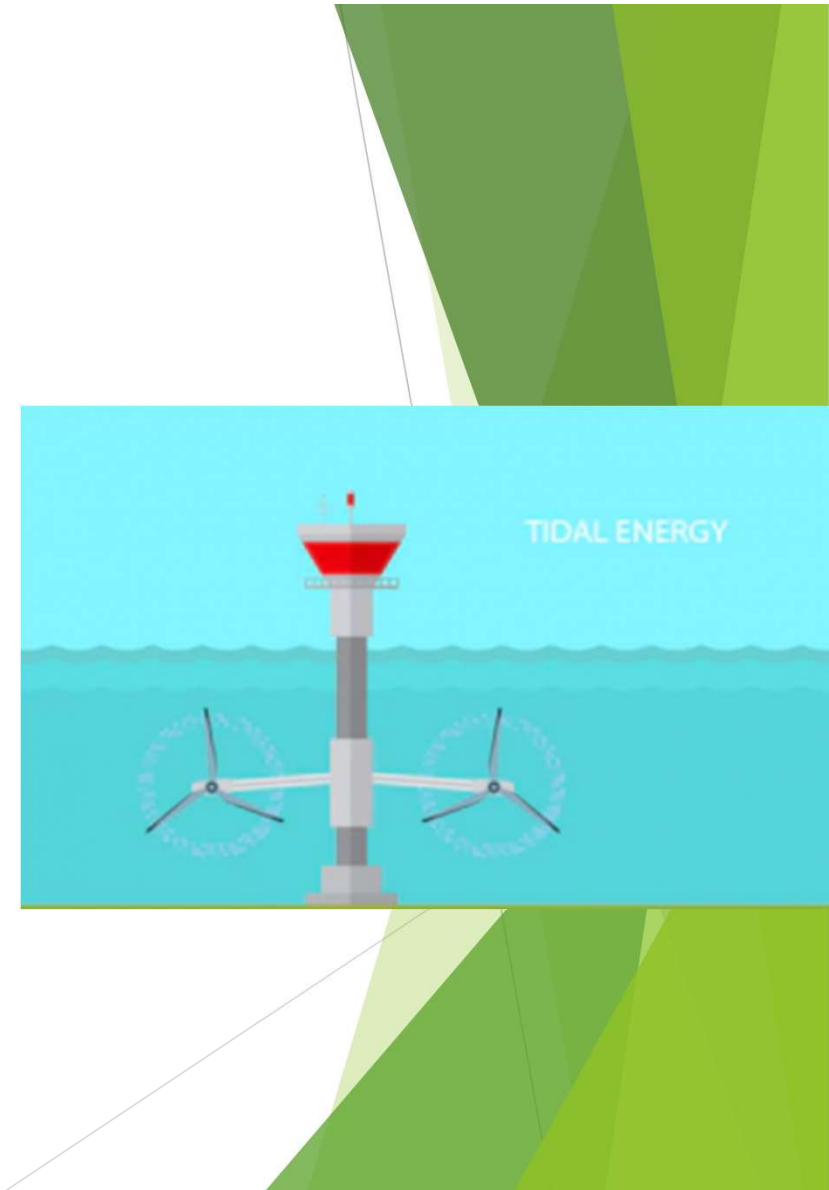
HYDROPOWER



- ▶ Hydropower or hydroelectricity refers to the conversion of energy from flowing water into electricity.
- ▶ Hydro turbines can convert as much as 90% of the available energy into electricity.
- ▶ The water is diverted with civil work to flow from high elevation to low. This falling water is used to drive the water turbine, which results in generating electricity in generator.
- ▶ Hydropower is fueled by water, so it's a clean fuel source, meaning it won't pollute the air like power plants that burn fossil fuels, such as coal or natural gas.

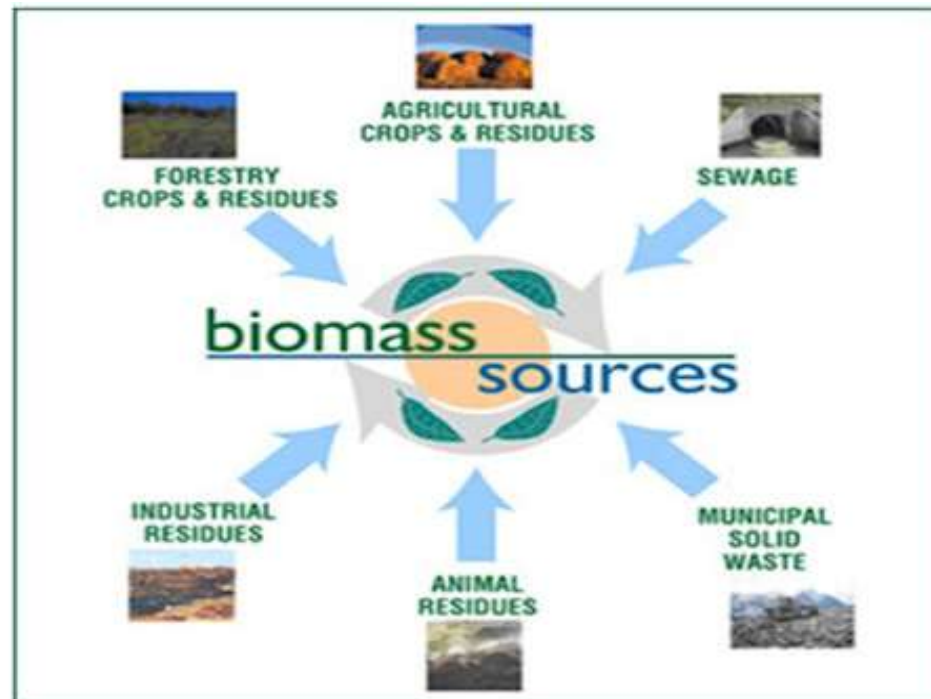
TIDAL ENERGY

- ▶ Harnessed from the tides produced in the ocean.
- ▶ The turbine and generator converts the movement of water coming from change in tide, the kinetic **energy**, into electricity.
- ▶ Tidal Energy has an expensive initial cost which is one of the reasons tidal energy is not a popular source of renewable energy.



BIOMASS ENERGY

- Biomass is organic matter produced by the green plants or animals.

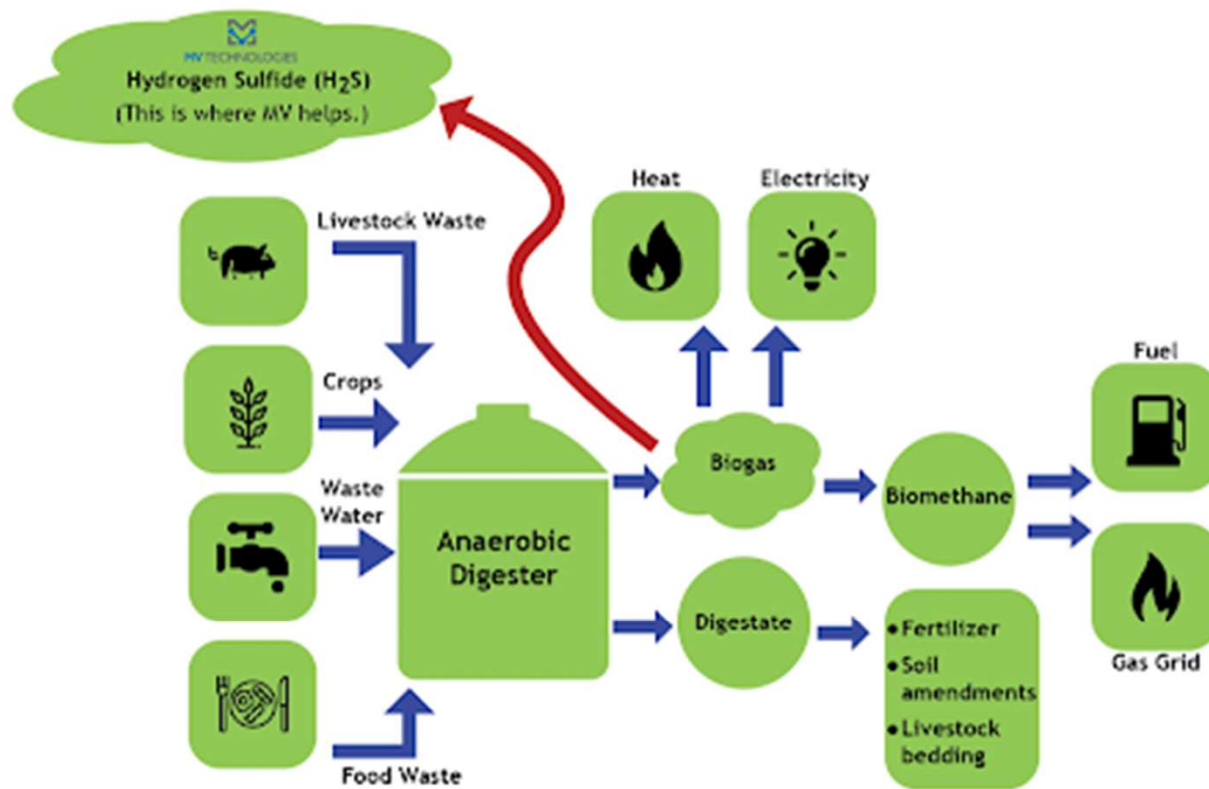


- ❑ Biomass can be directly burned to produce heat or it can be processed to produce charcoal, liquid fuel like methanol or ethanol.
- ❑ The dry biomass can be heated at high temperature and producer gas can be obtained.
- ❑ Animal dung or industrial, organic residues can be anaerobically digested to produce gaseous fuel as biogas.
- ❑ Biomass based cogeneration, biomass combustion based power generators, biomass gasifiers, biogas plants.

Biogas & anaerobic digestion

- ▶ Mixture of methane, carbon dioxide, hydrogen & hydrogen sulphide
- ▶ Non- polluting, clean & low cost fuel.
- ▶ Biogas contains roughly 50-70 percent methane, 30-40 percent carbon dioxide, and trace amounts of other gases

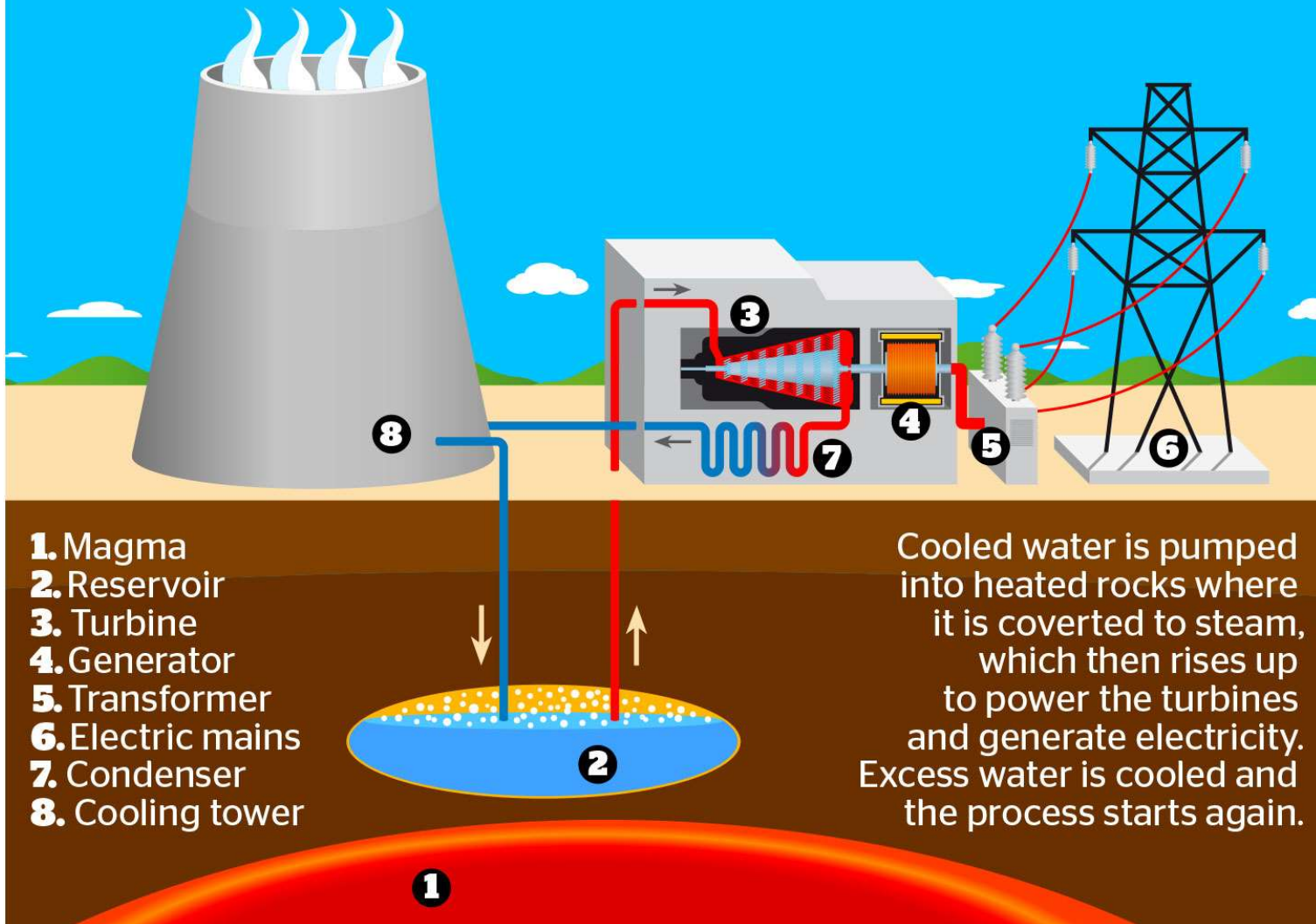




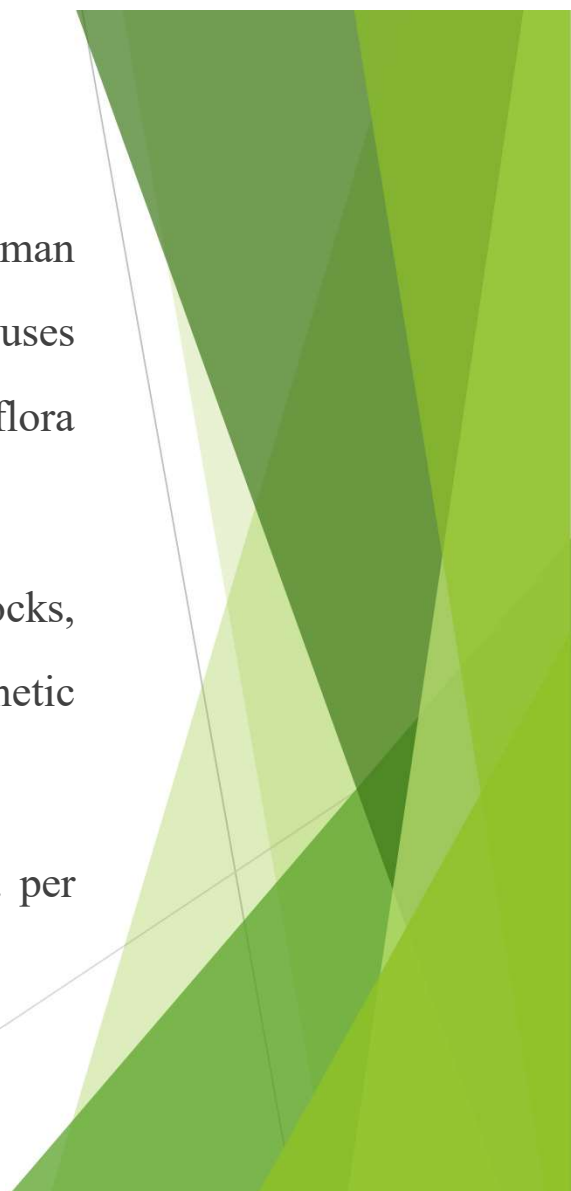
Geothermal Energy

- ▶ The energy extracted from earth's interior hot region is called geothermal energy. The interior of earth is hot.
- ▶ The temperature of earth goes on increasing from upper crust to solid inner core consisting of molten material called magma.
- ▶ Basically, the heat coming out from the molten material of earth's core is the source of this energy. The magma is pushed up through faults and cracks in rock near earth's surface, these regions are known as hot springs or thermal springs hot regions.
- ▶ Energy from such hot regions can be extracted by inducing to produce steam, using steam turbine and generators and uses the steam generated to produce electricity.

How geothermal energy works





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- ▶ **Land** is considered an important **resource** because it is being used by human beings for several purposes such as agriculture, forestry, mining, building houses and roads, and setting up industries. Also, it provides habitation to a variety of flora and fauna. Hence, it is among the most important natural **resources**.
 - ▶ Includes particular geographical locations, mineral deposits, forests, fish stocks, atmospheric quality, geostationary orbits, and portions of the electromagnetic spectrum.
 - ▶ India has 2.4% land of the world, supporting 16% of the total population i.e. per capita availability is 0.48 ha only.

Major land use

Categories of land

Cultivation

142

Forest

67

Non- agricultural

20

Barren & pasture

55

Fallow

25

Million hectare



Problems

- ▶ Land degradation
- ▶ Man induced landslides
- ▶ Soil erosion
- ▶ Desertification



Land degradation

- ▶ As the land resources becomes less productive, food security is compromised.
- ▶ Deforestation, inappropriate land management and overgrazing.
- ▶ Sustainable rather than exploitative land use practices



Man induced landslides

- ▶ Downward and outward movement of slopes composed of natural rock, soils, artificial fills or a combination of both.
- ▶ Landslides are primary natural processes of shaping the earth, but certain human activities cause significant increase in landslides such as :
 1. Excavation of steep slope at an existing landslide zone
 2. Addition of material to the top of a landslide prone area
 3. Addition of moisture to the landslide mass
 4. Human activities such as Excavation for highways and houses, watering of surface, drainage diversions, deforestation, blasting for mining, etc.

Soil erosion

- ▶ The removal of soil at greater rate than its formation or replacement by natural agencies such as water and wind is known as soil erosion.
- ▶ The rate of soil formation is very slow and the soil profile develops at a rate of about 1 cm every 100 to 400 years.



Soil Conservation

- ▶ Soil erosion can be controlled by adopting land management practices and also by changing the pattern of human activities.
- ▶ The soil erosion can be controlled by adopting few measures such as,
 1. practicing contour farming at across hills
 2. strip cropping and crop rotation for better soil fertility and soil enriching
 3. terrace farming and construction of embankment across the slope
 4. development of green belts
 5. controlled grazing in grasslands
 6. expansion of vegetation cover and protective afforestation
 7. maintenance of soil fertility
 8. proper land utilization
 9. flood control measure, etc.



Desertification

- ▶ Process of conversion of productive land to unproductive arid land.
- ▶ Remedies : efficiently use existing water resources and control of salination, Control over grazing, Large scale plantation, etc.



Role of an individual in conservation of natural resources ?

