Volume 1
NEW EDITION

ENVIRONMENTAL STUDIES

Authored By

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Environmental Studies

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Preface

Environmental literacy is described as "the degree to which individuals possess an objective and educated grasp of environmental concerns." Today, it is critical to have a working knowledge of environmental concerns. This is because the human economy is involved in a broad variety of activities that are wreaking havoc on the ecosystems that support both our species and the Earth's biological heritage. Pollution, climate change, failing fisheries, deforestation, soil degradation, species extinctions and endangerment, and other impacts are all evidence of this.

Nonetheless, we do not need to be too negative. If our society takes positive action now, or in the near future, it will not be too late to avoid or fix many of these serious environmental issues that endanger the wellbeing of humans and the majority of other species. Within certain parameters, people are clairvoyant beings, and our society is capable of establishing a sustainable economy that supports both our lives and healthy environments.

However, it is evident that any sustainable economy would need business models that are distinct from those that have lately been prevalent. Additionally, it will need major adjustments in the habits of many people, particularly those in India. In the end, such socioeconomic revolutions must use far less energy, materials, and other resources than many of us take for granted today. Additionally, a more respectful attitude toward the natural environment is critical.

Achieving this shift will need people to have a firm grasp of environmental challenges. Restriction of access to resources will first be unsettling for a large number of individuals. Nonetheless, we think that individuals will be more receptive to lifestyle adjustments if they understand the rationale for such adjustments in terms of future generations' livelihoods and ecological sustainability in general. With this perspective, the

majority of people will favour economic and social reforms that preserve the quality of their current and future surroundings.

A widespread environmental literacy would be critical if India is to successfully transition to an environmentally viable economy. This book was written in that context to assist Indian students at universities and colleges in developing an impartial and well-informed awareness of critical environmental challenges.

Naturally, much work has been spent updating the contents in this data-rich textbook. This was done when new data became available, ensuring that the information is current and accurate.

Additionally, the book's language and structure have been extensively modified to increase its clarity and accessibility, with the goal of making the subject more accessible to undergraduate engineering students.

- Dr. B. S. Ravi Kumar
- Dr. S. Ravi Kiran
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We appreciate the publisher for his painstaking effort in bringing out this book. Any suggestion for the improvement of the book is most welcome.

- **Dr. B. S. Ravi Kumar**
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ENVIRONMENTAL STUDIES

UNIT 1

INTRODUCTION TO ENVIRONMENTAL STUDIES

UNIT - I

INTRODUCTION TO ENVIRONMENTAL STUDIES

Unit 1: Introduction to Environmental Studies

1.1 Multi-Disciplinary Nature of Environmental Studies

Environmental studies concern any topic that has an impact on an organism. It is a multi-disciplinary approach to understanding our natural environment and the human influences on it. It is an analytical science because it looks for viable solutions to keep human society afloat on the planet's dwindling resources.

Environmental science is also studying the external conditions that affect the growth and development of plants, animals, and other organisms.

Environmental studies have the following objectives:

- Attitude: It is a kind of consideration for the enhancement and conservation of the environment.
- Skill: Identifying and addressing environmental issues.
- Participation: Creating opportunities for people to get involved in addressing conflicts and preserving our climate.
- Knowledge: Obtaining or acquiring a basic understanding of the climate and environmental issues.
- Awareness: To raise public awareness about the environment.

1.1.1 EVS's multi-disciplinary Nature:

The field of EVS deals with both the natural and constructed worlds. Underlying themes such as genetics, chemistry, geography, science, etc. As a consequence, environmental science is defined as multi-disciplinary. The Earth has impacted the organisms. Students on this course can deal with the dynamics of environmental issues in several

areas. It is scientific research as well. It studies climate, water, soil, and biological organisms; it also explores the effect of human activity on these. Students study interdisciplinary and problem-solving techniques in environmental science.

1.2 Components of the environment

There are four parts of the environment.

- Atmosphere- The gaseous blanket that surrounds the earth.
- Hydrosphere – The earth's various bodies of water.
- Lithosphere- The earth's lithosphere contains a variety of soils and rocks.
- Biosphere- All living organisms and their relationships with the atmosphere make up the biosphere.

A. Atmosphere

- It is present around the World
- It ranges up to 20,000km
- It consists of gases (Nitrogen-78 %, Oxygen-21 %, Argon-0.9 %, and other gases contained in trace amounts), as well as some liquid and solid particles suspended in it.

Fig 1 The Earth's Atmospheric Layers

This atmosphere is separated into five layers vertically based on the distribution of temperature:

I. Troposphere

- It is the lowest layer of the atmosphere, where the temperature decreases as altitude increases.
- Winds from clouds in this layer range up to 8/ 10 km and comprise 90% of the air in the atmosphere.
- Seasonal variations are common in this layer.

II. Stratosphere

- It exists above the troposphere, and the temperature increases as altitude increases.
- Long-range planes travel in the lower portion of the stratosphere, which ranges up to 50 kilometres.
- Above 30 kilometres in the stratosphere, ozone molecules are abundant, and this area is known as the ozone layer. It protects the earth's life from UV radiation.

III. Mesosphere

- It is located between 50 and 100 kilometres above sea level.
- A decrease in temperature distinguishes it.

IV. Thermosphere

- It reaches up to 400 kilometres beyond the mesosphere.
- Here the temperature increases rapidly to 1000 degrees Celsius.

V. Exosphere

- It is located above the thermosphere at a distance of more than 400 kilometres.
- The density of the atmosphere in this layer is very low.

The atmosphere is essential for life on Earth because it provides oxygen for respiration, carbon dioxide for photosynthesis, rain, and temperature. It also stops the Sun's ultraviolet rays from reaching the Earth.

B. Hydrosphere

- The Hydrosphere is the water layer on Earth's atmosphere, containing all liquids, suspended surface water, groundwater held in rocks and soils, and water vapours.
- The world's water supply is projected to be more than 1 46,000 cubic kilometres.

- Oceans and seas cover approximately 97 % of the earth's surface.
- Polar ice caps and glaciers account for 2% of the Earth's surface area.
- Freshwater sources, groundwater, and atmospheric vapour account for 1% of total water.
- The hydrologic cycle keeps all of the water in the hydrosphere in continuous circulation.
- It contains oceans, rivers, streams, ponds, and wetlands, among other things.

C. Lithosphere

- The lithosphere is the stable portion of the Earth, and it is made up of soil, minerals, and rocks.
- The Lithosphere is divided into three layers:
- The Earth's crust, the Mantle, and the Core.

Fig 2 - The Inner Layers of the Earth

- The Crust is the Earth's outermost stable region, with a thickness ranging from 12 to 60 kilometres;
- The Mantle is the middle layer, in a liquid state, with a thickness of 2,900 kilometres;
- The Core is composed of Nickel which Iron, and is solid and molten in state. The centre has a thickness of around 2,500 kilometres.

D. Biosphere

- Biosphere refers to all living organisms on Earth, including plants, animals, and microorganisms; it is also known as the Ecosphere.
- Organisms, Populations, Communities, and Ecosystems make up the biosphere.
- Plants and animals come under organisms.
- A population is a group of plants or animals that live in the same place—for example, All the Oak trees in the forest.
- A community refers to all of the plants and animals that live in a given environment;
- An ecosystem refers to all non-living things, plants, and animals that live in a given area and their habitats

1.3 Scope and Importance

When we look at our neighbourhood, we can see that it consisted of a jungle, a mountain, and a desert, before humans encroached upon it. Much of us remain in regions that humans have heavily modified. Our fuelwood comes from grasslands and waterways, seashores, and farms that rely on crops and livestock.

We are bound to our surroundings inescapably, thus. We use water for everyday activities. We breathe oxygen, get food from resources, and are a part of the biosphere, which is part of an ecosystem of living plants and animals. All about our environment has an effect on us and everything else.

We rely on Nature so much that we cannot let the planet's natural resources go to waste. Most people see our world as "Mother Nature"

has caused most peoples to become environmentally conscious. As a result, certain cultural traditions evolved to help maintain and preserve the natural resources of long- India has historically respected all living things. These ideas influence our rituals.

Unfortunately, the global expectation is that technical improvements would yield quick alternatives to new energy sources. Increased fertilization and chemical use in agriculture yielded rapid economic development and the building of large dams, for instance. This mode of development, on the other hand, led to environmental degradation.

Due to industrialization and large-oriented agriculture, water use, minerals, fuel, and timber use, natural resources are becoming more scarce. Depletable resources without considering future generations Renewable tools, such as timber and runoff, may be used. However, if we use them enough, Nature will eventually replenish them. If timber consumption exceeds the rate of recovery, then the stock is depleted.

Additionally, deforestation depletes forest wealth, such as timber and non-wood products, and damages our water supplies since it absorbs and releases water. Short answer: Deforestation is a significant reason for monsoon floods. We must be careful in the coming years to account for the number of environmental impacts produced by long-producing work. The importance of our natural capital is equivalent to reserves. When we spend everything, the money is gone. On the other hand, our only source of income will be interesting. This is sustainable use.

We must consider and be concerned about our environmental problems and concerns. We, each of us, should be more worried about our global environment. Surplus of energy, rapid population growth, and over-consumption Many of our unhealthy habits are environmentally taxing. As a result, we must reevaluate our energy and be environmentally friendly.

1.4 Concept of sustainability and sustainable development

Sustainability and sustainability are important issues today. Over the twentieth century, population growth in the developing world raised

environmental issues, and resource-constrained countries brought on humans' awareness of the inherent complexities. The pros and cons of development and global prosperity are debated. Let's see how Earth and human institutions' capability responds to social change.

To gain a greater appreciation of the relationship with nature, it is beneficial to study its historical role in human development.

1.4.1 The evolution of environmental concerns from early society to the present modern society

Human evolution has created unsustainable conditions since the dawn of time. Old civilizations had to confront issues concerning cultural evolution. The most outstanding example of water supply and waste management practices of ancient Athens The sustainability issues are ancient. The industrial revolution, which took place between the 18th and 19th century, profoundly changed social values and behaviour. It's resulting in exponential population growth. Over the twentieth century, the world's GDP has almost tripled.

The incorporation of steam into modern manufacturing methods showed the vital importance of energy, initially generated by the steam engine, on the local and global economies. To generate power, conventional, alternative, and/green energy are used. Processing power influences the environment. Indeed, the Industrial Revolution and the result of increased use of coal led to unparalleled levels of waste. There has been more or less pollution of rivers and wetlands since the turn of the century. In the 1800s, water was running in much of Europe. With time, water, pollutants build-up, and anoxic conditions take hold.

Socialization has a variety of unintended and otherwise unacceptable consequences. A few examples:

This led to an increase in water demands and the pollution of the surface and groundwater, which necessitated the implementation of resource management strategies. This has little effect on electricity generation. It has to do with the increasing need for water due to socioeconomic development.

The dams and canals built for the production of electricity altered river habitats. Environmental flow is described as the sum of freshwater and estuarine ecosystems, how, and where it gets.

The supply of oil has dwarfed the market, which is fulfilled mainly by the combustion of fossil fuels. The amount of CO₂ in the atmosphere has risen over the last century. Fossil fuels may be the leading cause of this rise in CO₂ levels. The world is warming after the mid-twenties. The past of our time finds us to be unsustainable. Recent understandings of these issues have pushed them to use a more practical approach.

1.4.2 Conferences on the climate and sustainability held globally

The realization that global human growth could be unsustainable prompted politicians and policymakers to encourage international conferences to discuss possible solutions. The Council of Europe's first environmental agreement is the European Water Charter, enacted in 1968. The Charter's key points are:

- ❖ Without water, there is no life. It is a priceless asset that is needed for all human endeavours.
- ❖ The availability of freshwater is limited. It is critical to conserve, monitor, and increase them wherever possible.
- ❖ Pollution of water is harmful to humans and other living beings that depend on it for survival.
- ❖ Water quality must be preserved at acceptable levels for the intended use and follow applicable public health requirements.
- ❖ Reused water should not obstruct the reuse for both public and future private needs.
- ❖ The protection of water supply necessitates the preservation of sufficient plant life cover, preferably forest land.
- ❖ It is essential to determine water supplies. The responsible authorities shall prepare for the wise use of water supplies.
- ❖ Water conservation necessitates increased environmental study, expert recruitment, and public knowledge facilities.

- ❖ Water is a shared resource. All have a responsibility to use water wisely and efficiently.
- ❖ The main objective in water resource management should be natural basins.
- ❖ As a global resource, water needs international cooperation.

"International issues resulting from the use of water shall be resolved by reciprocal consent between the States involved, to protect the quality and quantity of water," the European Water Charter added.

Remember, the first consequences of a social transition is water supply control. Additionally, the Charter emphasizes that international negotiation is essential to tackle environmental problems. As a result, it was first thought that sustainability was seen as a local problem. The effects of excessive resource use seemed like air and water contamination. Thirdly, water is healthy, which makes respecting it an economic. Finally, people have learned how important it is to regulate the state of the water supply.

Sustainability has only lately been recognised as a worldwide challenge, necessitating global adjustments. By the late 20th century, environmental problems become the bigger picture. The global population has grown to focus on non-renewable energy sources in 1973 and 1979. Because of the planetary concerns, the UN General Assembly held the UN Conference on the Human Environment in 1972.

The meeting showed that environmental conservation and human rights are linked in several respects. Such as the right to life, health, the right to privacy (among many others). Concern for the world has raised the likelihood of confrontation with human rights. In the long run, we must allow everybody the right to a healthy environment.

Despite different viewpoints and ideas, the conference settled on environmental standards, which included 109 sustainability initiatives. Safe environmental capital, but also change the climate, the Stockholm principle states.

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