

The background features a light gray gradient with several realistic water droplets of various sizes scattered in the corners. A faint, circular watermark logo is visible in the upper center of the page.

Earth Resources and Man

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Earth Resources and Man

❖ The Earths resources on which mankind is dependent are provided by various sources or 'spheres'

1) Atmosphere

- Oxygen for human respiration (metabolic requirements)
- Oxygen for wild fauna in natural ecosystems and domestic animals used by man as food
- Oxygen as a part of carbon dioxide, used for the growth of plants (in turn are used by man)

To continue to support life, atmosphere (Air) must be kept clean

Major pollutants of air are created by:

- ✓ Industrial units that release various gases such as carbon dioxide, carbon monoxide and toxic fumes into the air
- ✓ Burning fossil fuel pollutes air resulting into the buildup of carbon dioxide which is known as 'greenhouse effect' in the atmosphere leading to current global warming
- ✓ The growing number of scooters, motorcycles, cars, buses and trucks which run on fossil fuel (petrol and diesel) is a major cause of air pollution in cities and along highways

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2) Hydrosphere

- Clean water for drinking (a metabolic requirement for living processes)
 - Water for washing and cooking
 - Water used in agriculture and industry
 - Food resources from the sea, including fish, crustacea, sea weed, etc
 - Food from fresh water sources, including fish, crustacea and aquatic plants
 - Water flowing down from mountain ranges harnessed to generate electricity in hydroelectric projects
- ✓ Human activities such as deforestation create serious changes in the hydrosphere. Once land is denuded of vegetation, the rain erodes the soil which is washed into the sea
- ✓ Chemicals from industry and sewage find their way into rivers and into the sea. Water pollution thus threatens the health of communities as all our lives depend on the availability of clean water. This once plentiful resource is now becoming rare and expensive due to pollution

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3) Lithosphere

- Soil, the basis for agriculture to provide us with food
- Stone, sand and gravel, used for construction
- Micronutrients in soil, essential for plant growth
- Microscopic flora, small soil fauna and fungi in soil, important living organisms of the lithosphere, which break down plant litter as well as animal wastes to provide nutrients for plants
- A large number of minerals on which our industries (**Copperbelt Mines**) are based
- Oil, coal and gas, extracted from underground sources. It provides power for vehicles, agricultural machinery, industry, and for our homes

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4) Biosphere

- Food, from crops and domestic animals, providing human metabolic requirements
- Food, for all forms of life which live as interdependent species in a community and form food chains in nature on which man is dependent
- Energy needs: Biomass fuel wood collected from forests and plantations, along with other forms of organic matter, used as a source of energy
- Timber and other construction materials

✓ **NOTE:** All four spheres are closely inter-linked systems and are dependent on the integrity of each other. Disturbing one of these spheres in our environment affects all the others

✓ Activity 1:

- Explain how the atmosphere, hydrosphere and lithosphere are all connected through the hydrological cycle

✓ Activity 2:

- Take a simple object in daily use and track its components back to each of its spheres

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- ❖ Natural resources and associated problems
 - **The unequal consumption of natural resources:**
 - ✓ A major part of natural resources are today consumed in the technologically advanced or 'developed' world including some other few 'developing nations' such as India and China, who also over use many resources because of their greater human population
 - **Planning Land use:**
 - ✓ Land itself is a major resource, needed for food production, animal husbandry, industry, and for our growing human settlements
 - ✓ Thus it is essential to evolve a rational land-use policy that examines how much land must be made available for different purposes and where it must be situated
 - ✓ Scientists today believe that at least 10 percent of land and water bodies of each ecosystem must be kept as wilderness for the long-term needs of protecting nature and natural resources

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The need for sustainable lifestyles:

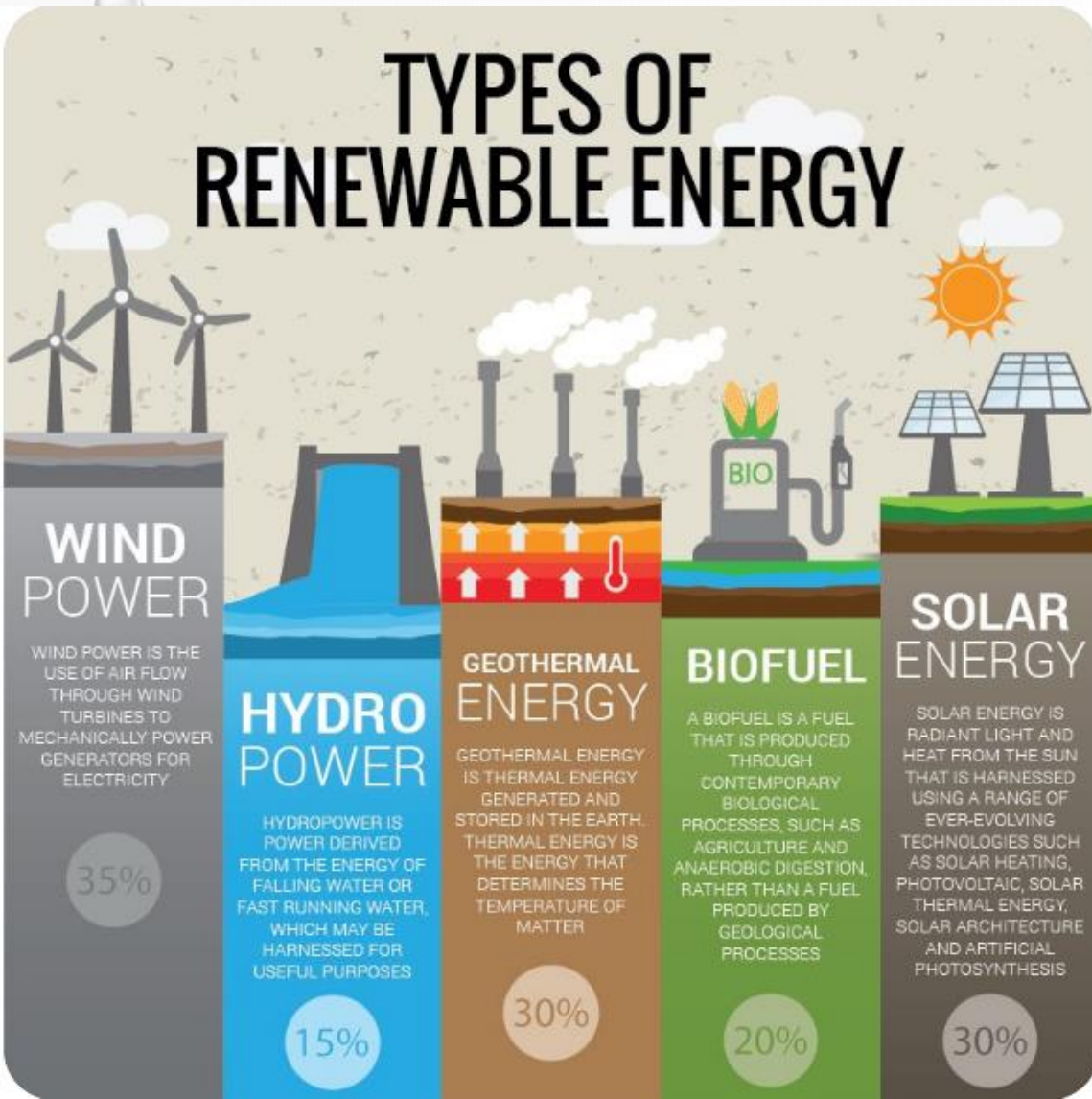
The quality of human life and the quality of ecosystems on earth are indicators of the sustainable use of resources. There are clear indicators of sustainable lifestyles in human life.

- Increased longevity
- An increase in knowledge
- An enhancement of income

These three together are known as the 'Human development index'.

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❖ Renewable and Non-renewable resources



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a) Forest Resources

- **Use and overexploitation:** People who live in or near forests know the value of forest resources first hand because their lives and livelihoods depend directly on these resources
- ✓ The water we use depends on the existence of forests on the watersheds around river valleys
- ✓ Our homes, furniture and paper are made from wood from the forest
- ✓ We use many medicines that are based on forest produce
- ✓ And we depend on the oxygen that plants give out and the removal of carbon dioxide we breathe out from the air

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FOREST FUNCTIONS

Watershed protection:

- Reduce the rate of surface run-off of water.
- Prevent flash floods and soil erosion.
- Produces prolonged gradual run-off and thus prevent effects of drought.

Atmospheric regulation:

- Absorption of solar heat during evapo-transpiration.
- Maintaining carbon dioxide levels for plant growth.
- Maintaining the local climatic conditions.

Erosion control:

- Holding soil (by preventing rain from directly washing soil away).

Land bank:

- Maintenance of soil nutrients and structure.

Local use - Consumption of forest produce by local people who collect it for subsistence – (Consumptive use)

- Food - gathering plants, fishing, hunting from the forest.
(In the past when wildlife was plentiful, people could hunt and kill animals for food. Now that populations of most wildlife species have diminished, continued hunting would lead to extinction.)
- Fodder - for cattle.
- Fuel wood and charcoal for cooking, heating.
- Poles - building homes especially in rural and wilderness areas.
- Timber – household articles and construction.
- Fiber - weaving of baskets, ropes, nets, string, etc.
- Sericulture – for silk.
- Apiculture - bees for honey, forest bees also pollinate crops.
- Medicinal plants - traditionally used medicines, investigating them as potential source for new modern drugs.

Market use - (Productive use)

- Most of the above products used for consumptive purposes are also sold as a source of income for supporting the livelihoods of forest dwelling people.
- Minor forest produce - (non-wood products): Fuelwood, fruit, gum, fiber, etc. which are collected and sold in local markets as a source of income for forest dwellers.
- Major timber extraction - construction, industrial uses, paper pulp, etc. Timber extraction is done in India by the Forest Department, but illegal logging continues in many of the forests of India and the world.

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Deforestation:

- ✓ In countries where civilizations have looked after forests resources cautiously, they have prospered, and where forests have been destroyed, the people were/are gradually impoverished
- ✓ Today mining is serious cause of loss of forests in our country (Zambia) and all over the world
- ✓ Dams built for hydroelectric power or irrigation have submerged forests and have displaced tribal people whose lives are closely knit to the forest. This has also become of serious cause of concern in Zambia
 - *Therefore, what needs to be understood is that long-term ecological gains cannot be sacrificed for short-term economic gains that unfortunately lead to deforestation*

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b) Water resources

- The water cycle, through evaporation and precipitation, maintains hydrological systems which form rivers and lakes and support in a variety of aquatic ecosystems
 - All aquatic ecosystems are used by a large number of people for their daily needs such as drinking water, washing, cooking, watering animals, and irrigating fields
 - Water covers 70% of the earth's surface but only 3% of this is fresh water. Of this, 2% is in polar ice caps and only 1% is usable water in rivers, lakes and subsoil aquifers
- ❑ *One of the greatest challenges facing the world (Zambia inclusive) is the need to rethink the overall management of water resources*
- ❑ *Studies indicate that a person needs a minimum of 20 to 40 liters of water per day for drinking and sanitation*

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❖ **Overutilization and pollution of surface and groundwater:**

- ✓ Overutilization of water occurs at various levels. Most people use more water than they really need
- ✓ Agriculture also pollutes surface water and underground water stores by the excessive use of chemical fertilizers and pesticides
- ✓ Industry tends to maximise short-term economic gains by not bothering about its liquid waste and releasing it into streams, rivers and the sea

❖ **Global climate change:** Changes in climate at a global level caused by increasing air pollution have now begun to affect our climate. Everywhere the 'greenhouse effect' due to atmospheric pollution is leading to increasingly erratic and unpredictable climatic effects. This has seriously affected regional hydrological conditions

- ❑ *As people begin to learn about the serious health hazards caused by pesticides in their food, public awareness can begin putting pressures on farmers to reduce the use of chemicals that are injurious to health*
- ❑ *The polluting industry that does not care for the environment and pays off bribes to get away from the cost needed to use effluent treatment plants may eventually be caught, punished and even closed down*

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❖ **Sustainable water management:** ‘Save water’ campaigns are essential to make people everywhere aware of the dangers of water scarcity

These include measures such as:

- **Building several small reservoirs instead of few mega projects**
- Develop small catchment dams and protect wetland
- **Soil management, micro catchment development and afforestation permits recharging of underground aquifers thus reducing the need for large dams**
- Treating and recycling municipal waste water for agricultural use
- **Preventing leakages from dams and canals**
- Preventing loss in Municipal pipes
- **Effective rain water harvesting in urban environments**
- Water conservation measures in agriculture such as using drip irrigation
- **Pricing water at its real value makes people use it more responsibly and efficiently and reduces water wasting**

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c) Mineral Resources

- A mineral is a naturally occurring substance of definite chemical composition and identifiable physical properties
- An ore is a mineral or combination of minerals from which a useful substance, such as a metal, can be extracted and used to manufacture a useful product at a profit
- ✓ Iron, aluminum, zinc, manganese and copper are important raw materials for industrial use
- ✓ Important non-metal resources include coal, salt, clay, cement and silica
- ✓ Stone used for building material, such as granite, marble, limestone, constitute another category of minerals

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- ❖ **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. Mining operations generally progress through several stages some of which includes:
 - ✓ **Prospecting:** Searching for minerals
 - ✓ **Exploration:** Assessing the size, shape, location, and economic value of the deposit
 - ✓ **Development:** Work of preparing access to the deposit so that the minerals can be extracted from it
 - ✓ **Exploitation:** Extracting the minerals
- ❖ In the past, mineral deposits were discovered by prospectors in areas where mineral deposits in the form of veins were exposed on the surface
- ❖ Today, however, prospecting and exploration is done by teams of geologists, geophysicists, and geochemists who work together to discover new deposits

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Environmental problems:

- Mining operations are considered one of the main sources of environmental degradation. The extraction of all these products from the lithosphere has a variety of side effects
- Depletion of available land due to mining, waste from industries, conversion of land to industry and pollution of land, water and air by industrial wastes, are environmental side effects of the use of these non-renewable resources

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e) Energy resources

- We use energy for household use, agriculture, production of industrial goods and for running transport systems
- However, it is estimated that the currently used methods of using energy sources together will be insufficient to meet foreseeable global demands for power generation beyond the next 50 to 100 years

❖ **Thus**, when we use energy wastefully, we are contributing to a major environmental disaster for our earth. We all need to become responsible energy users

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Non-Renewable Energy Sources:

- These consist of the mineral based hydrocarbon fuels (e.g., coal, oil and natural gas) that were formed from ancient prehistoric forests called 'fossil fuels' because they are formed after plant life is fossilized
- At the present rate of extraction there is relatively enough coal. However, Oil and gas resources however are likely to be used up within the next 50 years

Oil and its environmental impacts:

- The processes of oil and natural gas drilling, processing, transport and utilisation have serious environmental consequences, such as leaks in which air and water are polluted and accidental fires that may go on burning for days or weeks before the fire can be controlled
- During refining oil, solid waste such as salts and grease are produced which also damage the environment
- Oil slicks are caused at sea from offshore oil wells, cleaning of oil tankers and due to shipwrecks

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Coal and its environmental impacts:

- Coal is the world's single largest contributor of green house gases and is one of the most important causes of global warming
- Many coal-based power generation plants are not fitted with devices such as electrostatic precipitators to reduce emissions of suspended particulate matter (SPM) which is a major contributor to air pollution
- Burning coal also produces oxides of sulphur and nitrogen which, combined with water vapour, lead to 'acid rain'. This kills forest vegetation, and damages architectural heritage sites, pollutes water and affects human health
- Thermal power stations that use coal produce waste in the form of 'fly ash'. Large dumps are required to dispose off this waste material, while efforts have been made to use it for making bricks

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ROLE OF INDIVIDUALS IN CONSERVATION OF EARTH'S RESOURCES

- The two most damaging factors leading to the current rapid depletion of all forms of natural resources are increasing 'consumerism' on the part of the affluent sections of society, and *rapid population growth*

Both factors are the results of choices we make as individuals

As individuals we need to decide;

- What will we leave to our children? (Are we thinking of short-term or long-term gain?)
- Is my material gain someone else's loss?

✓ Greed for material goods has become a way of life for a majority of people in the world

✓ Reduction of the unsustainable and unequal use of resources, and control of our population growth are essential for the survival of our nation and indeed of human kind everywhere

If we respect this we cannot commit acts that will deplete our life supporting systems