

# IT,Environment and Human Rights

KUTTIKKANAM PO, PEERMADE, IDUKKI DISTRICT, KERALA, 685531



# Module 1

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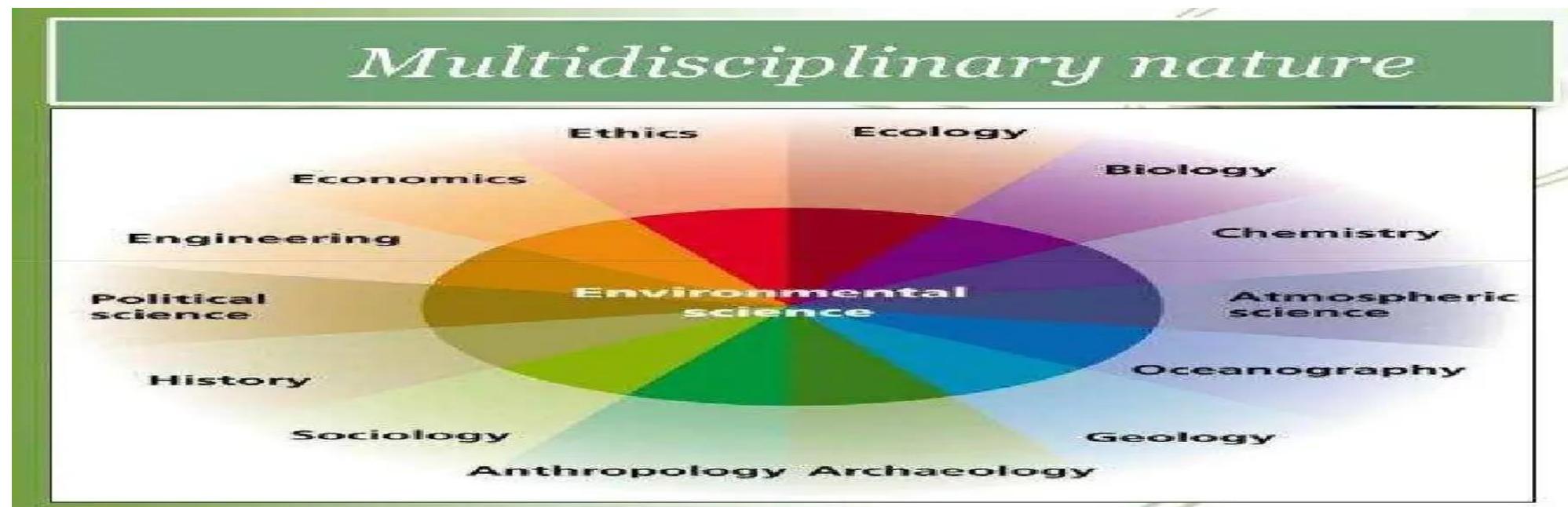


Module 1: Multidisciplinary Nature of Environmental Studies and Natural Resources : Definition, scope, importance and need. Forest resources. Water resources. Mineral resources. Food resources, Energy resources. Land resources.



# Environmental Science?

- It is an interdisciplinary field
- Environmental science is the study of how living things (like people, animals, and plants) interact with the Earth. It helps us understand how we affect the environment and how we can protect it.



# Definition

- Environmental studies is the systematic examination of the natural and human-made environment, the complex web of relationships that exist within it, and the consequences of human actions on the environment.
- It involves the study of various environmental components such as ecosystems, biodiversity, natural resources, pollution, climate change, and sustainability.



# Scope

The scope of environmental studies is as follows:

- Ecology: Study of the relationships between organisms and their environment.
- Conservation: Preservation and protection of natural resources and biodiversity.
- Environmental Science: Scientific investigation of environmental issues and processes.
- Environmental Policy: Development and implementation of policies to address environmental problems.
- Sustainability: The pursuit of practices that meet current needs without compromising the ability of future generations to meet their needs.
- Pollution Control: Strategies to minimize and mitigate pollution of air, water, and soil.
- Climate Change: Study of the causes, effects, and mitigation of climate change.



# Importance

- Environmental studies is crucial for several reasons:
- **Sustainability:** It provides the knowledge and tools needed to ensure that natural resources are used sustainably, allowing future generations to meet their needs.
- **Environmental Protection:** It helps identify and address environmental issues and threats, such as pollution, habitat destruction, and climate change.
- **Human Health:** Understanding environmental factors is essential for safeguarding human health, as many diseases and health problems are linked to environmental conditions.
- **Biodiversity:** It plays a crucial role in biodiversity conservation, which is essential for ecosystem stability.
- **Policy and Decision-Making:** It informs policymakers, businesses, and individuals about the consequences of their actions, facilitating better decision-making.



# Need

- Environmental studies is needed for several reasons:
- **Environmental Challenges:** The world faces numerous environmental challenges, including climate change, deforestation, pollution, and resource depletion. Understanding these challenges is essential for finding solutions.
- **Resource Management:** With growing human populations, effective management of natural resources like water, energy, and food is critical to avoid resource scarcity and conflicts.
- **Public Awareness:** Environmental education and studies raise public awareness about environmental issues and encourage responsible behavior.
- **Policy Development:** Policymakers need scientific data and insights to develop effective environmental policies and regulations.



# Importance of Environment Protection

- If we degrade our environment, we are harming ourselves.

## 1. Climate Change and Global Warming:

Climate change, driven by human activities, is leading to severe consequences such as extreme weather events and rising sea levels. We must reduce greenhouse gas emissions and adopt sustainable practices to mitigate these impacts.

## 2. Biodiversity Conservation:

Biodiversity is the web of life that sustains us. Its loss affects ecosystems and threatens our food security. We must protect habitats and endangered species to maintain ecological balance.

## 3. Air and Water Quality:

Clean air and water are fundamental to our health. Air pollution and water contamination have severe health consequences. We must reduce emissions and improve waste management.



## 4. Plastic Pollution:

Plastic pollution is choking our oceans and harming marine life. We need to reduce single-use plastics and promote recycling and responsible disposal.

## 5. Sustainable Living:

Each of us can make a difference through sustainable living practices. From energy conservation to reducing waste, our daily choices matter.

## 6. Environmental Education:

Environmental education is key to raising awareness and fostering informed citizens who can advocate for positive change. It should be integrated into our education system.



## 7. Economic and Social Benefits:

A healthy environment underpins economic prosperity and human well-being. Sustainable practices can create jobs and improve public health.

## 8. Collective Action:

Environmental protection is a collective responsibility. We need community engagement, green movements, and active participation in environmental initiatives.

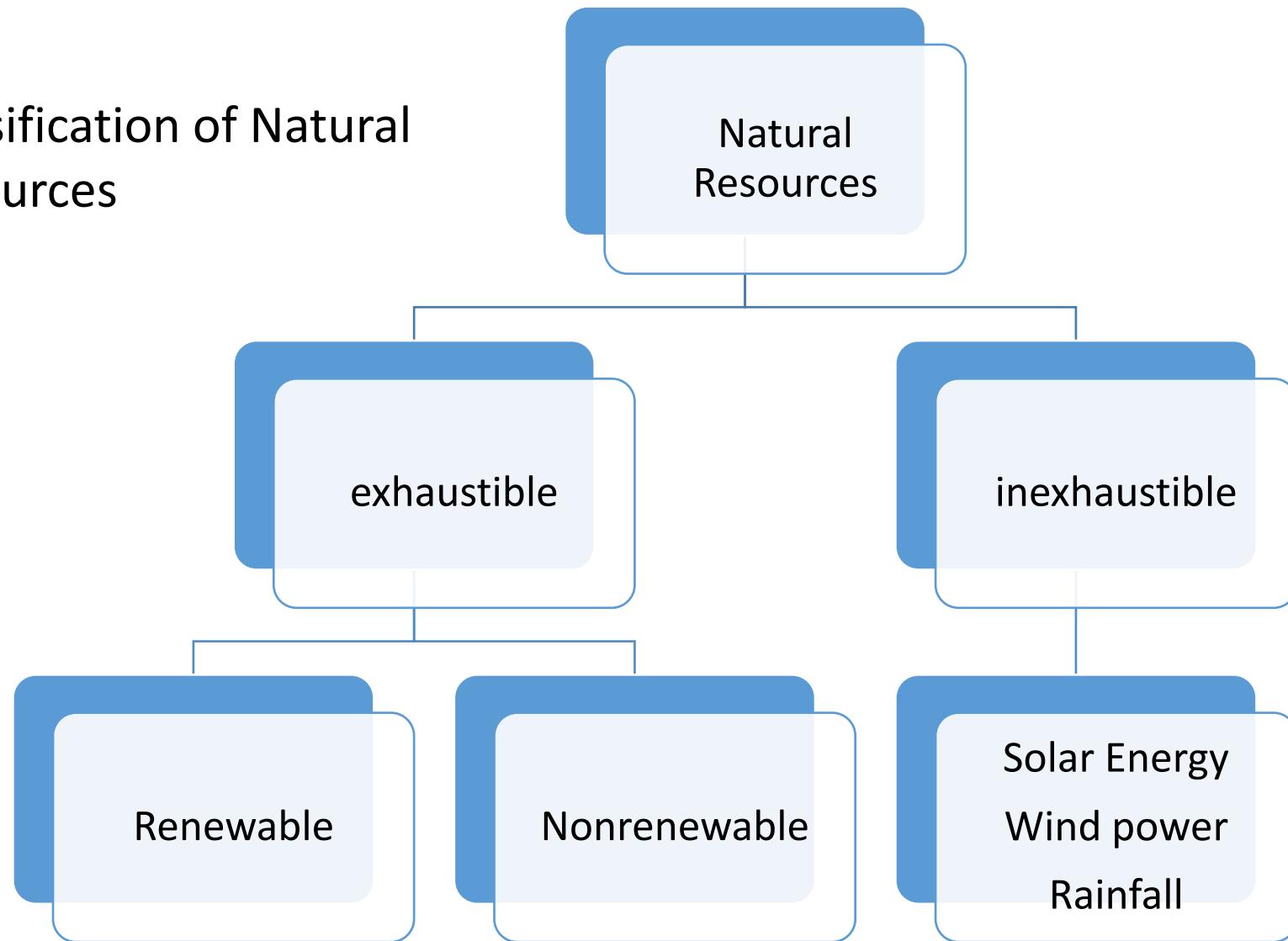


# Natural Resources

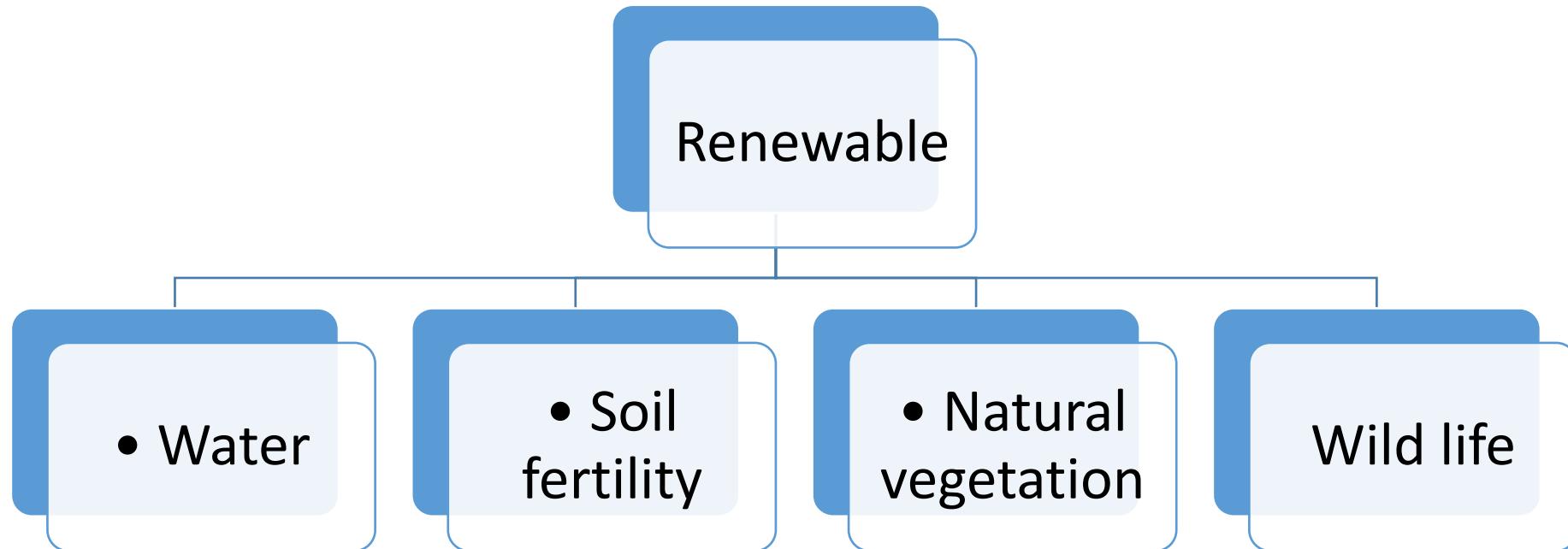
- Resources that are inherent on earth
- Utilized to create products and services useful to mankind
- Eg: Air, Water, Forest, soil...



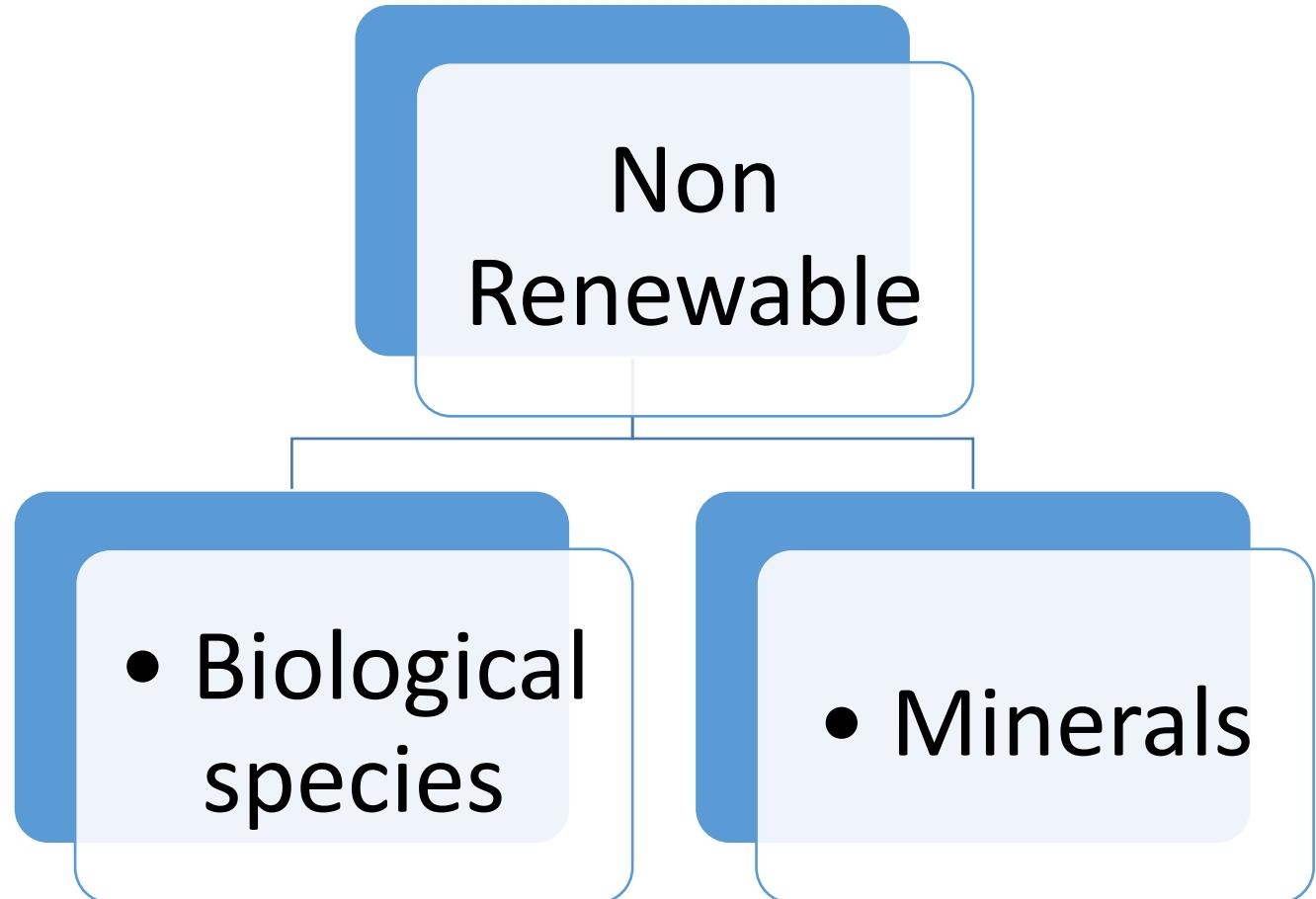
# Classification of Natural Resources



**Renewable resources:** Resources that can be harvested continuously with proper planning and management



- Resources that are limited in supply and can not be replenished by natural means



# Inexhaustible resources

- Inexhaustible resources are available in unlimited quantities on the earth.
- Resources like solar energy, wind power, tide power, rainfall, and even atomic energy.
- Such resources may sometimes be locally affected by human activities; for example, pollution may change the quality of air.



## Exhaustible resources

- A large number of natural resources are exhaustible,
- i.e. they have a finite supply on the earth and can be exhausted if used indiscriminately.



# PRINCIPAL NATURAL RESOURCES

Amongst the earth's resources, the following contribute significantly to human welfare:

- (i) Forests (ii) Water (iii) Minerals (iv) Food (v) Energy and (vi) Land.

## 1. FOREST

- Approximately **one-third of the earth's total land area** is forest.
- The forests are **storehouses of biodiversity** and provide important environmental services to mankind.



# Deforestation

- Means the permanent destruction of indigenous forests and woodlands.
- Deforestation causes the extinction of plant, animal and microbial species.
- World's forest cover has been shrinking rapidly
- The main causes of deforestation are the **expansion of agriculture, urbanization, industrialization, cattle grazing, and excessive commercial use of timber, fuel, wood and other forest products.**



# The Individual's Role in Forest Conservation

- **Habitat Encroachment:** Human settlements, agriculture, and infrastructure development have encroached upon traditional animal habitats, pushing wildlife to venture into human territories in search of food and shelter.
- **Crop Raiding:** Elephants, in particular, are known for raiding crops, leading to significant economic losses for farmers and escalating tensions.



- **Individuals' Role in Forest Conservation:**
- **Awareness and Education:** Individuals can educate themselves and their communities about the importance of coexisting with wildlife and respecting their natural habitats.
- **Support Conservation Initiatives:** Support and actively participate in local and national conservation initiatives, NGOs, and government programs aimed at protecting forests and wildlife.
- **Responsible Land Use:** Promote responsible land use practices, such as sustainable agriculture and minimizing encroachments into wildlife habitats.



- **Community Vigilance:** Encourage and participate in community-based efforts to monitor and report animal movements and potential conflicts, helping authorities take timely action.
- **Implement Safety Measures:** Implement safety measures on personal property, such as constructing secure fences and trenches, to deter wildlife from entering human settlements.
- **Crop Protection Methods:** Employ non-lethal methods like electric fencing, guarding, and using chilli smoke to protect crops without harming wildlife.
- **Advocacy and Policy Engagement:** Engage with policymakers and advocate for the development of effective policies and strategies to address man-animal conflicts.



# Reasons for Reduction of Forest Cover/ Deforestation

- **Deforestation:**

- **Agriculture:** The expansion of agriculture often leads to the clearing of forests for crop cultivation.
- **Logging:** Commercial logging for timber and wood products can result in extensive deforestation.
- **Infrastructure Development:** Roads, highways, and urban expansion necessitate the clearing of forests.
- **Mining:** The extraction of minerals and resources often requires the removal of forested areas.

- **Illegal Logging and Land Encroachment:**

- Unauthorized and illegal logging operations, as well as land encroachments, contribute to forest loss.



- **Natural Factors:**

- **Wildfires:** Uncontrolled wildfires, often exacerbated by climate change, can destroy large forested areas.
- **Disease and Pests:** Outbreaks of pests and diseases can lead to the death of trees and forest degradation.

- **Infrastructure Development:**

- Large infrastructure projects like dams, reservoirs, and highways can result in the flooding or fragmentation of forests.

- **Climate Change:**

- Altered weather patterns, increased temperatures, and changing precipitation patterns associated with climate change can stress forests and make them more susceptible to pests, diseases, and wildfires.



# WATER RESOURCES

- About three-fourths of the earth's surface is occupied by oceans, which contain about 97.5 % of the earth's water is strongly saline conditions.
- The rest 2.5% is fresh water, and all of this is not available for direct human use.



Main approaches for conservation of water are:

- (1) Reducing agricultural water wastage by increasing the efficiency of irrigation. By the traditional method of irrigation, plants absorb less than 50% of the water applied to the soil, the rest is lost.
- (2) Reducing water wastage in the industry by recycling the used water.
- (3) Reducing domestic water wastage by constructing wastewater treatment plants and recycling the treated water.
- (4) Rainwater harvesting by employing practices to store rainwater and recharge groundwater.
- (5) Afforestation and protection of watersheds to improve water economy.



- Some important water management approaches to provide a sustainable supply of high-quality water are:
  - (1) Construction of dams and reservoirs to ensure a year-round supply of water and, in addition, controlling floods and generating electricity.
  - (2) Desalination of seawater and saline groundwater, making it fit for drinking and other purposes. Diversion of water bodies (e.g. through the canal) to increase the natural supply of water to a particular area.



# Waterlogging

- **Waterlogging** refers to the saturation of soil with excess water, to the extent that it restricts the movement of air and creates unfavorable conditions for plant growth. It occurs when water accumulates in the root zone of plants, typically because the soil cannot drain water effectively. Waterlogged soil can lead to oxygen deprivation, root rot, and other problems that can harm plant health. When growing interior plants, particularly in containers or indoor gardens, it's important to prevent waterlogging to ensure the well-being of your plants.
- Here are measures to overcome and prevent waterlogging issues:
- **Use Well-Draining Soil:** Choose a high-quality potting mix specifically designed for the type of plants you're growing. Well-draining mixes usually contain ingredients to facilitate water drainage.
- **Select Appropriate Containers:** Use containers with drainage holes at the bottom to allow excess water to escape. Avoid using containers without drainage holes or consider adding drainage holes if possible.



- **Monitor Watering Practices:** Water your plants thoroughly but allow the top inch or two of the soil to dry out before watering again. Stick your finger into the soil to check for moisture. Overwatering is a common cause of waterlogging.
- **Proper Watering Technique:** Water the soil directly and avoid splashing water on the leaves. Water at the base of the plant to prevent excess moisture from accumulating on the soil surface.
- **Use Saucers and Elevate Pots:** Place a saucer under the plant pot to catch excess water. Elevate the pot slightly by placing it on pot feet or small wooden blocks to ensure that the pot doesn't sit directly in any collected water.
- **Improve Drainage Layers:** Place a layer of small stones or broken pottery pieces at the bottom of the pot before adding soil. This can enhance drainage by creating a space for excess water to collect without saturating the roots.



- **Avoid Overcrowding:** Don't overcrowd plants in a single container, as this can lead to poor air circulation and waterlogging. Ensure each plant has adequate space to grow and breathe.
- **Prune and Maintain:** Regularly prune your plants to remove dead or overgrown foliage. Proper maintenance can help prevent overcrowding and improve air circulation.
- **Use Adequate Light:** Ensure your indoor plants receive the appropriate amount of light for their species. Plants in low-light conditions may take longer to use up water, increasing the risk of waterlogging.
- **Repot When Necessary:** As plants grow, they may outgrow their containers. When this happens, consider repotting them into larger containers with fresh, well-draining soil.
- **Monitor for Signs of Waterlogging:** Keep an eye out for signs of waterlogging, such as yellowing leaves, wilting, or the presence of mold or mildew. If you suspect waterlogging, adjust your watering practices accordingly.



## Reasons for Issues Over Water Resources: Reasons and Explanation

- **Displacement and Resettlement:** Dams require moving communities, causing upheaval and resistance due to loss of homes and livelihoods.
- **Environmental Concerns:** Dams harm ecosystems, disrupt fish migration, and destroy habitats, sparking opposition from conservationists.
- **Water Scarcity and Allocation:** Downstream users may dispute their share of water resources, particularly in times of drought.
- **Economic vs. Environmental:** Dams offer economic benefits but conflict arises when balancing development with environmental conservation.
- **Socioeconomic Inequities:** Dams often benefit urban areas while rural communities suffer negative impacts, leading to social tension.



- **Transboundary Conflicts:** International river dams can strain relations between countries due to disputes over water-sharing and operation.
- **Lack of Consultation:** Mistrust occurs when communities aren't consulted or informed about dam projects, and decision-making lacks transparency.
- **Safety Concerns:** Dam safety issues, especially downstream risks, can trigger conflicts, particularly when maintenance is inadequate.
- **Cultural and Heritage Impact:** Submerging cultural sites and heritage can lead to protests, especially among indigenous communities.
- **Climate Change Uncertainty:** Altered climate patterns increase uncertainty in dam operations, potentially worsening water disputes.
- **Political Factors:** Political motivations may prioritize dam construction over social and environmental concerns, leading to conflicts.



# Mineral Resources

- Minerals are materials that meet five requirements.
  1. Naturally occurring
  2. Inorganic
  3. Solids
  4. Having a definite chemical composition
  5. An ordered internal structure.



# Types of minerals

There are three type of mineral resources

- **Fuel Minerals** : Coal, oil and natural gas are the basic fossil fuel.
- **Metallic** : Metallic resources are things like Gold, Silver, Tin, Copper, Lead, Zinc, Iron, Nickel, Chromium, and Aluminum.
- **Non-Metallic** : Nonmetallic resources are things like sand, gravel, gypsum, halite, Uranium etc.



# Use and Exploitation

- Development of Industrial plants and machinery
- Generation of energy sources like coal, ignite , uranium etc.
- Construction, housing, settlements.
- Defense equipment and weapons.
- Transportation means.
- Communication means like wires, cables and electronic devices.
- Medicines, particularly in Ayurvedic systems.
- In agriculture as fertilizers.
- Jewelry and ornamentations.



# Environmental Effects of Extracting and Using Mineral Resources

Minerals and their ores need to be extracted from the earth's interior so that they can be used. This process is known as **mining**.

Four general stages of Mining Operations:

1. **Prospecting** : Searching for minerals.
2. **Exploration** : Assessing the size, shape, location, and economic value of the deposit.
3. **Development** : Work of preparing access to the deposit so that the minerals can be extracted from it.
4. **Exploitation**: Extracting the minerals from the mines.



# Impact of Mining

- ❖ Mining poses several long-term occupational hazards to the miners.
- ❖ Dust produced during mining operations is injurious to health and causes a lung disease known as black lung.
- ❖ Fumes generated by incomplete dynamite explosions are extremely poisonous.
- ❖ Radiation is a hazard in uranium mines.



- **Environmental issues**

- ❖ Depletion of available land due to mining
- ❖ Waste from mining industries
- ❖ Conversion of land to industry
- ❖ Pollution of land, ground water and surface water, and air by industrial wastes
- ❖ Blasting and transport cause noise disturbance to residents and to wildlife.
- ❖ Extraction and transportation requires huge amounts of energy which adds to impacts such as acid rain and global warming.



# The Individual's Role in Mineral Conservation

- **Understanding the Problem:** Sand mining, often undertaken for construction and industrial purposes, has significant environmental and social impacts:
- **Habitat Destruction:** Mining disrupts aquatic ecosystems, affecting fish and other aquatic life.
- **Erosion and Flooding:** Excessive mining can lead to increased riverbank erosion and contribute to flooding.
- **Groundwater Depletion:** Mining can lower the water table, impacting local wells and springs.
- **Illegal Mining:** Illicit and unregulated sand mining exacerbates these issues and generates revenue for criminal organizations.



- **The Individual's Role in Mineral Conservation:**
- **Raise Awareness:**
  - Educate yourself and your community about the environmental and social consequences of unsustainable sand mining.
  - Share information through social media, community meetings, and awareness campaigns to mobilize support.
- **Support Responsible Mining Practices:**
  - Advocate for and support sand mining operations that adhere to environmental regulations and sustainable practices.
  - Encourage businesses and builders to source sand responsibly.
- **Report Illegal Mining:**
  - Be vigilant and report any illegal sand mining activities to local authorities. Document evidence responsibly and safely.
- **Participate in Clean-Up Initiatives:**
  - Organize or participate in river and shoreline clean-up events to help mitigate the effects of sand mining on the environment.



- **Promote Alternatives:**

- Encourage the use of alternative materials in construction where possible, reducing the demand for sand.
- Support research into sustainable alternatives to sand in construction.

- **Advocate for Stronger Regulations:**

- Engage with local and national policymakers to advocate for stricter regulations and enforcement in the sand mining industry.
- Support efforts to establish and maintain protected areas along water bodies.

- **Reduce Consumption:**

- Contribute to mineral conservation by reducing your own consumption of sand-based products and construction materials when possible.



# FOOD RESOURCES

- Food is essential for growth and development of living organisms.
- These essential materials are called nutrients and these nutrients are available from variety of animals and plants.
- The majority of people obtain food from cultivated plants and domesticated animals.
- Although some food is obtained from oceans and fresh waters, but the great majority of food for human population is obtained from traditional land-based agriculture of crops and livestock.



# World Food Problems

- Large number of people in India are poor which can be attribute to equitable distribution of income.
- Food insufficiency can be divided into two categories into under-nourishment and malnourishment. Both of these insufficiencies are global problems.
- Some of the major problems are:
  - a) Under nourishment
  - b) Malnourishment
  - c) Balanced diet



# Under-Nourishment

The average minimum daily caloric intake over the whole world is about 2,500 calories per day.

- People who receive less than 90% of their minimum dietary intake on a long-term basis are considered undernourished.
- Those who receive less than 80% of their minimum daily caloric intake requirements are considered ‘seriously’ undernourished.
- Children in this category are likely to suffer from stunted growth, mental retardation, and other social and developmental disorders.
- Therefore, under-nourishment means lack of sufficient calories in available food, resulting in little or no ability to move or work.



# Malnourishment

- Person may have excess food but still diet suffers from due to nutritional imbalance or inability to absorb or may have problem to utilize essential nutrients.
- Malnourishment can be defined as lack of specific components of food such as proteins, vitamins, or essential chemical elements.



# Major problems of malnutrition

- **Marasmus:** a problem caused by lack of protein and calories.
- **Kwashiarkor:** a lack of sufficient protein in the diet which leads to a failure of neural development and therefore learning disabilities.
- **Anemia:** it is caused by lack of iron in the diet or due to an inability to absorb iron from food.
- **Pellagra:** it occurs due to the deficiency of vitamins in the diet.



# Balanced Diet

- Supply of adequate amount of different nutrient can help to improve malnutrition and its ill effects.
- A balanced diet is one that provides the body with all the essential nutrients, vitamins, and minerals it needs to function optimally. It includes a variety of foods in the right proportions to maintain overall health and well-being.



- A balanced diet typically consists of the following components:
- **Proteins:** Proteins are essential for the growth, repair, and maintenance of tissues in the body. Good sources include lean meats, poultry, fish, eggs, dairy products, legumes (beans and lentils), and nuts.
- **Carbohydrates:** Carbohydrates are the body's primary source of energy. They should come from complex carbohydrates like whole grains (rice, wheat, oats), fruits, vegetables, and legumes, rather than simple sugars.
- **Fats:** Healthy fats are essential for energy storage, absorption of fat-soluble vitamins (A, D, E, and K), and overall health. Include sources like avocados, nuts, seeds, and olive oil while limiting saturated and trans fats.



- **Fiber:** Dietary fiber aids digestion, helps maintain healthy cholesterol levels, and regulates blood sugar. It is found in whole grains, fruits, vegetables, legumes, and nuts.
- **Vitamins:** Include a variety of fruits and vegetables to ensure an adequate intake of vitamins, such as vitamin C, vitamin A, vitamin K, and the B-complex vitamins.
- **Minerals:** Consume foods rich in essential minerals like calcium (dairy products, leafy greens), iron (lean meats, beans, fortified cereals), potassium (bananas, potatoes), and magnesium (nuts, seeds, leafy greens).
- **Water:** Stay well-hydrated by drinking plenty of water throughout the day. Water is essential for digestion, temperature regulation, and overall health.
- **Dairy or Dairy Alternatives:** Include milk, yogurt, or dairy alternatives fortified with calcium and vitamin D for strong bones and teeth.



- **Suggested Items for a Balanced Diet in Kerala:**
- The traditional diet in Kerala, known for its rich flavors and diverse cuisine, can be adapted to create a balanced diet. Here are some suggested items:
- **Rice:** Kerala is known for its rice-based dishes. Choose brown or parboiled rice for added fiber.
- **Fish:** Kerala's coastal region offers a variety of fresh fish. Include fish in your diet for lean protein and omega-3 fatty acids.
- **Coconut:** Coconut is a staple in Kerala cuisine. Use it in moderation for flavor, but be mindful of its high saturated fat content.
- **Fruits and Vegetables:** Kerala offers a wide variety of tropical fruits and vegetables like jackfruit, plantains, mangoes, and spinach. Incorporate them into your diet for vitamins, minerals, and fiber.



- **Legumes:** Lentils and beans are commonly used in Kerala cuisine. They provide protein and fiber.
- **Spices:** Kerala is famous for its spices like turmeric, black pepper, and cardamom, which have potential health benefits.
- **Yogurt:** Include yogurt, particularly traditional Kerala yogurt-based dishes like "moru curry" (buttermilk curry), for probiotics and calcium.
- **Nuts and Seeds:** Snack on nuts like cashews and almonds for healthy fats and protein.
- **Whole Grains:** Choose whole grain options like whole wheat bread, brown rice, and oats for added fiber.
- **Green Tea:** Consider drinking green tea, which is rich in antioxidants and can have potential health benefits.



# Energy Resources?

- Energy is the capacity to do work and is required for life processes. An energy resource is something that can produce heat, power life, move objects, or produce electricity.
- Matter that stores energy is called a fuel.
- Sources:
  - Solar energy.
  - Gravity generated by earth and moon.
  - Nuclear fission reactions.
  - Energy in the interiors of the earth.
  - Energy stored in chemical bonds.



# Renewable Energy Resources

- Renewable energy resources are sources of power that are naturally replenished and can be utilized without depleting them. They help mitigate environmental impacts, reduce greenhouse gas emissions, and promote energy security.
- Some common forms of renewable energy include solar, wind, hydroelectric, geothermal, and biomass energy.
- The availability of renewable energy resources can vary depending on the geographical location.



- 1. Solar Energy: Solar energy is a viable option in many regions, including our locality. Solar panels can be installed on rooftops or in open areas to capture sunlight and convert it into electricity.
- 2. Wind Energy: Coastal areas and elevated regions in our locality have the potential for harnessing wind energy. Wind turbines can convert wind energy into electricity, providing a source of clean and renewable power.
- 3. Hydropower: Our locality has several rivers and water bodies. Small-scale hydropower projects can tap into this resource, using flowing water to generate electricity.



- 4. Geothermal Energy: geothermal energy can be harnessed in areas with underground heat sources. Our locality may have some geothermal potential for heating or electricity generation.
- 5. Biomass Energy: Agricultural and organic waste can be converted into biomass energy through processes like biogas production and biomass power plants.
- 6. Tidal and Ocean Energy: If situated near the coast, a locality could explore the potential of tidal and ocean energy.
- 7. Waste-to-Energy: Waste-to-energy facilities can be established to convert municipal solid waste into electricity, helping manage waste while generating clean energy.



# Non-renewable energy resources

- Non-renewable energy resources are sources of energy that cannot be easily replaced or regenerated within a short period of time. These energy sources are finite and will eventually be depleted as they are extracted and used.
- **1. Nuclear Energy:** Nuclear energy is generated through nuclear fission, where the nucleus of an atom is split to release a large amount of energy. It is a non-renewable resource because the fuel used in nuclear reactors, such as uranium-235, is finite. It poses challenges related to nuclear waste disposal and the risk of accidents.



- 2. Fossil Fuels:
  - a. Coal: Coal is a carbon-rich sedimentary rock that is burned for electricity generation and industrial processes. It is one of the most abundant non-renewable energy sources but is a major contributor to air pollution and greenhouse gas emissions.
  - b. Oil: Also known as petroleum, oil is primarily used for transportation fuels, such as gasoline and diesel, as well as for heating and industrial processes. The extraction and combustion of oil contribute to air and water pollution and are associated with environmental disasters.
  - c. Natural Gas: Natural gas is used for electricity generation, heating, and as a fuel for vehicles. It is the cleanest-burning fossil fuel but still releases carbon dioxide and other pollutants when burned.



## Categorizing Energy Resources

### Renewable Energy Resources:

- 1. Solar Energy: Generated from sunlight through solar panels.
- 2. Wind Energy: Generated by wind turbines harnessing wind power.
- 3. Hydropower: Generated from flowing water in rivers and dams.
- 4. Geothermal Energy: Extracted from the Earth's heat from geothermal wells.
- 5. Biomass Energy: Produced from organic materials like wood, crop residues, and biogas.

### Non-Renewable Energy Resources:

- 1. Fossil Fuels: Includes coal, oil/petroleum, and natural gas, which are finite and release greenhouse gases when burned.
- 2. Nuclear Energy: Generated through nuclear fission of uranium, also finite and produces radioactive waste.



# Reducing the Use of Non Renewable Energy Resources

1. Energy Efficiency: Upgrade appliances, insulate homes, and use LED lighting to reduce energy consumption.
2. Public Transport: Opt for public transport, carpooling, or cycling to reduce the use of fossil fuels for personal transportation.
3. Renewable Energy Adoption: Invest in solar panels or wind turbines for home energy generation to reduce reliance on non-renewable sources.
4. Nuclear Energy Alternatives: Promote research into and adoption of safer and more sustainable nuclear energy alternatives.



5. Energy Storage: Invest in energy storage solutions like batteries to store excess renewable energy for use during non-generation periods.
6. Energy Conservation: Practice energy conservation by turning off lights and appliances when not in use.
7. Efficient Transportation: Choose electric vehicles (EVs) or hybrids, which rely on electricity and reduce the use of fossil fuels.



# Nuclear Energy As an Alternate energy source

- The need of development of nuclear energy as an alternative to fossil fuels :
- **Energy Demand:** Fossil fuels, such as coal, oil, and natural gas, have historically been the dominant sources of energy, but their extraction and combustion have led to environmental problems like air pollution, greenhouse gas emissions, and climate change. As energy demand continues to grow, finding cleaner and more sustainable sources of energy becomes imperative.
- **Environmental Concerns:** The burning of fossil fuels releases carbon dioxide (CO<sub>2</sub>) and other pollutants into the atmosphere, contributing significantly to global warming and air pollution. This has serious implications for the environment and human health. Nuclear energy, in contrast, does not produce CO<sub>2</sub> during electricity generation, making it an attractive option for reducing greenhouse gas emissions.



- **Resource Depletion:** Fossil fuels are finite resources, and their extraction can have detrimental effects on ecosystems, including habitat destruction and water pollution. Nuclear energy, while also finite in terms of uranium fuel, can provide a more extended and stable energy supply.
- **Energy Security:** Developing alternative energy sources like nuclear power can enhance energy security by reducing dependence on foreign oil and gas.



## Use of alternate sources of energy, including nuclear energy: Threats

- **Safety Concerns:** Nuclear energy has inherent safety risks. Ensuring the safe operation and disposal of nuclear waste is a significant challenge.
- **Nuclear Waste Management:** Nuclear power generates radioactive waste that remains hazardous for thousands of years. Developing long-term storage solutions and addressing public concerns about nuclear waste disposal are critical challenges.
- **Cost and Economics:** While nuclear energy is relatively clean, it is not always cheap to build and maintain nuclear power plants. The construction and decommissioning costs, as well as the expense of handling nuclear waste, can be significant.
- **Geopolitical Considerations:** Nuclear energy can lead to the proliferation of nuclear weapons, which poses significant global security risks. Managing nuclear technology to prevent its misuse is crucial.



# Land Resources

- Hills, valleys, plains, river basins and wetlands
- If land is utilized carefully it can be considered a renewable resource.
- But Land is also converted into a non-renewable resource
- Man needs land for building homes, cultivating food, maintaining pastures for domestic animals, developing industries to provide goods, and supporting the industry by creating towns and cities



# Land Degradation

- Every year, between 5 to 7 million hectares of land worldwide is added to the existing degraded farmland.
- **Land degradation is the result of human-induced actions which exploit land, causing its utility, biodiversity, soil fertility, and overall health to decline.**
- Over irrigating farmland leads to salinization. Salinisation refers to **the increase in salt concentration in an environmental medium, notably soil**.
- Over irrigation also creates water logging of the topsoil. **Waterlogging** occurs when there is too much water in a plant's root zone, which decreases the oxygen available to roots.
- Use of chemical fertilizers poisons the soil



# Soil erosion

- Loss of valuable soil through erosion by the monsoon rains and, to a smaller extent, by wind.
- Deforestation thus leads to soil erosion.
- In this process, the soil particles are loosened or washed away in the valleys, oceans, rivers, streams or far away lands. This has been worsening due to human activities such as agriculture and deforestation.
- Soil erosion is a continuous process that occurs either slowly or at an alarming rate. It results in a continuous loss of topsoil, ecological degradation, soil collapse, etc.



# Desertification



- **Desertification** is a type of land degradation in drylands in which biological productivity is lost due to natural processes or induced by human activities whereby fertile areas become increasingly arid.
- It is the spread of arid areas caused by a variety of factors, such as climate change (particularly the current global warming) and overexploitation of soil as a result of human activity.



# Soil Erosion

- Soil erosion is the process by which the top layer of soil, known as the topsoil, is removed or displaced from its original location. It occurs due to natural forces like wind, water, or human activities such as deforestation and improper land use.
- Soil Erosion Problem During Floods:
  - 1. Intense Rainfall:** The last flood in Kerala was characterized by exceptionally heavy rainfall over a short period. This intense rain can lead to accelerated soil erosion as raindrops dislodge soil particles and transport them downhill.
  - 2. Landslides:** Kerala's hilly terrain makes it susceptible to landslides during heavy rainfall. Landslides involve the rapid movement of soil and rocks downhill, causing severe erosion and endangering communities downstream.
  - 3. Loss of Topsoil:** Soil erosion during floods leads to the loss of fertile topsoil. This topsoil is essential for agriculture, and its removal can degrade land quality and reduce crop productivity.



**4. Sedimentation:** Eroded soil particles are carried away by floodwaters and deposited in rivers and water bodies. This sedimentation can disrupt aquatic ecosystems, reduce water quality, and increase the risk of flooding in downstream areas.

**5. Infrastructure Damage:** Soil erosion during floods can damage infrastructure like roads, bridges, and buildings, leading to costly repairs and disruptions to transportation and communication networks.

**6. Erosion Control Measures:** The Kerala government has been taking measures to combat soil erosion, such as afforestation, terracing, and contour farming.

**7. Climate Change Impact:** Climate change is expected to bring more intense rainfall events and extreme weather to the region, potentially exacerbating soil erosion problems in the future.

**8. Community Resilience:** Building community resilience through early warning systems, disaster preparedness, and sustainable land use practices is crucial to mitigating the impacts of soil erosion during floods.



# Salinity

- Salinity refers to the concentration of salt or dissolved salts, primarily sodium chloride (table salt), in a substance, typically in water or soil. Salinity can have significant impacts on ecosystems, agriculture, and freshwater resources. After the tsunami, salinity issues often arise due to the interaction between the saltwater from the sea and freshwater from rivers, groundwater, or rainfall.
  1. **Saltwater overflow:** Tsunamis can cause the sudden overflow of coastal areas with seawater. When this saltwater infiltrates agricultural lands, freshwater sources, and ecosystems, it raises salinity levels.
  2. **Soil Salinization:** Saltwater intrusion into soil can lead to soil salinization, making it unsuitable for agriculture. High salinity levels can harm crops.
  3. **Contaminated Freshwater:** The intrusion of saltwater into freshwater sources, such as rivers and groundwater aquifers, contaminates drinking water supplies. This can pose health risks and increase the cost of providing safe drinking water.



- 4. Ecosystem Impact:** Elevated salinity levels in coastal ecosystems can harm aquatic life, particularly freshwater species that are not adapted to high salinity.
- 5. Agricultural Losses:** Salinity issues can lead to crop failures and reduced agricultural productivity.
- 6. Infrastructure Damage:** Salinity can corrode infrastructure, including roads, bridges, and buildings, leading to costly repairs and maintenance.
- 7. Saltwater Farming:** Some communities near affected areas may adapt to increased salinity by turning to saltwater farming, cultivating salt-loving plants such as mangroves and salt-tolerant crops like rice varieties developed for such conditions.
- 8. Mitigation Measures:** Post-tsunami, governments and organizations often implement measures to mitigate salinity issues, such as restoring freshwater aquifers, desalinating water for agriculture, and introducing salt-tolerant agricultural practices.
- 9. Long-Term Monitoring:** Continuous monitoring of salinity levels in affected areas is essential to assess the effectiveness of mitigation efforts and understand the long-term impact on ecosystems and communities.



# Organic Farming

- Organic farming in Kerala, a state in India known for its lush green landscapes and agricultural diversity, can be practiced effectively by adopting sustainable and eco-friendly methods. Here's a guide on how organic farming can be done in Kerala:

## 1. Soil Management:

- Soil Testing: Start by conducting soil tests to understand nutrient levels and pH.
- Compost: Prepare compost from kitchen waste, crop residues, and farmyard manure. Apply it to improve soil structure and fertility.

## 2. Crop Selection:

- Choose crop varieties that are well-suited to Kerala's climate and soil conditions. Indigenous and traditional varieties often work best.



### 3. Crop Rotation and Diversity :

- Implement crop rotation to break pest and disease cycles.
- Practice intercropping and mixed cropping to enhance biodiversity and soil health.

### 4. Natural Pest and Disease Management :

- Use neem-based products, garlic-chili sprays, and other natural pesticides to manage pests.
- Employ biological control methods like introducing beneficial insects.

### 5. Water Management :

- Adopt efficient irrigation methods to conserve water.
- Collect rainwater for irrigation during the monsoon season.

### 6. Livestock Integration :

- Integrate livestock into the farming system. Their manure can be used for composting.

### 7. Natural Fertilizers :

- Utilize organic fertilizers like vermicompost, green manure, and biofertilizers to nourish crops naturally.



## 9. No Synthetic Chemicals :

- Strictly avoid chemical fertilizers in organic farming.

## 10. Farm Record-Keeping :

- Maintain accurate records of all farming activities, inputs used, and harvests. This is essential for certification and tracking farm performance.

## 12. Education and Training :

- Stay updated on organic farming practices through workshops, training programs, and agricultural extension services.

## 13. Market Access :

- Identify local markets, cooperatives, or organic outlets **to sell your products**. Kerala has a growing demand for organic products.

## 14. Community Engagement :

- Collaborate with other organic farmers and join local organic farming associations or groups to share knowledge and resources.



# Landslides

- Landslides are complex geological events that can be triggered by various natural and human-related factors. The causes of landslides include:
- **Heavy Rainfall:** Prolonged or intense rainfall can saturate the soil, making it more susceptible to sliding. Rainfall-triggered landslides are common in many regions.
- **Steep Slopes:** Areas with steep slopes are more prone to landslides because gravity has a stronger pull on the soil and rock.
- **Soil Erosion:** Soil erosion, often caused by factors like deforestation or construction activities, can weaken the stability of slopes and contribute to landslides.



- **Earthquakes:** The shaking from an earthquake can destabilize slopes.
- **Volcanic Activity:** Volcanic eruptions can trigger landslides by causing the displacement of volcanic wastes and ash.
- **Human Activities:** Activities such as mining, road construction, and improper land use can disturb slopes and increase the risk of landslides.
- **Groundwater Level Changes:** Changes in groundwater levels, such as rapid rise or drawdown, can influence the stability of slopes.
- **Previous Landslides:** Areas that have experienced landslides in the past are often at greater risk of future landslides.



# Effects of Landslides

1. Loss of Life and Injury : Landslides can result in casualties, including fatalities and injuries, as they can bury homes, roads, and people.
2. Property Damage : Landslides can cause significant damage to buildings, vehicles, and infrastructure such as roads, bridges, and utility lines.
3. Displacement of Communities : People living in areas prone to landslides may be forced to evacuate their homes, leading to displacement and the need for temporary shelter.
4. Environmental Impact : Landslides can disrupt ecosystems, lead to habitat destruction, and alter watercourses, affecting aquatic life.
5. Blocked Waterways : Landslides can obstruct rivers and streams, potentially leading to flash floods if the blockage is suddenly released.



6. Loss of Agricultural Land : Landslides can destroy agricultural fields, impacting local food production and livelihoods.
7. Transport Disruption : Roads and transportation networks can be affected by landslides.
8. Water Contamination : Landslides can introduce pollutants, waste, and soil into water bodies, affecting water quality downstream.
9. Economic Impact : Landslides can result in economic losses due to damaged infrastructure, reduced agricultural productivity, and increased repair and recovery costs.
10. Social Disruption : Landslides can disrupt communities, including education, healthcare, and daily life, leading to social and psychological stress.



- Regarding the effects of landslides in Kerala during the flood season:

1. Loss of Lives : Landslides can result in casualties, and Kerala has witnessed tragic incidents of people losing their lives in landslides during heavy rainfall.
2. Property Damage : Homes, buildings, and infrastructure are damaged or destroyed, leading to significant financial losses.
3. Displacement : Communities living in hilly areas may be displaced, requiring emergency shelter and support.
4. Transport Disruption : Roads and transportation networks can be severed, hampering relief efforts and access to affected areas.
5. Environmental Impact : Landslides in Kerala can affect the lush biodiversity of the Western Ghats, disrupt watercourses, and lead to soil erosion.
6. Agricultural Loss : Farming communities can suffer from landslides, impacting local food production.
7. Water Contamination : Water sources can be contaminated by landslides, posing health risks to downstream communities.
8. Economic Impact : Landslides result in economic losses due to damaged infrastructure, property, and agriculture



# Land degradation issues that can arise from granite quarrying

1. Habitat Destruction : Quarrying can result in the destruction of natural habitats for various plant and animal species, leading to a loss of biodiversity.
2. Soil Erosion : The removal of vegetation and soil in the quarrying process can lead to increased soil erosion, affecting the surrounding landscape.
3. Water Pollution : Quarrying activities can introduce pollutants and sediments into nearby water bodies, negatively impacting water quality and aquatic ecosystems.
4. Noise and Dust Pollution : Quarry operations can generate noise and dust pollution, affecting the quality of life for nearby residents and causing health concerns.



5. Landscape Alteration : The extraction of granite alters the natural landscape, leading to changes in topography and landform.
6. Impact on Agriculture : Nearby farmlands may be affected by dust deposition and changes in water availability, potentially reducing agricultural productivity.
7. Aesthetic and Recreational Value : The visual impact of quarry operations can diminish the aesthetic and recreational value of the area, affecting tourism and local communities.
8. Long-Term Rehabilitation : Proper rehabilitation and reclamation of quarry sites are essential to mitigate land degradation and restore the land to a functional state. However, this process can be challenging and time-consuming.



# Desertification Symptoms

- 1. Soil Erosion : Increased soil erosion has been observed in certain parts of Kerala due to factors such as deforestation, construction activities, and heavy rainfall. This erosion can lead to the loss of topsoil, reduced soil fertility, and decreased agricultural productivity.
- 2. Water Scarcity : Despite its reputation for high rainfall, Kerala has been facing water scarcity issues in some regions. Changing rainfall patterns, population growth, and overextraction of groundwater have contributed to water stress in certain areas, affecting agriculture and water availability for domestic use.
- 3. Drying Water Bodies : Some rivers, streams, and small water bodies in Kerala have experienced reduced water flow and drying in recent years. This can be attributed to factors like changes in land use, sand mining, and altered hydrological patterns.



- 4. Reduced Vegetation : Deforestation, land conversion for development, and unsustainable land use practices have led to reduced vegetation cover in certain areas. This loss of green cover can exacerbate soil erosion and reduce ecosystem services.
- 5. Land Degradation : Land degradation, including loss of soil fertility, has been reported in parts of Kerala. Unsustainable agricultural practices, such as excessive use of chemical fertilizers and pesticides, can contribute to this issue.
- 6. Increased Temperature : Rising temperatures have been observed in Kerala, which could be associated with climate change. While not a direct desertification symptom, higher temperatures can exacerbate water scarcity and affect agriculture.



# Human Activities Increasing Soil Erosion

1. Deforestation : Clearing forests for agriculture, urbanization, or timber extraction reduces the protective forest cover that helps prevent soil erosion.
2. Improper Land Use : Unsustainable land use practices, such as construction on steep slopes or unregulated land development, can disturb the soil structure and increase erosion risk.
3. Agricultural Practices : Poor farming practices, including excessive plowing, overuse of chemical fertilizers and pesticides, and inadequate crop rotation, can degrade soil quality and increase erosion.
4. Mining and Quarrying : Extractive industries can result in significant soil disturbance and erosion, particularly in hilly or mountainous areas.
5. Road Construction : Improper road design and construction can disrupt natural drainage patterns, leading to increased runoff and erosion.
6. Lack of Vegetation : Removal of vegetation cover through activities like unregulated logging or construction leaves soil exposed and vulnerable to erosion.



# Preventing Soil Erosion

- 1. Afforestation and Reforestation : Promote the planting of native trees and vegetation, especially on steep slopes and vulnerable areas, to stabilize the soil and reduce erosion.
- 2. Terracing and Contour Farming : Implement terracing and contour farming techniques to reduce the speed of water runoff and soil erosion on agricultural lands.
- 3. Soil Conservation Practices : Adopt soil conservation methods like mulching, cover cropping, and organic farming to improve soil structure and reduce erosion.
- 4. Water Management : Implement water management strategies such as constructing check dams, retention ponds, and rainwater harvesting systems to control runoff and retain water in the landscape.



- 5. Erosion Control Structures : Use erosion control structures like silt fences, gabion walls, and retaining walls to prevent soil erosion in vulnerable areas.
- 7. Education and Awareness : Raise awareness among communities, farmers, and landowners about the importance of soil conservation and sustainable land management practices.
- 8. Government Policies : Implement and enforce policies that promote sustainable land use, afforestation, and erosion control measures.
- 9. Research and Monitoring : Invest in research and monitoring of soil erosion trends and prevention measures to adapt strategies as needed.
- 10. Community Involvement : Engage local communities in soil conservation efforts through training, support, and incentives.



# Effects of Pesticide Use on Land Sustainability

- 1. Soil Degradation : Pesticides, especially chemical herbicides and fungicides, can have adverse effects on soil health. They may disrupt beneficial soil microorganisms and reduce soil fertility over time.
- 2. Water Pollution : Pesticides can leach into the soil and contaminate groundwater or runoff into nearby water bodies, leading to water pollution. This pollution can harm aquatic life and affect the quality of drinking water sources.
- 3. Non-Target Species Impact : Pesticides can harm non-target organisms, including beneficial insects, pollinators, and natural predators of pests. This disruption of the ecosystem can lead to pest resurgence and imbalances in the tea garden ecosystem.
- 4. Residue Accumulation : Pesticide residues can accumulate in tea leaves, affecting the safety and quality of the final product. This can have economic implications as well.



- Eco-Friendly Measures to Mitigate Pesticide Impacts :
- 1. Integrated Pest Management (IPM) : Implement IPM practices, which involve monitoring pest populations, using natural predators and biopesticides, and applying pesticides only when necessary and in a targeted manner.
- 2. Crop Rotation : Rotate tea crops with other suitable plants to disrupt pest life cycles and reduce the need for pesticides.
- 3. Organic Farming : Transition to organic farming methods that rely on natural and non-toxic pest control measures like neem oil, beneficial insects, and companion planting.
- 4. Biological Controls : Introduce beneficial insects and organisms that prey on tea pests, such as ladybugs, lacewings, and parasitoid wasps.



- 5. Natural Fertilizers : Use organic and natural fertilizers to improve soil fertility without resorting to chemical inputs.
- 6. Reduced Chemical Use : Implement reduced chemical input strategies by adopting safer, more eco-friendly pesticides and applying them sparingly.
- 7. Buffer Zones : Create buffer zones or vegetation strips around tea gardens to mitigate pesticide runoff into water bodies.
- 8. Training and Education : Educate tea growers and workers about the proper use of pesticides, emphasizing safety, protective gear, and responsible application.
- 9. Soil Conservation : Implement soil conservation practices, such as mulching and cover cropping, to maintain soil health and prevent erosion.
- 10. Certification : Consider seeking organic or sustainability certifications for tea products to demonstrate commitment to eco-friendly practices.



Example – Paper as a resource: steps of resource use, including its collection, processing, transportation, consumption, and waste management, with a focus on environmental management:

## 1. Collection :

- Extraction of Raw Materials : Paper production typically begins with the collection of raw materials, primarily wood from trees. Sustainable forestry practices, such as selective logging and reforestation, can minimize the environmental impact of this step.
- Recycling : An eco-friendly option is to collect and recycle used paper to reduce the need for virgin pulp and the associated deforestation.



## 2. Processing :

- Pulping and Manufacturing : Trees are processed to extract wood fibers, which are then used to make paper. Environmentally responsible paper mills employ efficient technologies and seek certifications such as FSC (Forest Stewardship Council) to ensure sustainable practices.
- Chemical Use : Reducing or substituting harmful chemicals in the pulping and bleaching process with more eco-friendly alternatives can minimize pollution.

## 3. Transportation :

- Raw Material Transport : Sustainable transportation practices, including reducing emissions and optimizing routes, are crucial for minimizing the carbon footprint associated with the movement of raw materials to the paper mill.
- Product Distribution : Environmentally friendly logistics can reduce emissions during the distribution of paper products to consumers.



#### 4. Consumption :

- Paperless Options : Encouraging digital alternatives and reducing unnecessary paper use, such as opting for e-documents and e-books, can significantly reduce paper consumption.
- Responsible Printing : When printing is necessary, double-sided printing, using eco-friendly ink, and choosing recycled paper can minimize the environmental impact.

#### 5. Waste Management :

- Recycling : Promoting paper recycling helps divert used paper from landfills and reduces the need for virgin pulp.
- Composting : Certain types of paper, like uncoated and non-glossy paper, can be composted, contributing to organic waste recycling.
- Proper Disposal : Ensuring that paper waste is disposed of in designated bins or recycling facilities is essential for effective waste management.

