



## BAS 104/204: ENVIRONMENT AND ECOLOGY

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- Subject Credit – 03
- 100 Marks (70 Marks External + 30 Marks Internal)
- Entire syllabus coverage and understanding of the subject thru  
AKTU Important Questions
- Approach for short, Medium and Long Answer type Questions



## **AKTU Syllabus**

### **Unit-2 : Natural Resources**

**Natural Resources:** Introduction, Classification.

**Water Resources;** Availability, sources and Quality Aspects, Water Borne and Water Induced Diseases, Fluoride and Arsenic Problems in Drinking Water.

**Mineral Resources;** Material Cycles; Carbon, Nitrogen and Sulfur cycles.

**Energy Resources;** Conventional and Non conventional Sources of Energy.

**Forest Resources;** Availability, Depletion of Forests, Environment impact of forest depletion on society.



# BAS 104/204: ENVIRONMENT AND ECOLOGY

## Unit-2 : Natural Resources



**Q.1. What are the natural resources? Classify it with examples. Also, Discuss the major reasons for depletion of natural resources. How can we achieve sustainability in resource use?** **AKTU 2013-14**

**Ans. Natural resources** are the materials or substances that occur in the natural environment and are used by humans for various purposes (Like–Water, Coal, Oil, Sunlight, Sea/Ocean, Wind, Natural Gas, Minerals, Nuclear etc).

These resources can be classified into two main categories - **Renewable and non-renewable**.

**1. Renewable Resources:** Renewable resources are those that can be replenished over time and are not depleted when used sustainably. Examples include:

- a. Solar Energy:** The sun provides an immense source of energy that can be harnessed using solar panels.
- b. Wind Energy:** Wind turbines convert the kinetic energy of the wind into electricity.
- c. Hydropower:** The energy of flowing water, such as rivers and waterfalls, can be used to generate electricity.
- d. Biomass:** Organic materials like wood, crop residues, and animal waste can be used for energy production.



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e. **Geothermal Energy:** Heat from the Earth's interior can be utilized for heating and electricity generation.

f. **Tidal Energy:** The rise and fall of tides in oceans can be used to generate electricity.

**2. Non-Renewable Resources:** Non-renewable resources are finite and cannot be replaced on a human timescale. Once they are depleted, they are gone. Examples include:

- a. **Fossil Fuels - Coal:** A combustible black or brownish-black sedimentary rock used as a fuel.
  - **Oil (Petroleum):** Extracted from the ground, refined into various products like gasoline and diesel.
  - **Natural Gas:** A flammable gas often found in association with petroleum deposits.
- b. **Minerals - Metallic Minerals:** Examples include iron ore, copper, gold, and aluminum.
  - **Non-Metallic Minerals:** Examples include salt, gypsum, and limestone.
- c. **Nuclear Fuels - Uranium:** Used as fuel in nuclear reactors for the generation of electricity.
- d. **Fossil Groundwater:** Ancient water stored in underground aquifers that is not easily replenished.
- e. **Coal Bed Methane:** Natural gas associated with coal deposits.



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### Major reasons for depletion of natural resources

#### 1. Overexploitation:

- **Overfishing:** Excessive and unsustainable fishing practices can deplete fish populations, leading to the collapse of fisheries.
- **Deforestation:** Clearing large areas of forests for timber, agriculture, or urban development can result in the loss of biodiversity and essential ecosystem services.

#### 2. Pollution:

- **Water Pollution:** Disposal of industrial waste, chemicals, and untreated sewage into water bodies can degrade water quality and harm aquatic ecosystems.
- **Air Pollution:** Emissions from industries, vehicles, and other sources contribute to air pollution, affecting air quality and harming ecosystems.

**3. Climate Change (Global Warming):** The burning of fossil fuels releases greenhouse gases, contributing to climate change, which can alter ecosystems and impact biodiversity.

**4. Urbanization and Infrastructure Development (Land Conversion):** Converting natural habitats into urban areas, agricultural land, or infrastructure projects reduces the available space for ecosystems and wildlife.



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**5. Population Growth:** The growing global population puts increased pressure on natural resources as more people require food, water, energy, and living space.

**6. Inadequate Environmental Policies:** Weak or ineffective environmental regulations and enforcement can contribute to the unsustainable use of natural resources.

### Sustainability of Natural Resources

Sustainability of natural resources refers to the responsible and balanced use of resources to meet current needs without compromising the ability of future generations to meet their own needs. Achieving sustainability involves conservation, efficient resource management, and consideration of environmental, social, and economic factors.

#### 1. Renewable Resource Management:

- Prioritize the use of renewable resources, such as solar, wind, and hydropower, which can be replenished naturally.
- Implement sustainable forestry and fisheries practices to ensure the regeneration of ecosystems.





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### **2. Efficient Resource Use:**

- Promote resource efficiency in industries, agriculture, and households to reduce waste and minimize environmental impact.
- Adopt technologies and practices that optimize resource use, such as recycling, circular economy principles, and sustainable farming techniques.

### **3. Reduce, Reuse and Recycle (3R):**

- The 3-R approach advocating minimization of resource use, using them again and again instead of passing it on to the waste stream and recycling the materials goes a long way in achieving the goals of sustainability.
- Encourage the development of sustainable products with a focus on recyclability and reduced environmental impact.

### **4. Water Conservation:**

- Implement water-saving technologies and practices in agriculture, industry, and households.
- Protect and restore watersheds to maintain the quality and availability of freshwater resources.

### **5. Climate Change Mitigation:**

- Transition to renewable energy sources to reduce greenhouse gas emissions.
- Implement measures to adapt to and mitigate the impacts of climate change on ecosystems and natural resources.



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### **6. Policy and Regulation:**

- Develop and enforce environmental regulations that promote sustainable resource management.
- Encourage the adoption of sustainable practices through economic incentives, subsidies, and penalties for non-compliance.

### **7. Education and Awareness:**

- Raise awareness about the importance of sustainable resource use through education and outreach programs.
- Foster a sense of environmental responsibility and encourage sustainable behavior at the individual and community levels.





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**Q.2. What are the different sources of water? Write a note on the availability of water on the earth and describe the characteristics of good quality water.**

**Ans.**

### ***Sources of Water:***

Water on Earth is derived from various sources, and it exists in different forms, including liquid, solid (ice), and vapor. The primary sources of water include:

#### ***1. Surface Water:***

- **Rivers and Streams:** Flowing bodies of water that often originate from mountainous areas.
- **Lakes and Reservoirs:** Natural or artificial basins that store water.
- **Ponds:** Smaller water bodies, often shallow and man-made.
- **Wetlands:** Areas with waterlogged soil, supporting unique ecosystems.

#### ***2. Groundwater:***

- **Aquifers:** Underground layers of permeable rock or soil that contain water.
- **Wells:** Structures dug or drilled to extract groundwater.



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### 3. Ice and Snow:

- **Glaciers:** Large masses of ice that move slowly over land.
- **Ice Caps and Icebergs:** Formed from compacted snow and ice.

### Availability of water on the earth

Earth is often referred to as the "Blue Planet" due to its abundant water but the distribution and availability of freshwater are uneven. About 97.5% of the Earth's water is in the oceans (saltwater), leaving only about 2.5% as freshwater. However, the majority of freshwater is locked in ice caps, glaciers, and underground aquifers, making only a small percentage readily accessible for human use. This limited availability, coupled with population growth and climate change, poses challenges for water security in various regions.

### Availability of Water in India

India is the wettest country in the world, but rainfall is highly uneven with space and time. Rainfall is high in the North-East but extremely low in Rajasthan. Out of 4000 billion cm<sup>3</sup> rainfall received, about 600 billion cm<sup>3</sup> is put to use so far and with 16% of the world's population, India has only 4% of global water resources.



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### **Aspects (characteristics) of good quality water**

Maintaining good water quality is crucial for sustaining life, safeguarding ecosystems, and supporting various human activities. Monitoring and managing water quality are essential for preserving this vital resource.

Following are the various characteristics of good quality water:

1. It is transparent, colorless and odorless.
2. It has sufficient oxygen concentration for marine life to survive.
3. It is free from bacteriological contamination.
4. It is free from any water pollution.
5. It is free from excessive nutrients like N, P, etc., which are responsible for eutrophication.
6. It is pure and fit for the intended use.



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Q.3. What are the water borne and water induced diseases? Give the causes and preventive measures of water related disease.

OR

Differentiate between water borne diseases and water induced diseases with suitable example.

OR

AKTU 2013-14

Explain water related diseases. Discuss in details water borne and water induced diseases.

AKTU 2017-18

Discuss kinds of disease, their cause effect on human being.

**Ans. Waterborne diseases** are spread/caused by the consumption of contaminated water (contaminated with pathogenic microorganisms) and preparation of food by contaminated water. Waterborne diseases include - Cholera, Typhoid Fever, Dysentery, Giardiasis etc.

### 1. Cholera

**Cause:** Vibrio cholerae bacteria. **Transmission:** Consumption of contaminated water or food.

**Effects:** Watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration, shock and Kidney failure etc.

**Preventive Measures:** Water purification, sanitation, and hygiene practices, Eating fresh healthy foods.



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### 2. Typhoid Fever

**Cause:** Salmonella typhi bacteria. **Transmission:** Consumption of contaminated water or food.

**Effects:** High fever accompanied with diarrhea or vomiting.

**Preventive Measures:** Safe drinking water, improved sanitation, and vaccination, Eating fresh healthy foods.

### 3. Dysentery

**Cause:** Various bacteria, parasites, or viruses. **Transmission:** Contaminated water or food.

**Effects:** Diarrhea, fever, nausea, vomiting, weight loss and stomach cramps.

**Preventive Measures:** Clean water supply, sanitation, and personal hygiene, Eating fresh healthy foods.

### 4. Gastroenteritis or stomach flu

**Cause:** Bacteria, bacterial toxins, parasites, particular chemicals/drugs, Noroviruses.

**Transmission:** Contaminated water or food.

**Effects:** Low grade fever, diarrhea, frequent vomiting, dehydration, stomach or abdominal cramping.

**Preventive Measures:** Clean water supply, sanitation, and personal hygiene (frequent hand-washing), Eating fresh healthy foods.



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### 5. Giardiasis (Type of Diarrhea)

**Cause:** Giardia lamblia parasite.      **Transmission:** Consumption of contaminated water or food.

**Effects:** Severe abdominal cramps, diarrhea, nausea, greasy stool, gas, etc.

**Preventive Measures:** Water treatment, personal hygiene, and proper sanitation, Eating fresh healthy foods.

**Water induced diseases** are generally caused by **protozoa**. Water-induced diseases are often related to water-related environmental factors and conditions. Common water-induced diseases are **Malaria, Dengue** etc.

#### 1. Malaria

**Cause:** Plasmodium parasites transmitted by mosquitoes breeding in stagnant water.

**Effects:** Nausea, vomiting, and diarrhea. If not promptly treated, the infection can become severe and may cause kidney failure, seizures, mental confusion, coma, and death.

**Preventive Measures:** Mosquito control, bed nets, and antimalarial drugs.





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### 2. Dengue

**Cause:** Mosquito Biting.

**Effects:** Nausea, vomiting, Aches and pains (eye pain, typically behind the eyes, muscle, joint, or bone pain) etc.

**Preventive Measures:** Mosquito control, bed nets, and antiparasitic drugs.

### 3. Filariasis

**Cause:** Wuchereria bancrofti or Brugia malayi parasites transmitted by mosquitoes.

**Effects:** Damage to the lymphatic system and the kidneys and alter the body's immune system.

**Preventive Measures:** Mosquito control, bed nets, and antiparasitic drugs.

### 4. Schistosomiasis

**Cause:** Schistosoma parasites from contaminated freshwater.

**Effects:** abdominal pain, enlarged liver, blood in the urine, and problems passing urine etc.

**Preventive Measures:** Safe water sources, sanitation, and avoiding contact with contaminated water.



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### **Causes of water related disease**

1. Contaminated Water Sources
2. Inadequate Water Treatment
3. Lack of Sanitation
4. Poor Personal Hygiene
5. Stagnant Water
6. Lack of Access to Clean Water

### **Prevention measures of water related disease**

1. Water Treatment
2. Improved Sanitation
3. Hygiene Education
4. Vaccination
5. Access to Clean Water
6. Monitoring and Surveillance (Water Quality)
7. Community Awareness



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Q.4. Discuss fluoride problem in India. Also enumerate its causes & effects on human health.

OR

AKTU 2017-18

Briefly discuss the fluoride problem in drinking water. Also, list out the preventive measures.

**Ans.**

The fluoride problem in India is a significant public health concern, primarily associated with high levels of naturally occurring fluoride in drinking water. While fluoride is essential for dental health in appropriate amounts, excessive intake, especially through drinking water, can lead to health issues. Many parts of India, particularly in the states of Rajasthan, Andhra Pradesh, Telangana, Gujarat, and Tamil Nadu, experience elevated fluoride concentrations in groundwater.

#### Causes

**Geological Factors:** The presence of fluoride in the Earth's crust can result in leaching into groundwater.

**Agricultural Practices:** The use of phosphate fertilizers and certain pesticides can contribute to elevated fluoride levels.



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### Effects on human health

#### 1. Dental Fluorosis

**Mottling of Teeth:** Prolonged exposure to high fluoride levels during tooth development can lead to dental fluorosis, characterized by discoloration, pitting, and mottling of tooth enamel.

#### 2. Skeletal Fluorosis

**Bone and Joint Issues:** Long-term exposure to high fluoride concentrations can cause skeletal fluorosis, a condition marked by pain and damage to bones and joints. It can result in stiffness, limited joint mobility, and, in severe cases, deformities.

#### *Other Health Impacts:*

**Gastrointestinal Issues:** High fluoride levels may cause gastrointestinal problems, such as abdominal pain and nausea.

**Reduced Fertility:** Some studies have explored potential associations between high fluoride exposure and reduced fertility, but findings are not consistent.



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### Preventive measures for Fluoride problems

1. **Water Quality Testing** - Regular testing of water sources for fluoride levels to identify areas with high concentrations.
2. **Alternative Water Sources** - Providing alternative sources of drinking water in fluoride-affected areas.
3. **Water Treatment** - Implementing water treatment methods, such as defluoridation techniques, to reduce fluoride levels in water.
4. **Public Awareness** - Raising awareness about the health risks associated with high fluoride intake and promoting safe water consumption practices.
5. **Dental Health Education** - Educating communities on dental hygiene practices to mitigate the risk of dental fluorosis.
6. **Government Policies** - Implementing and enforcing policies to regulate and monitor fluoride levels in drinking water.



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**Q.5. Discuss arsenic problem in India. Also enumerate its effects on human health and the preventive measures.**

**Ans.**

The arsenic problem in India is a significant environmental and public health issue, particularly in certain regions where groundwater contains elevated levels of arsenic. Arsenic contamination in drinking water poses serious health risks to the population. The problem is prevalent in several states, including West Bengal, Bihar, Uttar Pradesh, Jharkhand, and Assam.

#### **Causes**

**Geological Factors:** Arsenic occurs naturally in the Earth's crust, and certain geological formations release arsenic into groundwater.

**Anthropogenic Activities:** Human activities such as mining, industrial discharges, and the use of arsenic-containing pesticides can contribute to arsenic contamination.



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### Effects on human health

- 1. Skin Lesions:** Prolonged exposure to arsenic-contaminated water can lead to skin lesions, including hyperpigmentation, keratosis, and the development of hard patches on the skin.
- 2. Cancer Risk:** Chronic exposure to arsenic is associated with an increased risk of various cancers, including skin, lung, bladder, and kidney cancers.
- 3. Cardiovascular Effects:** Arsenic exposure has been linked to cardiovascular diseases, including hypertension and atherosclerosis.
- 4. Neurological Impacts:** Some studies suggest potential neurological effects, such as cognitive deficits and developmental issues in children exposed to high levels of arsenic.
- 5. Respiratory Problems:** Long-term exposure to arsenic may contribute to respiratory issues, including chronic bronchitis and respiratory tract infections.



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### **Preventive measures for Arsenic problems**

1. **Water Quality Testing** - Regular testing and monitoring of groundwater to identify arsenic - contaminated areas.
2. **Alternative Water Sources** - Providing alternative sources of safe drinking water in arsenic-affected regions.
3. **Public Awareness** - Raising awareness about the health risks associated with arsenic exposure and promoting safe water consumption practices.
4. **Government Policies & Regulations** - Development and enforcement of policies to regulate arsenic levels in drinking water and industrial discharges.
5. **Healthcare Interventions:** Offering medical screenings and healthcare services in affected areas to identify and address health issues related to arsenic exposure.
6. **Community Engagement:** Involving communities in decision-making processes, encouraging community-led initiatives, and fostering local participation in addressing the arsenic problem.



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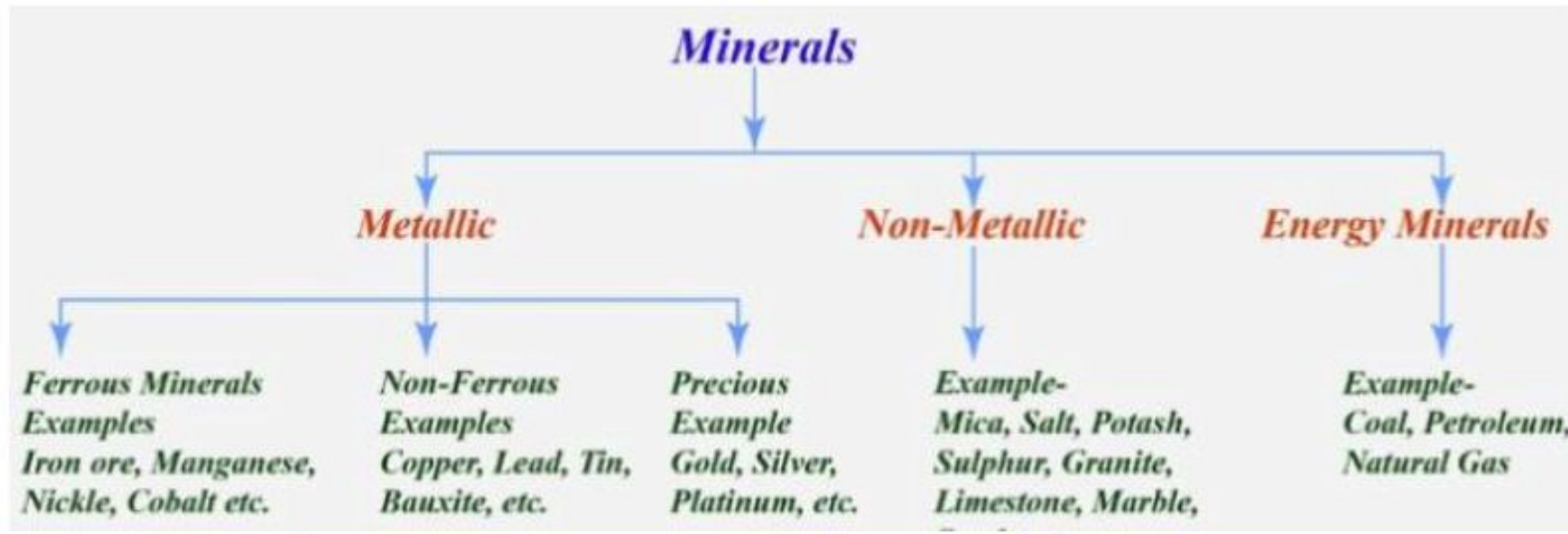
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**Q.6. What is meant by mineral resources? Describe the effect of mineral extraction on environment.**

**Ans.** Mineral resources refer to naturally occurring substances found in the Earth's crust that have economic value. These resources can be classified into two main types: metallic minerals (which yield metals when processed) and non-metallic minerals (which are used for various purposes, such as construction, energy production, and manufacturing - Sand, Mica, Gypsum, Diamond, etc).

Examples of mineral resources include iron ore, copper, gold, coal, oil, natural gas, limestone, and many others.



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### Effects of Mineral Extraction on the Environment

While mineral extraction is essential for economic development and various industrial processes, it often has significant environmental impacts. The extraction and processing of minerals can lead to a range of environmental challenges, affecting ecosystems, water quality, air quality, and biodiversity.

Some of the key effects of mineral extraction on the environment -

- 1. Habitat Destruction:** Mining activities can result in the destruction of natural habitats and ecosystems. Clearing land for mining operations can lead to the loss of biodiversity and disruption of wildlife.
- 2. Soil Erosion:** Excavation and removal of soil and rock during mining can contribute to soil erosion, which affects the fertility of the land and can lead to sedimentation in nearby water bodies.
- 3. Water Pollution:** Runoff from mining sites may contain pollutants, such as heavy metals, sediments, and chemicals, which can contaminate nearby rivers and streams. This pollution can harm aquatic ecosystems and affect the quality of drinking water.
- 4. Air Pollution:** Dust and particulate matter generated during mining and mineral processing activities can contribute to air pollution. Emissions from equipment and transportation also play a role.



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- 5. Deforestation:** In some cases, mining operations may require the clearing of forests. Deforestation can result in the loss of biodiversity, disruption of ecosystems, and contribute to climate change.
- 6. Greenhouse Gas Emissions:** The extraction and processing of certain minerals, such as coal and oil, can release significant amounts of greenhouse gases, contributing to global warming and climate change.
- 7. Resource Depletion:** Unsustainable mining practices can lead to the depletion of finite mineral resources, impacting future generations and necessitating the development of alternative, sustainable sources.
- 8. Social and Cultural Impacts:** Mining activities can also have social and cultural impacts, including the displacement of communities, changes in traditional land use, and conflicts over resource access.



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**Q.7. What do you mean by the term material cycle? Explain carbon cycle with the help of diagram.**

**OR**

**Describe carbon cycle in detail.**

**AKTU 2014-15, 2017-18**

**Ans.**

Material cycles refer to the movement and transformation of elements and compounds through different environmental compartments, including the atmosphere, land, water bodies, and living organisms. Three important material cycles are the ***carbon cycle***, ***nitrogen cycle***, and ***sulfur cycle***.

The carbon cycle, nitrogen cycle, and sulfur cycle are vital for ecological balance and supporting biological processes as they regulate the distribution and availability of essential elements, control climate by managing greenhouse gas concentrations, and guide sustainable resource management.



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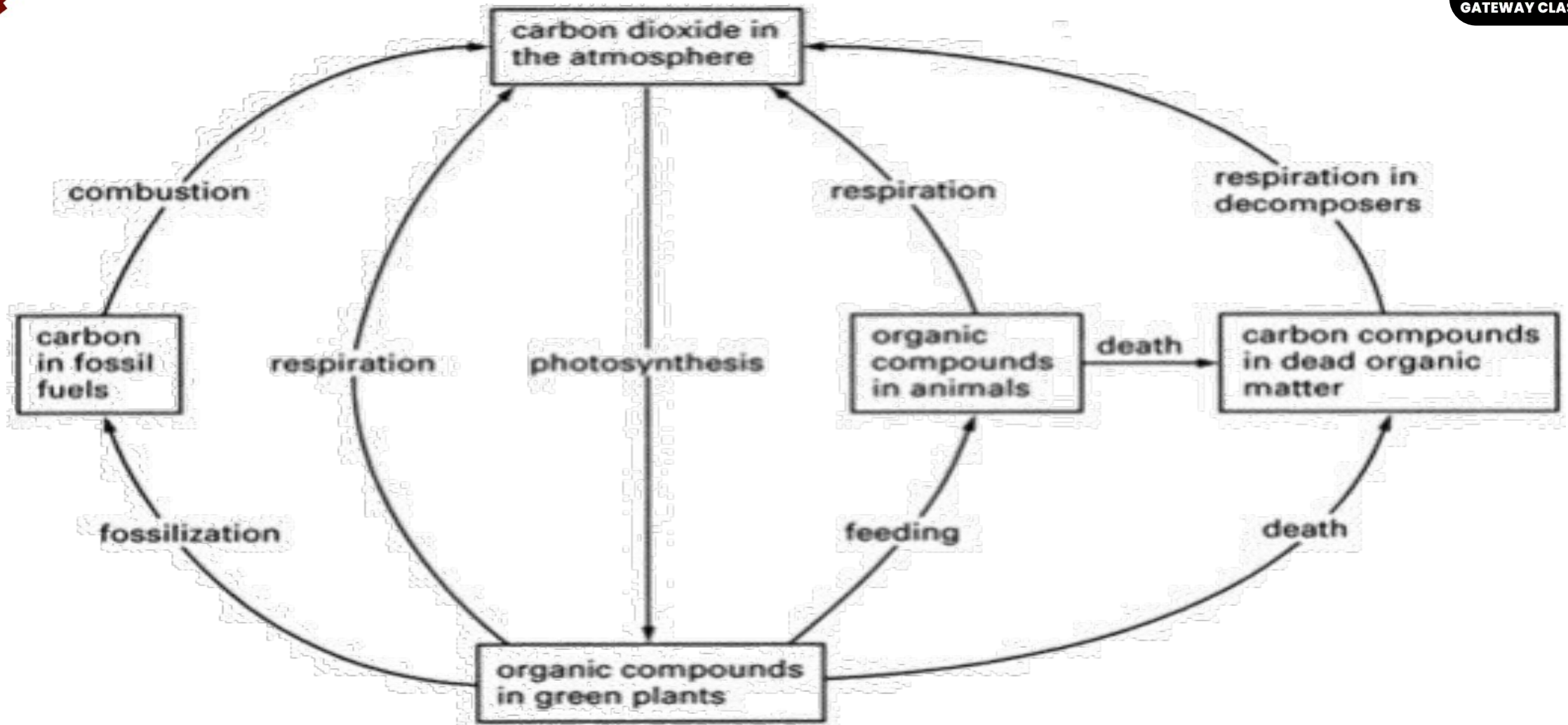
### **CARBON CYCLE**

- The carbon cycle is a natural process that involves the movement and recycling of carbon dioxide ( $\text{CO}_2$ ) in the Earth's atmosphere, oceans, land, and living organisms.
- It begins with carbon dioxide in the atmosphere, which is absorbed by plants through photosynthesis. Plants use this  $\text{CO}_2$  to produce glucose and release oxygen.
- When animals consume plants or other animals, they obtain carbon compounds and release carbon dioxide through respiration. Decomposers break down dead organisms, releasing carbon dioxide back into the atmosphere.
- Over millions of years, some carbon is buried and transformed into fossil fuels. When these fuels are burned, carbon dioxide is released.
- The oceans also absorb and store carbon dioxide.
- The carbon cycle helps regulate Earth's climate, but human activities, such as burning fossil fuels, have disrupted the cycle and contributed to global warming.



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Q.8. Draw and explain nitrogen cycle. Explain nitrification and denitrification process.

OR

AKTU 2014-15, 2015-16, 2017-18

Explain the phenomenon of nitrogen cycle with help of suitable line diagram. Also, Discuss detrimental effects of excess nitrogen.

Ans.

### Nitrogen Cycle

- The nitrogen cycle is a natural process that involves the conversion and movement of nitrogen in various forms within the Earth's atmosphere, biosphere, and geosphere.
- It begins with nitrogen gas ( $N_2$ ) in the atmosphere, which is converted into usable forms through nitrogen fixation by specific bacteria.
- These forms, such as ammonia and nitrate, are taken up by plants and incorporated into their tissues. When plants or animals die, decomposers break down organic nitrogen into ammonia through ammonification.
- **Nitrification** occurs when bacteria convert ammonia into nitrite and then into nitrate.
- **Denitrification** is the process by which certain bacteria convert nitrate back into nitrogen gas, returning it to the atmosphere.



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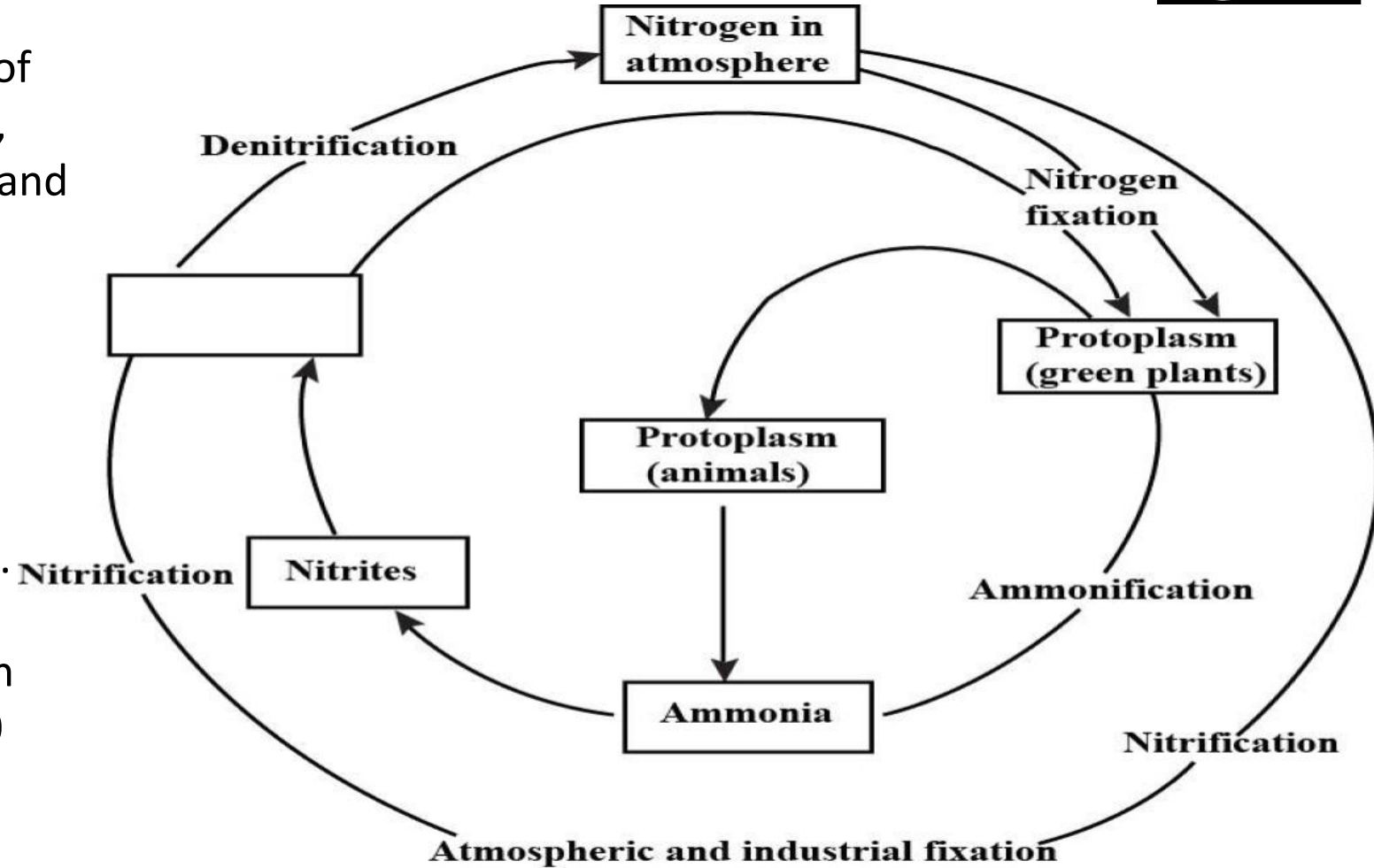
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- Human activities, such as the use of fertilizers and industrial processes, have disrupted the nitrogen cycle and can lead to environmental issues such as water pollution and air pollution.

### Effects of Excess Nitrogen

- The high concentration may cause asphyxiation and respiratory discomfort.
- NO<sub>x</sub> is responsible for causing eye and nasal irritations. Very high concentration of oxides of nitrogen as such as 40 to 50 mg/m<sup>3</sup> may lead to quicker deaths.



Nitrogen cycle



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Q.9. Draw and explain Sulphur cycle.

*Ans.*

#### Sulphur Cycle

- Plants and animals depend on the sulphur and its compounds for the synthesis of amino acids and proteins.
- $\text{SO}_2$  and  $\text{H}_2\text{S}$  are the gaseous form of sulphur. Sulphate ions are found, in water and soil.
- Plants and bacteria absorb sulphate ions from the soil are reduced and ultimately incorporated as sulfhydryl group ( $-\text{SH}$ ) in proteins.
- Some sulphates are reduced under anaerobic conditions directly to sulphites,  $\text{H}_2\text{S}$  or to elemental sulphur by desulfovibrio bacteria.
- $\text{H}_2\text{S}$  produced escapes into the air and replenishes the sulphur lost by precipitation.
- Atmosphere receives sulphur through bacterial emissions, in the form of hydrogen sulphide, fossil fuel burning as sulphur dioxide and volcanic emissions.



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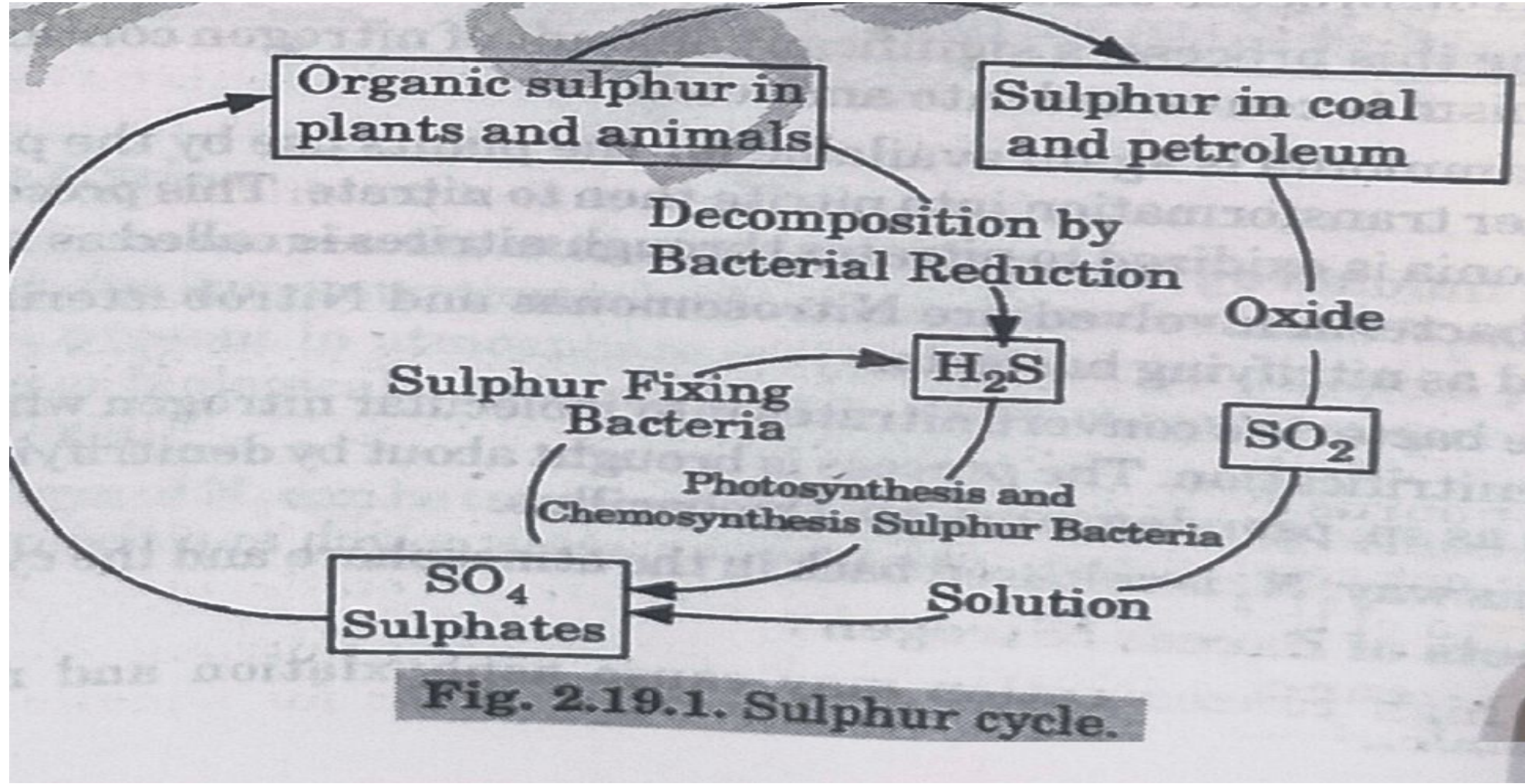


Fig. 2.19.1. Sulphur cycle.



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Q.10. Describe the non-renewable or conventional energy resources with examples.

OR

AKTU 2013-14

Describe conventional energy resources.

**Ans: Conventional Energy Resources** are traditional sources of energy that have been widely used for a long time. They are typically **non-renewable** and include fossil fuels such as coal, oil, and natural gas, as well as nuclear energy. These resources are finite and will eventually be depleted. They have significant environmental impacts, including greenhouse gas emissions and pollution.

As the name suggests, non-renewable energy resources are finite and cannot be replenished within a human lifespan. They include fossil fuels (coal, oil, natural gas) and nuclear energy. These resources take millions of years to form and cannot be easily replaced once depleted. Non-renewable resources contribute to environmental degradation and climate change.

**Examples:** fossil fuels such as coal, oil, and natural gas, nuclear energy



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Q.11. What are non-conventional energy resources? Discuss any two of them.

OR

AKTU 2014-15

What do you understand by non conventional energy resources? Discuss the solar energy in details.

OR

AKTU 2015-16

What do you understand by non conventional energy resources? Discuss the solar energy in details.

AKTU 2017-18

**Ans:** **Non-conventional energy resources** are also known as alternative energy resources, offer alternatives to conventional sources. They can be **renewable or non-renewable**, depending on the specific resource. They include a wide range of technologies and sources that are not as widely used or established as conventional resources.

As the name suggests, **renewable Energy Resources** are derived from sources that are naturally replenished and can be sustained over long periods. They include solar energy, wind energy, hydropower, biomass energy, and geothermal energy. These resources are considered sustainable and have minimal environmental impact. They offer a cleaner and more sustainable alternative to conventional energy sources.

**Examples:** Solar energy, wind energy, hydropower, biomass energy, and geothermal energy.



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Conventional		Non conventional
Conventional non-renewable energy	Conventional renewable energy	<ol style="list-style-type: none"><li>1.Solar energy</li><li>2.Hydro power</li><li>3.Wind energy</li><li>4.Nuclear energy</li><li>5.Hydrogen energy</li><li>6.Geothermal energy</li><li>7.Bio gas</li><li>8.Tidal energy</li></ol>
Mostly fossil fuels found under the ground. Coal,oil,natural gas etc. are the examples.	Mostly non-fossil fuels seen above the ground. Fire wood,cattle dung from vegetable wastes,wood charcoal etc. are the examples.	



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### Solar Energy

Solar energy is a renewable energy resource that is obtained from the sun's radiation. It is a clean and abundant source of energy that can be harnessed and converted into usable forms such as electricity or heat. Solar energy is captured using various technologies, including solar panels (photovoltaic cells) and solar thermal systems.

**Photovoltaic Cell:** A solar cell is a device that converts sunlight directly into electricity through the photovoltaic effect.

- The photovoltaic effect is the phenomenon where certain materials (semiconductor) generate an electric current when exposed to light.
- When sunlight hits the surface of the cell, the semiconductor material within absorbs photons, causing the release of electrons and the creation of electron-hole pairs.
- Due to the internal electric field created by the p-n junction, electric current generate.



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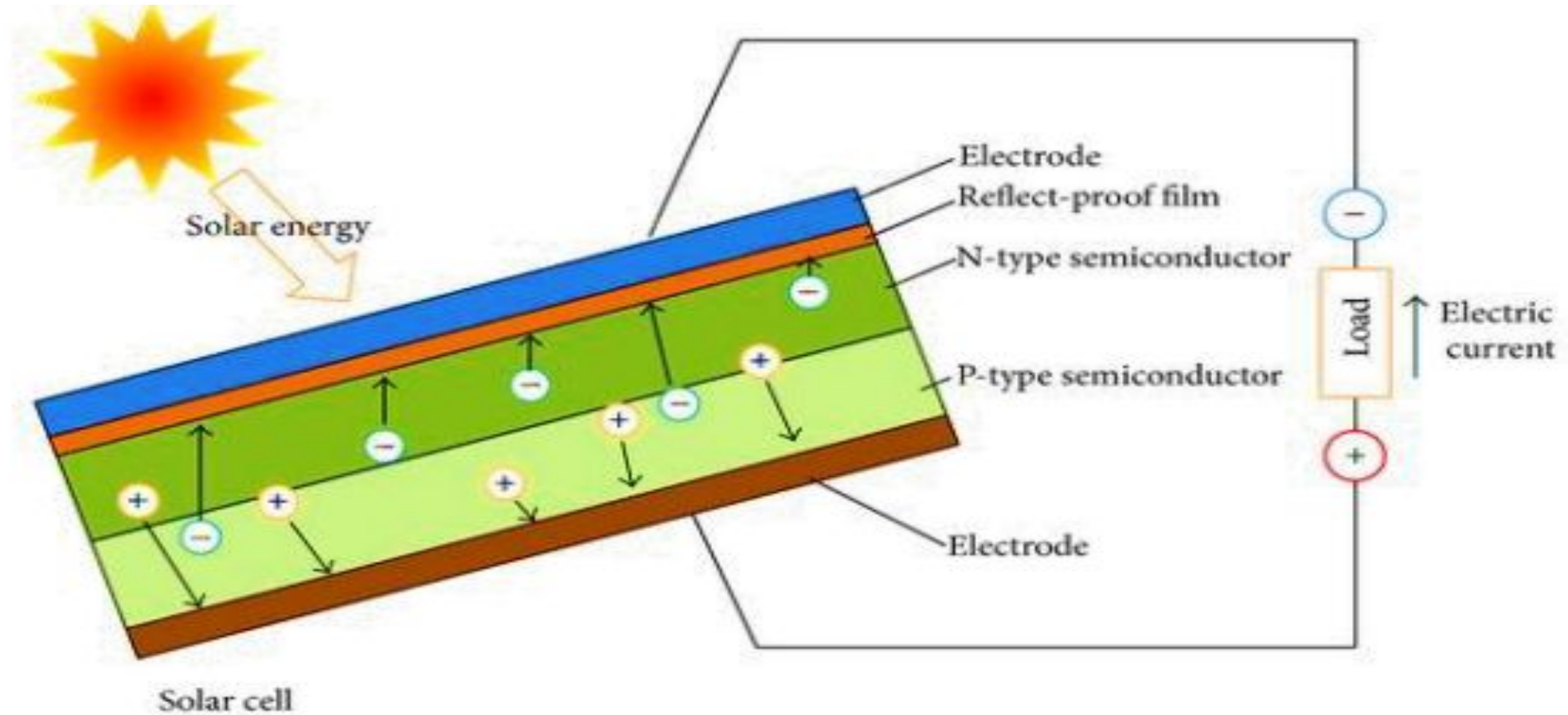


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### PV Cell



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### **Hydro Energy**

Hydroelectric power is a renewable energy source which harnesses the power of moving water to produce electricity. Hydropower, or hydroelectric power, is one of the oldest and largest sources of renewable energy, which uses the natural flow of moving water to generate electricity. Large scale hydroelectricity projects typically involve dams. Run-of-river and tidal projects also harness the power of moving water to generate renewable electricity.

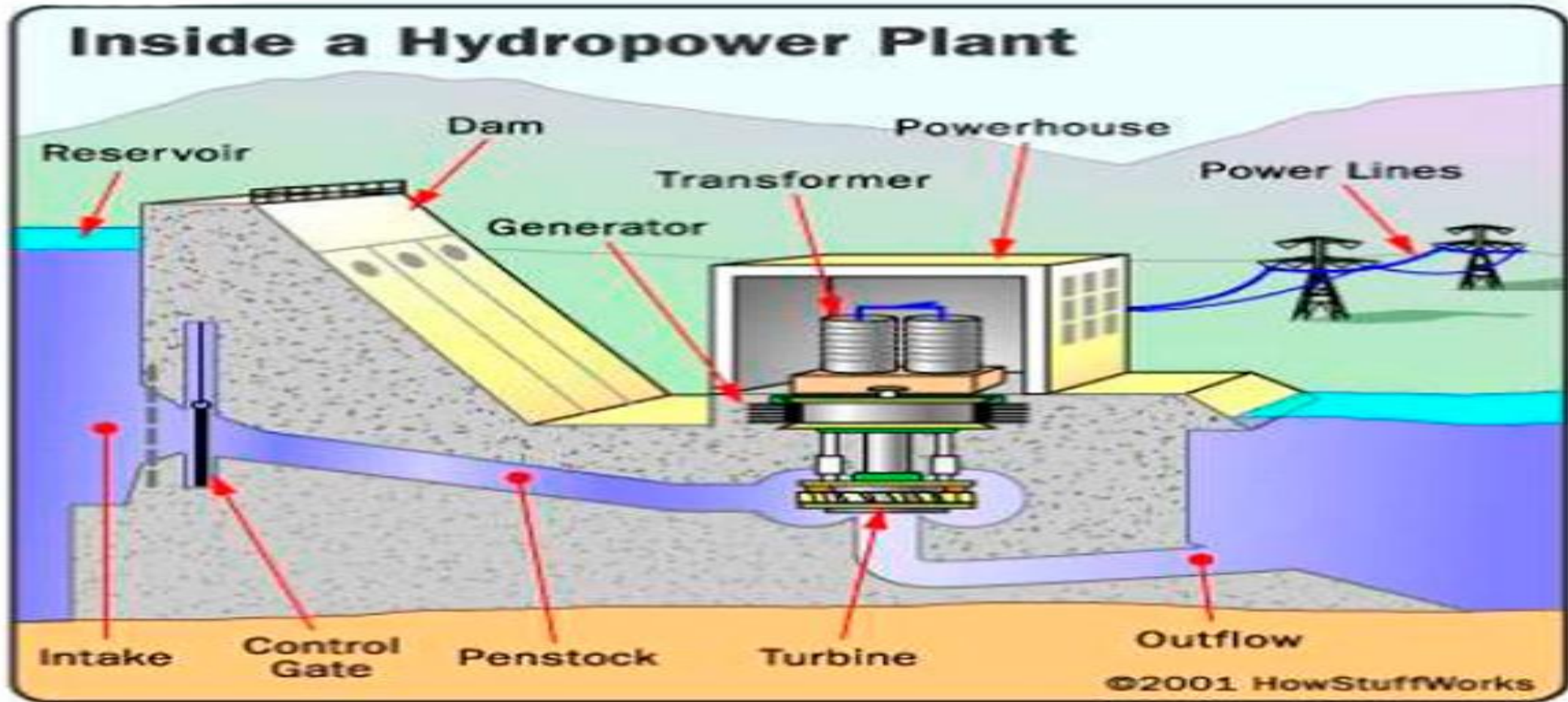
- A hydroelectric dam converts the potential energy stored in a water reservoir behind a dam to mechanical energy—mechanical energy is also known as kinetic energy.
- As the water flows down through the dam its kinetic energy is used to turn a turbine.
- Turbine rotates the coupled generator and converts the turbine's mechanical energy into electricity.
- This electric energy then goes through various transmission processes before it reaches you.





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### Other popular renewable energy Resources

- **Wind Energy** - Wind power or wind energy is a form of renewable energy that harnesses the power of the wind to generate electricity. It involves using wind turbines to convert the turning motion of blades, pushed by moving air (kinetic energy) into electrical energy (electricity). This requires certain technologies, such as a generator that sits at the top of a tower, behind the blades, in the head (nacelle) of a wind turbine.
- **Tidal Energy** - Tidal energy is a form of power produced by the natural rise and fall of tides caused by the gravitational interaction between Earth, the sun, and the moon. Tidal currents with sufficient energy for harvesting occur when water passes through a constriction, causing the water to move faster.
- **Biomass energy** - Biomass is renewable organic material that comes from plants and animals. Biomass contains stored chemical energy from the sun that is produced by plants through photosynthesis. Biomass can be burned directly for heat or converted to liquid and gaseous fuels through various processes.



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- **Geothermal Energy** - Geothermal energy is a type of renewable energy taken from the Earth's core. It comes from heat generated during the original formation of the planet and the radioactive decay of materials. This thermal energy is stored in rocks and fluids in the centre of the earth. Geothermal power plants draw fluids from underground reservoirs to the surface to produce steam. This steam then drives turbines that generate electricity.
- **Nuclear Energy** - Nuclear energy originates from the splitting of uranium atoms – a process called fission. This generates heat to produce steam, which is used by a turbine generator to generate electricity. Because nuclear power plants do not burn fuel, they do not produce greenhouse gas emissions.



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**Q.12. "Hydrogen is an alternative future source of energy". Comment.**

**Ans.**

- Hydrogen is a very light gas and its density is eight times less than that of natural gas.
- There are no significant problems regarding storage, transportation and dispensation.
- Hydrogen is either formed through the steam reformation of natural gas or through electrolysis of water with renewable energies such as solar, wind and geothermal.
- More than 90% of world's energy requirement are met by burning fossil fuels which leads to emission of carbon dioxide and other toxic gases, which results in global warming. A hydrogen based transport system has the potential to play an important role in reducing greenhouse gas emissions.
- To propel vehicles, hydrogen can be burnt directly in internal combustion engine (ICEs) or can be used as fuel for producing electricity in fuel cells.
- The electricity is produced by an electrochemical reaction. The electric power is then used to power an electric motor in the vehicle.
- Fuel cell driven vehicles have great potential to be more efficient and eco friendly than conventional fuel-driven vehicles,
- The vehicles will only emit steam and will not emit any greenhouse gases.



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## **BAS 104/204: ENVIRONMENT AND ECOLOGY**

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**Q.13. What is the role of forests or forest resources in human existence?**

**Ans.**

#### **Role of forests or forest resources in human existence**

Forests, because of their ecological resources, play a vital role in human existence. Forests provide indirect benefits by helping to sustain and control biophysical components of the ecosystem, such as climate and water.

- Humans depend on forests for food or fuel, and many call forests home. Forests provide us with oxygen, shelter, jobs, water, nourishment and fuel..
- Forests help prevent erosion and enrich and conserve soil, helping to protect communities from landslides and floods and producing the rich topsoil needed to grow plants and crops.
- Forests, in particular, have played an essential role in the biogeochemical control of the carbon and water cycles, the supply of wood and non-wood forest products.
- Forests also play an important role in the global water cycle, moving water across the earth by releasing water vapor and capturing rainfall. They also filter out pollution and chemicals, improving the quality of water available for human use.



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## BAS 104/204: ENVIRONMENT AND ECOLOGY

### Unit-2 : Natural Resources



Q.14. What is deforestation ? Give main causes, and adverse effects of deforestation.

OR

What are the various factors which influence the deforestation and list out the impact of deforestation?

OR

What is deforestation ? Enumerate and discuss the various causes for deforestation.

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**Ans. Deforestation** is the large-scale removal of trees from forests (or other lands) for the facilitation of human activities. It is a serious environmental concern since it can result in the loss of biodiversity, damage to natural habitats, disturbances in the water cycle, and soil erosion. Deforestation is also a contributor to climate change and global warming. Deforestation has significant environmental, social, and economic impacts. Forests cover approximately 31% of the total land surface of the Earth.



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### Causes or factors influencing Deforestation

1. **Agricultural Expansion:** The conversion of forests into agricultural land is a major driver of deforestation. As the global demand for food increases, more land is cleared for farming, especially for crops like soy, palm oil, and cattle ranching.
2. **Logging:** The logging industry, both legal and illegal, is responsible for clearing large areas of forests. Timber is in high demand for construction, furniture, and paper production.
3. **Infrastructure Development:** The construction of roads, highways, and urban areas often leads to deforestation as trees are cleared to make way for these projects. This is particularly evident in developing countries undergoing rapid industrialization.
4. **Mining:** Extraction of minerals and other resources from forests contributes to deforestation. This can result in habitat destruction and pollution, impacting both flora and fauna.
5. **Forest Fires:** Natural and human-induced fires can cause extensive damage to forests, leading to deforestation. In some cases, forests are intentionally set on fire for agricultural purposes, which can spiral out of control.



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#### Causes or factors influencing Deforestation

6. **Climate Change:** Changing climatic conditions, including increased temperatures and altered precipitation patterns, can stress forests and make them more susceptible to diseases and pests. This, in turn, may lead to deforestation as weakened trees are more vulnerable to logging or fires.
7. **Population Pressure:** High population density in certain regions can contribute to increased demand for land and resources, leading to deforestation as a means of meeting these demands.
8. **Government Policies and Regulations:** Weak or poorly enforced forest conservation policies can contribute to deforestation. In some cases, policies that prioritize economic development over environmental conservation can lead to unsustainable land use practices.



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### Adverse effects of Deforestation( On Environment)

Deforestation has numerous adverse effects on the environment, biodiversity, climate, and even human societies. Some of the major consequences include:

1. **Loss of Biodiversity:** Forests are home to a vast array of plant and animal species. When trees are cleared, many species lose their habitats, leading to a decline in biodiversity. Some species may face extinction, and the overall ecosystem becomes less resilient.
2. **Climate Change:** Forests play a crucial role in regulating the Earth's climate by absorbing and storing carbon dioxide (CO<sub>2</sub>). When trees are cut down or burned, this stored carbon is released into the atmosphere, contributing to the greenhouse effect and global warming.
3. **Disruption of Water Cycles:** Trees play a vital role in maintaining local and regional water cycles. Deforestation can disrupt these cycles, leading to altered precipitation patterns, reduced water quality, and increased risk of floods and droughts.



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- 4. Soil Erosion:** Tree roots help bind soil together, preventing erosion. When trees are removed, especially on slopes, the soil becomes more susceptible to erosion. This can result in landslides, decreased soil fertility, and sedimentation of water bodies.
- 5. Increased Greenhouse Gas Emissions:** Beyond the immediate release of carbon stored in trees, deforestation can lead to ongoing emissions as the cleared land is often used for agriculture or other purposes that involve the use of fossil fuels and other emission sources.
- 6. Impact on Indigenous Peoples:** Indigenous communities often rely on forests for their livelihoods, cultural practices, and sustenance. Deforestation can threaten their way of life, leading to displacement, loss of resources, and challenges to their cultural heritage.
- 7. Decreased Rainfall:** Forests contribute to the formation of clouds and precipitation. The removal of trees can disrupt local weather patterns, potentially leading to decreased rainfall in the affected areas.
- 8. Air and Water Pollution:** Deforestation can contribute to increased pollution as the absence of trees allows pollutants to reach water bodies more easily. Without the natural filtration provided by forests, water quality may deteriorate..



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