ENVIRONMENTAL PLANNING & PRACTICE

A Postgraduate Course

Course Code: EDHN-6001



Department of Nutritional Sciences & Environmental Design,
Faculty of Sciences

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

ENVIRONMENTAL PLANNING & PRACTICE

A Postgraduate Course

Course Code EDHN : 6001

Department of Nutritional Sciences and Environmental Design
Faculty of Science
ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD

(All rights are reserved with the publishers)

Year of Printing..... 2025

First Edition 2025

Quantity: 1000

Composed by ..... Ummad Ahmed Shad

Incharge Printing Press ..... Dr. Sarmad Iqbal

Printer..... AIOU, Islamabad.

Publisher ..... AIOU, Islamabad.

COURSE TEAM

CHAIRMAN OF THE DEPARTMENT	Dr. Zaheer Ahmed
COURSE COORDINATOR	Dr. Muhammad Farooq Mustafa Assistant Professor, Department of Nutritional Sciences & Environmental Design, AIOU.
PROGRAM COORDINATOR	Ar. Nazia Iftikhar Lecturer, Department of Nutritional Sciences & Environmental Design, AIOU.
WRITER	Dr. Muhammad Farooq Mustafa Assistant Professor, Department of Nutritional Sciences & Environmental Design, AIOU.
REVIEWERS	Dr. Rabeea Zafar Lecturer, Department of Nutritional Sciences & Environmental Design, AIOU. Ar. Nazia Iftikhar Lecturer, Department of Nutritional Sciences & Environmental Design, AIOU.
DESIGNER	To be Allocated by IET
EDITOR	Humera Ejaz
PRODUCER	To be Allocated by IET

PREFACE

With immense pride, we present the study guide for the Postgraduate Diploma in Sustainable Environmental Design at Allama Iqbal Open University. This program epitomizes our commitment to integrating environmental stewardship with innovative design practices in tackling some of the most pressing challenges facing humanity and in shaping a sustainable future.

More than ever before, the need for rapid environmental changes and ever-growing concerns toward sustainability is great in today's age. The PGD program is specially designed to provide students with the knowledge, skills, and practical insight needed to lead in such a dynamic field. Our curriculum integrates advanced design principles with sustainable practice, hence responding not only to the current needs of the industry but also foreseeing the future track in environmental design. This includes the use of sustainable materials, systems that efficiently utilize energy, eco-friendly construction methods, and integrations of natural ecosystems within the built environment which is necessary in designing solutions to current and future environmental demands.

This study guide serves as an overall map of courses that will render our students into capable and forward-looking citizens and designers. It, therefore, gives an outline of the course objectives, structure, and all the key components that will leave our students well-prepared for challenges with innovative, realistic, and sustainable solutions.

At Allama Iqbal Open University, we pride ourselves on being an epicenter of excellence in education and research. The PGD in Sustainable Environmental Design is proof of our continued quest to further knowledge and practice towards the betterment of local and global communities. This course will be your guide on how to engage with materials, interact with your peers, and take up the challenge to meaningfully impact the field of sustainable environmental design.

I wish the very best to all students in this pursuit. The program will enrich and transform you to be one of the leading creation contributors to a sustainable and resilient future.

Warm Regards,

Prof. Dr. Nasir Mahmood
Vice Chancellor,
Allama Iqbal Open University

MESSAGE FROM DEAN

Dear Students,

I extend a warm welcome to all of you enrolled in the Postgraduate Diploma in Sustainable Environmental Design (SED) program offered by the Department of Nutritional Sciences and Environmental Design (NSED). I hope this message finds you in good health and high spirits.

As we embark on this enriching journey together, I want to emphasize the significance of sustainable design in our collective goal of creating environmentally responsible and energy-efficient built environments. Sustainable Environmental Design is not merely a theoretical pursuit; it is a vital approach that can profoundly influence our planet's health and the quality of life for future generations. By understanding the principles of sustainability and their application in design, we can play a pivotal role in reducing resource consumption, enhancing occupant well-being, and fostering environmental stewardship.

To support your learning, we have developed comprehensive study guides that will help you grasp the principles and applications of Sustainable Environmental Design. These guides cover a wide range of topics, including but not limited to climate-responsive design, sustainable materials, energy-efficient technologies, and innovative building practices. Engaging thoroughly with this material will empower you to create designs that are not only functional but also environmentally sustainable.

I encourage you to dive deeply into the course content, participate actively in discussions, and apply what you learn to your projects. Our aim is not merely to succeed in exams, but also to internalize this knowledge and apply it in ways that contribute to a sustainable future. Your active involvement and curiosity are key to mastering these concepts and making a meaningful impact in the field of environmental design.

If you have any questions or need further clarification on any topic, please do not hesitate to reach out. Let's make sustainability and climate responsiveness our top priorities as we explore these vital subjects together.

Best Wishes,
Prof. Dr. Hajra Ahmed

MESSAGE FROM CHAIRMAN

Dear Students,

Welcome to the Department of Nutritional Sciences and Environmental Design's diploma program in SED. I am pleased to announce the development of a comprehensive study guide focused on "Environment Planning & Practice".

This guide aims to develop your base regarding the fundamentals of Environmental planning. The steps ahead include the topics related to design and built environment which will be covered in other courses one by one in the current and forthcoming semesters. This initiative aligns with your professional and personal commitment to prioritizing SED culture. Moreover, the reduction, reuse, recycling and proper disposal of buildings should not be oversighted as it is a key issue in sustainability.

I encourage all students to actively engage with the study guide and utilize its resources to enhance their understanding of SED. By far the most significant feature of the Environmental Design Program and the course Environmental Planning is to raise awareness on environmental parameters at all levels (global to local and community to individual) for bringing lifestyle change to value the sustainability concepts.

Thank you for your attention to this important matter. If you have any questions or suggestions, please don't hesitate to reach out to the program coordinator.

Stay Safe, Stay Vigilant!

Best Wishes

Dr. Zaheer Ahmed
Chairman,
Department of Nutritional Sciences and
Environmental Design (NS&ED)

ACKNOWLEDGEMENT

All praises to **Allah**, who gave me the strength to complete this project. The development of this comprehensive study guide on "Environment Planning & Practice" has been a collaborative effort, drawing upon the expertise and support of numerous individuals. It gives me pleasure to express my profound gratitude and reverence to the Vice Chancellor of Allama Iqbal Open University, **Prof. Dr. Nasir Mehmood** for guiding, facilitating, and supporting the preparation of the course. We extend our heartfelt gratitude to all those who have contributed to the creation of this resource.

I would like to express my sincere appreciation to **Prof. Dr. Hajra Ahmad**, Dean, Faculty of Sciences, for her support and encouragement. Thanks to **Dr. Zaheer Ahmed**, Chairman, Department of Nutritional Sciences and Environmental Design, for his sustenance and trust. All the faculty members, especially **Dr. Rabeea Zafar**, Lecturer, Department of Nutritional Sciences and Environmental Design, **Ar. Nazia Iftikhar**, Lecturer, Department of Nutritional Sciences and Environmental Design, being an expert in environmental sciences, environmental design, architecture, planning and sustainable development, provided valuable insights and guidance throughout this study guide's planning and development stages. Your expertise and dedication have been instrumental in ensuring the content's quality and relevance.

I also acknowledge the contributions of the design and editorial team, production, and printing team who worked diligently to ensure the clarity, coherence, and accessibility of the content presented in this study guide. Your dedication and attention to detail have been essential in bringing this resource to fruition.

Lastly, we extend our deepest appreciation to the post-graduate students who will use this study guide as a tool for learning and professional development. It is our sincere hope that it will serve as a valuable resource in your studies.

Thank you to everyone who has contributed to the creation of this study guide. Your collaboration and support have been invaluable in making this project a reality.

Dr. Muhammad Farooq Mustafa
Course Coordinator

NTRODUCTION TO THE COURSE

Dear student,
Assalam-o- Alaikum,

We welcome you to the PGD Sustainable Environmental Design Course entitled "Environmental Planning and Practice". This course is part of the first semester of your PGD program. For introduction to the course please go through the introductory pages of the course book. This course aims to build the basic concepts and background of the students regarding the environment, its components, their interaction, the issues and their remedies.

OBJECTIVES OF THE COURSE

This course aims to build the basic concepts and background of the students regarding the environment, its components, their interaction, the issues and their remedies. Where other courses are designed to improve your skills, this course would develop your basic knowledge.

UNIT 1

INTRODUCTION

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT – 1: INTRODUCTION

1.1 Scope of Environmental Planning and Practice

1.2 Sustainable Development

1.3 Role of Environmental Planning in Sustainable Development

1.4 The Main “Environmental Agendas”

1.5 Environmental Sustainability

INTRODUCTION

The multidisciplinary process of environmental planning is essential to establishing harmonious and sustainable relationships between people and the environment. It entails the methodical creation and application of environmental management, conservation, and enhancement plans. Environmental planners take into account of factors during this process, including pollution control, resource management, land use, and the overall effects of human activity on the environment.

LEARNING OBJECTIVES

- To introduce the students to the concept of the environment and the scope of its planning.
- To introduce the students to topics like sustainability which is the main theme of the program.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

Environmental planning is the process of assessing how social, political, economic and prevailing factors affect the natural environment when considering development. Society and the environment, both, benefit from successful environmental planning. Society benefits through the effective use of resources and the environment benefits by sustaining itself for future generations. Three components that must be considered for environmental planning are:

- Considering the current status of the environment, and the existing state of the area to be developed
- Vision, considering the laws and needs of the society
- Implementation, considering the materials, personnel and technology required to carry out the plan.

Effective environmental planning requires attention to the current environmental conditions and future challenges of Infrastructure, Policies and Stakeholder involvement. Pollution, waste, floods, droughts, excessive population and transport are all the concerns of today's society. Safeguarding endangered resources, creating new ecological assets and improving degraded sites are vital for the decision-making process.

1.1 SCOPE OF ENVIRONMENTAL PLANNING AND PRACTICE

Planning for the environment refers to human activity that is done consciously to regulate how the built and natural environments are used. Environmental planning has historically been primarily grounded in the multidisciplinary study of environmental systems, mostly grounded in economics and the sciences.

The more recent strategy stresses sustainability and long-term resource management and is more multidisciplinary. These methods include social sciences, ecological economics, and multidisciplinary science.

When making decisions that are necessary to manage the relationships that occur within and between natural systems and human systems, environmental planning is the focus. For the benefit of all parties involved in these systems, both now and in the future, environmental planning aims to manage these processes in an efficient, transparent, equitable, and orderly manner.

Modern environmental planning procedures are the outcome of ongoing improvements and enlargements to the range of these decision-making procedures. Among the primary components of environmental planning in the modern era are:

- Social and economic development
- Urban development
- Regional development
- Natural resource management and integrated land use
- Infrastructure systems
- Governance frameworks

Reducing emissions and reusing materials are the main focus of many environmental planning initiatives nowadays, rather than making adjustments to mitigate the effects of future climate change. The most common explanation for this is the difficulty in anticipating the long-term implications of climate change. The nature of climate action is extremely complex, and the schedule for reducing emissions is uncertain. However, some nations have adopted "anticipatory governance" as a substitute for avoiding adaptation.

To incorporate adaptation into their environmental planning, this strategy aims to investigate the uncertainties surrounding the implications of climate change that are unique to their community.

Future-focused environmental planning scenarios ought to flow naturally into the management of the plans that are enacted. Real life is rarely smooth, particularly in democratic countries where even the best-laid plans have to withstand a barrage of public hearings, stakeholder opinions, and political backbiting. Such proposals are always less successful and more diluted if and when they are adopted.

In addition to having an awareness of the actual world, geo-morphologists who are actively involved in creating, executing, and overseeing management scenarios need to possess the resilience and tact necessary to endure the real world of politics, business, society, and law to which they are bringing their wares.

Furthermore, despite the limitations in environmental regulation, planners do have some authorities that allow them to preserve threatened species, restore damaged areas, and develop new ecological assets. Planners can also be of assistance in integrating the use of environmental resources, which has

historically been ill-coordinated, by applying their mediation and negotiation skills.

To preserve and replenish the depleted resources and guarantee their sustainable usage, the development authorities and non-governmental organizations in Pakistan also need to coordinate their activities.

1.2 SUSTAINABLE DEVELOPMENT

A method of social, economic, and environmental planning known as "sustainable development" aims to strike a balance between the requirements of the current and future generations on the one hand, and the necessity of protecting the environment on the other.

Although there are many ways to understand the idea of sustainable development, at its foundation is a method of development that seeks to strike a balance between many, frequently conflicting goals and an understanding of the social, economic, and environmental constraints that our society must work within.

By using indicators that track changes in the economic, social, and environmental spheres, nations can create systems for tracking and assessing their progress towards attaining sustainable development.

The goal of this course is to provide a fundamental and foundational understanding of sustainability and sustainable development. We will quickly go over each of the major life domains in this section where adopting sustainable behaviors will help us protect and preserve ourselves down the road.

1.3 ROLE OF ENVIRONMENTAL PLANNING IN SUSTAINABLE DEVELOPMENT

Sustainable development is a strategy by which communities seek economic development approaches that also benefit the local environment and quality of life. Where traditional approaches can lead to congestion, sprawl, pollution and resource over-consumption, sustainable development offers real, lasting solutions that will strengthen our future.

Sustainable development is not a new concept. Rather it is the latest expression of a long-standing ethic involving people’s relationships with the environment and the current generation’s responsibility towards future generations. For a community to

be truly sustainable, it must adapt to an approach that holistically considers the following:

- **Human sustainability:** Aims to maintain the human capital in the society. Investments in health and education systems along with better job prospects and achieving economic well-being for everyone

- **Social/ cultural sustainability:** Focus on maintaining and improving the social and cultural resources in terms of cohesion amongst people.

- **Economic sustainability:** Aims to maintain the capital intact, and improve the standard of living of people

- **Environmental sustainability:** Aims to provide human welfare through protection and efficient use of natural resources i.e.: land, air, water, minerals etc.

Environmental planning plays an important role in sustainable development. It encourages maintaining sustainable agricultural practices (integrating environmental health, economic profitability and social & economic equity), forestry (sustainable timber harvest and forest ecosystem) and carrying out water and soil conservation.

It also stresses the need for sustainable energy development by using the concept of integrated energy management by using both fossil fuels and alternative renewable resources.

Sustainable architecture refers to buildings/ built structures that are designed to minimize humanity's impact on the environment. It includes every aspect of the planning and construction process i.e.: building materials, design and implementation of structures, heating, cooling, plumbing, waste & ventilation systems and the integration of the built environment into the natural landscape.

In the modern day, the works of Japanese architect Shigeru Ban, using recycled cardboard tubing in his built structures and designs, is a good example of sustainable architecture.



Figure 1: Cardboard Pavillion at Abu Dhabi Art Fair- By Shingeru Ban

1.4 THE MAIN "ENVIRONMENTAL AGENDAS"

Climate change, biodiversity preservation, economic collaboration, migration, and, most recently, freshwater, energy, food and agriculture, are all on the global environmental agenda. Nearly every country, big business, and non-governmental organization takes part in programmes that aim to achieve one or more of these policy objectives. Nevertheless, there is still a lack of timely and reliable scientific evidence to address these issues. Information regarding the aforementioned environmental goals can be found in the reference book and will be covered in the lectures.

1.5 ENVIRONMENTAL SUSTAINABILITY

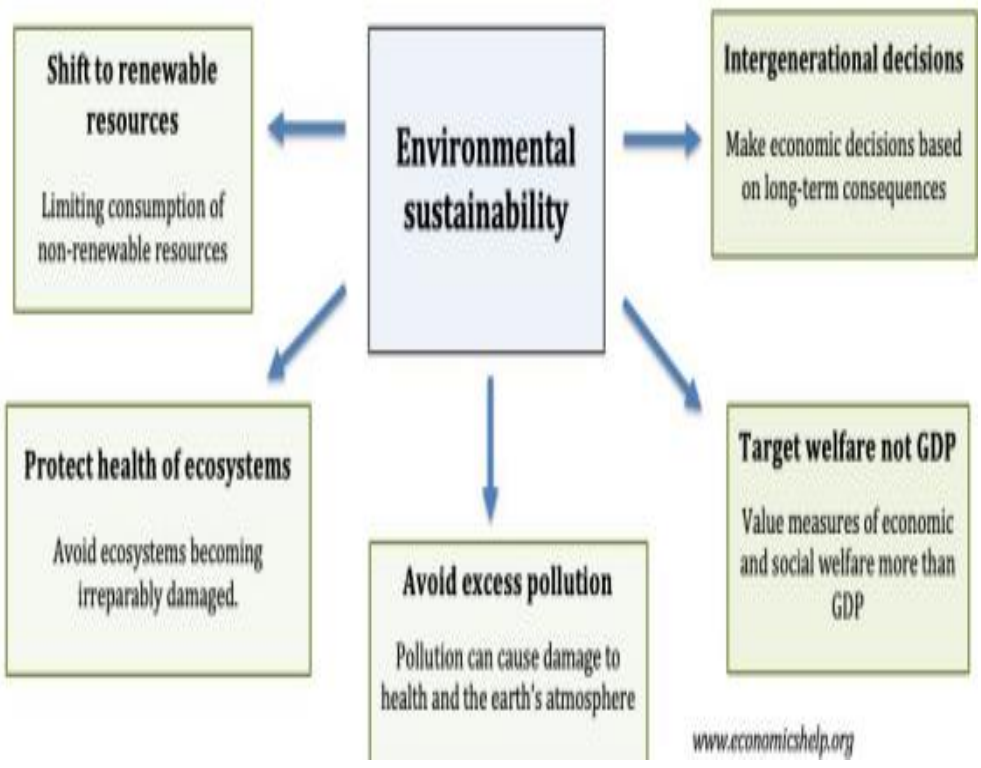
The environment can be both natural and fabricated. It helps in supplying resources (both renewable and non-renewable), sustaining life, assimilating waste and enhancing the quality of life. Sustainability is something that is capable of being

continued at a certain level and Sustainability is the process by which it is kept at a certain level. It is a method of collecting or consuming a resource so is not depleted or permanently damaged. The concept of sustainability is composed of three pillars i.e:

- Economic (Profits)
- Environmental (Planet)
- Social (People)

Environmental sustainability is "a responsible interaction with the surroundings to avoid depletion or degradation of resources and allows for long-term environmental quality". The practice of environmental sustainability helps to ensure that in meeting our needs for water, food and shelter as well as our daily activities including leisure, we do not damage our environment or deplete resources that we cannot renew.

Natural environment can refresh and sustain itself but human actions can diminish natural resources, and without the application of "environmental sustainability methods", long-term viability would be compromised.



Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environment and Development World, principles policies and management by Avijit Gupta and Mukil G. Asher.
2. Environmental Planning - 2nd edition by Paul Selman

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 Define Environmental Planning. What approach can a community adopt to become a truly sustainable community?

Q2 Why the problems related to sustainability cannot be solved without collaboration and a combined effort.

UNIT 2

ECHOSPHERE

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT – 2: ECHOSPHERE

2.1 Atmosphere

2.1.1 Layers of Atmosphere

2.2 Hydrosphere

2.3 Lithosphere

2.3.1 Lithosphere Composition

2.3.2 Types of Lithospheres

2.4 Biosphere

INTRODUCTION

This section provides an overview of how life interacts with its environment and how those interactions affect one another. The lithosphere (soil component), Hydrosphere (water component), and Atmosphere (air component) make up the abiotic component. The ecosphere is made up of these three elements as well as the biosphere. These are the three fundamental elements of the environment, and students need to understand these ideas before delving into the specifics of environment design.

LEARNING OBJECTIVES

After studying this unit, you should be able to:

1. Define and differentiate between soil, rocks minerals and ores.
2. Become familiar with the importance of minerals and their importance in the building industry.
3. Understand the composition of air, stratification of the atmosphere, basic categories of the living organisms, their interaction with the environment and major biomes on the earth.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

2.1 ATMOSPHERE

"Atmosphere is a protective layer of gases that shelters all life on Earth, keeping temperatures within a relatively small range and blocking out harmful rays of sunlight."

Features of the Atmosphere:

- Helps retain the sun's heat and prevents it from escaping back into space.
- Protects life from harmful radiation from the sun.
- Plays a major role in Earth's water cycle.
- Helps keep the climate on Earth moderate.

There is no boundary between the atmosphere and outer space. The atmosphere gets less dense and denser until it "blends" into outer space. It comprised of gases (permanent and variable), water droplets (clouds and precipitation) and microscopic solid particles (aerosols). The dynamism of the atmosphere is maintained by a ceaseless flow of solar energy. Winds push large air masses of differing temperatures and moisture around the globe. The movement of these air masses creates our daily weather. Climate is a description of the long-term pattern

Summary of Layers of Atmosphere			
Region	Altitude Range (km)	Temperature Range(0°C)	Important Characteristics
Troposphere	0-11	15 to -56	Weather occurs here
Stratosphere	11-50	-56 to -2	The ozone layer is present here
Mesosphere	50-85	-2 to -92	Meteors burn in this layer
Thermosphere	85-800	-92 to 1200	Auroras occur here

of weather in a particular area.

Earth's atmospheric structure ranges from less than 1 meter below the earth's surface to more than 10,000 km above it. It is composed of roughly 78% nitrogen, 21% oxygen, 0.97% argon & carbon dioxide, and 0.04% trace amounts of other gases and water vapours.

The atmosphere guards life on Earth by absorbing UV solar radiation and decreasing extreme temperatures between day and night. Trace gases in the atmosphere, such as Carbon dioxide, ozone and water vapors are responsible for keeping the Earth warm enough to sustain life and for protecting us from UV radiation.

2.1.1 Layers of Atmosphere

The atmosphere has five distinct layers that are determined by the changes in temperature that happen with increasing altitude. Layers of Earth's atmosphere are divided into five different layers:

- Exosphere
- Thermosphere
- Mesosphere
- Stratosphere
- Troposphere

Details about layers of atmosphere, composition and structure of the atmosphere are available below:

- **Troposphere**

It is the lowest atmospheric layer, closest to the Earth's surface in which we live in. It encompasses most of our weather, clouds, rain & snow and contains 80% of the atmospheric mass. Here the temperature gets cooler as the distance above the earth rises.

Vertical mixing in the troposphere produces winds, storms and clouds

The concentration of water vapour in the atmosphere declines rapidly with elevation and almost all water is confined to the troposphere

Pollutants found in the troposphere are easily removed by raindrops, while stratosphere pollutants may linger for longer periods

- **Stratosphere**

The stratosphere comprises the ozone layer, which is vital for the survival of life on Earth. It contains about 19.9% of atmospheric mass. Temperatures in the stratosphere are maximum over the summer pole and minimum over the winter pole.

By absorbing dangerous UV radiation, the ozone in the stratosphere protects us from skin cancer, skin tumours and other health damages and damages to flora and fauna

Stratospheric ozone plays an important role in the formation of clouds and rain as it heats up and blocks water vapours in the lower layers of the atmosphere

Greenhouse gases are responsible for heating of the lower atmosphere &Earth's surface

- **Mesosphere**

The mesosphere is the third layer of Earth's atmosphere in which most meteors burn up after entering and before reaching its surface. The temperature here decreases with height, to a minimum of about -80°C

- **Thermosphere**

The thermosphere is a region of highly ionized gases extending out to about 1600

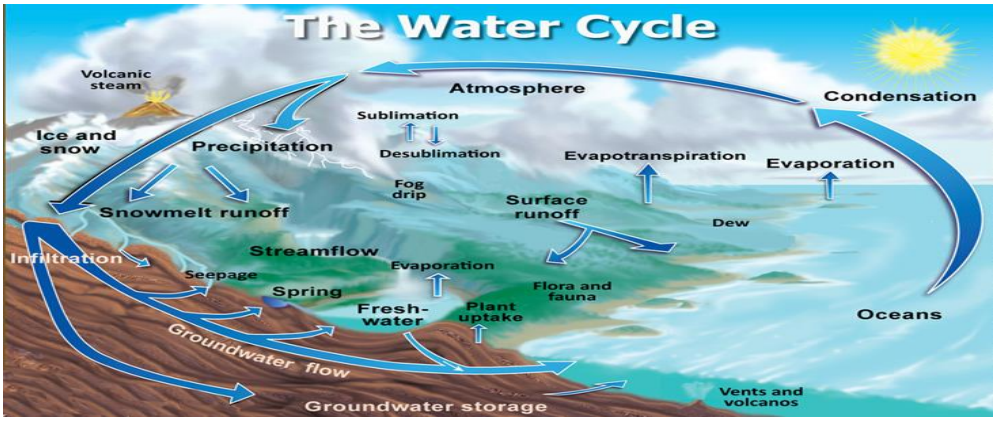
km. Temperatures are very high because molecules are constantly bombarded by high-energy solar and cosmic radiation. The lower part of the thermosphere is called the Ionosphere

- **Exosphere**

The exosphere contains few particles that move into and from space

2.2 Hydrosphere

The hydrosphere is one of the primary elements of Earth's interrelated physical systems. The total amount of water on Earth in the ocean, on land, in the atmosphere, and on the surface is known as the hydrosphere. The amount of land on Earth that is covered with water is about 71%. Merely three percent of that total amount of water is freshwater. You can use even less of it as drinking water. As a result of the sun's energy, water constantly cycles around the system, rising into the atmosphere, condensing, and falling as precipitation that can be recycled or used. Warm water is moved from the tropics to the poles by currents that are created by the continuous movement and exchange of water, helping to control Earth's temperature.



Water makes up the majority of the hydrosphere. Particulates, gases, and dissolved minerals are some of the additional contaminants. While some of these are important for the well-being of ecosystems, others are seen as pollution. While an excessive amount of silt might be detrimental to the nearby habitats, a lack of dissolved oxygen in the water can cause hypoxic conditions that can also be hazardous to those species. Consequently, thriving ecosystems that encircle different hydrosphere components need a delicate balance.

For us, the human race, two main sources of water are useful in a range of sizes, from a household's needs to the irrigation of hundreds of acres of land. The following are the two main sources:

- Surface water
- Groundwater

2.3 LITHOSPHERE

The hard outermost layer of Earth is called the lithosphere and is made up of the crust. A rocky planet's crust, or outermost shell, is identified by its mineralogy and chemistry. This includes the Earth's hard, rigid exterior layer, which is made up of the crust and topmost mantle. The pedosphere is the uppermost portion of the lithosphere that forms soil by chemically reacting with the atmosphere, hydrosphere, and biosphere.

2.3.1 Lithosphere Composition

The crust of the earth is composed of a variety of rock layers, with basaltic rocks at the bottom, granitic and metamorphic rocks in the middle, and sedimentary rocks on top. Numerous sizable active tectonic plates make up the earth's crust. The typical tectonic plate movement is about 10 cm per year, and it is gradual yet constant.

2.3.2 Types of Lithosphere

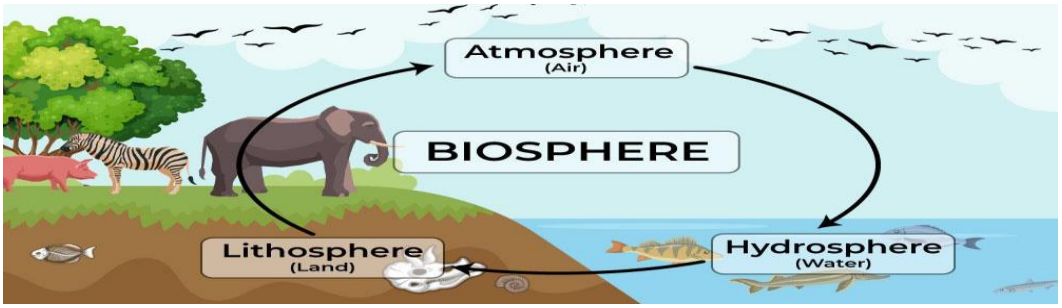
There are two types of lithosphere:

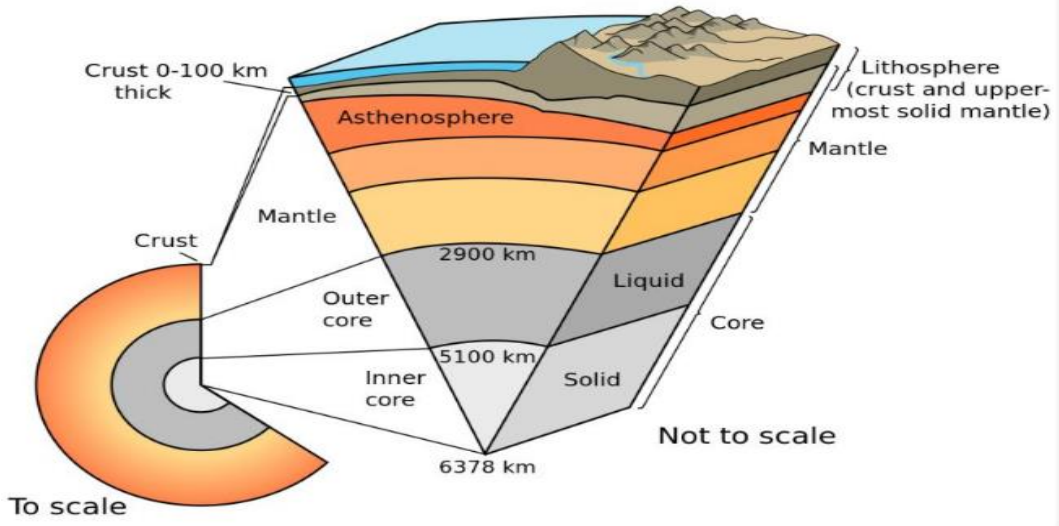
- **Oceanic:** This is associated with oceanic crust and exists in the ocean basins.
- **Continental:** This is associated with continental crust.

2.4 BIOSPHERE

The biosphere is the comparatively small layer of the Earth's surface that supports life. It reaches the deep-sea ocean vents and a few kilometers into the atmosphere. The biosphere is a worldwide ecosystem made up of abiotic (nonliving) elements that provide nourishment and energy to living things, or biota.

The biosphere is a system where some huge molecules and cells reproduce themselves. It is defined by the constant cycling of matter and the corresponding flow of solar energy. Given that all life depends on water, it is a major predisposing factor. Together, these elements carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur provide the building blocks, fuel, and guidance for the emergence of life as proteins, lipids, carbohydrates, and nucleic acids. Energy flow is necessary for the phosphate bond-building and breaking processes that preserve an organism's structure. All organisms have nucleic acids, which store and transfer genetic information. Organisms are cellular and always have some form of enclosing





membrane structure. Specifics are covered in the class lectures and can be found in the reference book.

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environmental Science 13th Edition by Miller, G. Tyler, Spoolman, Scott.
2. Environmental Science- A Study of Interrelationships by Enger& Smith.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 Differentiate between climate and weather.

Q2 Which component of air is responsible for keeping the Earth warm?

UNIT 3

CURRENT ENVIRONMENTAL PROBLEMS IN GLOBAL PERSPECTIVE

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT : 3 CURRENT ENVIRONMENTAL PROBLEMS IN GLOBAL PERSPECTIVE

3.1 Green House Effect

3.1.1 The Major Green House Gases (GHG

3.2 Ozone Layer Depletion

3.3 Desertification

3.3.1 Reasons for Desertification

3.3.2 Effect of Desertification on the Environment

INTRODUCTION

Thanks to scientific and technological advancements, millions of people worldwide now enjoy greater freedom, power, and knowledge than their forebears could have ever imagined. However, there is a negative side to this newfound freedom, power, and knowledge, especially when it comes to the earth and its resources. This unit has been put together to help pupils learn the fundamentals of the environmental issues that the world is currently facing.

LEARNING OBJECTIVES

After studying this unit, you should be able to understand:

- The sources and mechanisms of the current environmental issues like global warming, acid rain, and ozone depletion.
- The menace that earth is facing due to them shortly.
- The remedies to avoid the disastrous effects and the obligations of an individual.

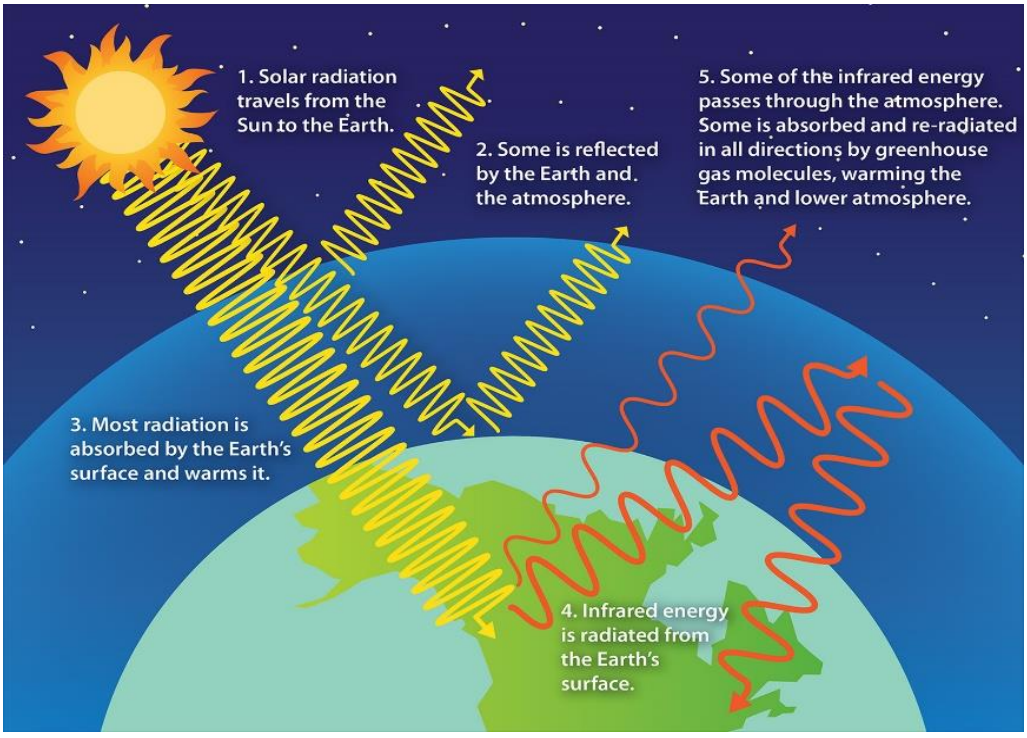
INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

3.1 GREEN HOUSE EFFECT

It's invisible, odourless, and touchless. Because human activity increases the greenhouse effect, it contributes to global warming. When specific gases, referred to as greenhouse gases, accumulate in the Earth's atmosphere, the greenhouse effect takes place. These naturally occurring gases in the atmosphere include nitrogen oxide, carbon dioxide, methane, and fluorinated gases, which are also referred to as chlorofluorocarbons (CFCs).

Although greenhouse gases allow light from the sun to reach the surface of the Earth, they also retain heat that is reflected into space. They function similarly to a greenhouse's insulating glass walls in this way. The Earth's climate remains comfortable due to the greenhouse effect. It would be below freezing on Earth if not for the greenhouse effect. A portion of it is a natural process. But as greenhouse gases are added to the atmosphere, the Earth's greenhouse effect becomes more pronounced. This increases the greenhouse effect in the atmosphere, which modifies the climate of our planet by causing changes in the patterns of snowfall and rainfall, an increase in mean temperatures, and an increase in the frequency of extreme weather events like heat waves and floods.

Factories, autos, deforestation, etc. are the main sources of greenhouse gases. The quantity of these gases in the atmosphere rises with the number of factories and cars.



The world is currently dealing with some major effects, including the flooding of coastal towns, the desertification of productive areas, the melting of glacial masses, and the increase in catastrophic hurricanes.

3.1.1 The Major Green House Gases (GHG)

Carbon dioxide CO_2 Gas is one of the major greenhouse gases. CO_2 is currently 40% more in the atmosphere than when the industrialization age began. CO_2 is mostly produced by the burning of oil and coal which in short make CO and NO the main contributor of CO_2. Cutting down forests (deforestation) has affected the increase in CO_2 as trees are responsible for the regulation of CO_2 and O_2 in the atmosphere. On Cutting down trees the beneficial effect is lost and the carbon stored in the trees is released into the atmosphere, adding to the greenhouse effect.

Water Vapor: It is the most abundant greenhouse gas in the atmosphere and a less efficient absorber than CO_2. Vapor tends to absorb heat because of which the temperature in our atmosphere increases. Water vapor usually stays in the air for a few days and falls back to Earth as precipitation.

Methane, Nitrous oxides, and CFCs are emitted in smaller quantities, but they trap heat far more effectively than CO_2, and in some cases are thousands of times stronger. Methane is emitted into the atmosphere during the production, processing, storage, transmission, and distribution of natural gas. Animals such as cows and sheep produce methane and they are one of the main contributors to greenhouse gas. CH_4 is also generated in landfills as waste decomposes and in the treatment of wastewater. In addition, Natural wetlands are the largest source of CH_4 as the waste emits it while decaying.

Nitrous oxide is 270 times more effective than CO_2. It is naturally produced during nitrogen fixation. Nitrous oxide can result from various agricultural soil management activities, such as synthetic and organic fertilizer application and other cropping practices, the management of manure, or the burning of agricultural residues. Other sources of fuel combustion and industrial processes.

Fluorinated gases only come from humans directly or byproducts of human activities. Fluorinated gases such as Hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are synthetic, powerful greenhouse gases that are emitted from a variety of industrial processes. They are potent greenhouse gases, they are High Global Warming Potential gases.

Chlorofluorocarbons (CFCs) are nontoxic, nonflammable chemicals containing atoms of carbon, chlorine, and fluorine. They are used in the manufacture of aerosol sprays, blowing agents for foams and packing materials, solvents, and refrigerants. CFCs destroy ozone in catalytic reactions where 100,000 molecules of ozone can be destroyed per chlorine atom. The short-term substitutions for CFCs are hydrochlorofluorocarbons (HCFCs), which lessen stratospheric ozone, but to a much smaller extent than CFCs.

3.2 OZONE LAYER DEPLETION

Ozone layer depletion is one of the most serious problems faced by our planet Earth. It is also one of the prime reasons which are leading to global warming. Ozone is a colorless gas which is found in the stratosphere of our upper atmosphere. The layer of ozone gas is what protects us from the harmful ultraviolet radiations of the sun. The ozone layer absorbs these harmful radiations and thus prevents these rays from entering the earth's atmosphere. Ultraviolet radiations are high energy electromagnetic waves emitted by the sun which if enter the earth's atmosphere can lead to various environmental issues including global warming, and also several health-related issues for all living organisms. Thanks to the ozone layer which protects us from these harmful rays.

This issue gained attention in the 1970's. The causes were investigated to find out possible solutions to it. Some of the main causes are listed as under: The main things that lead to the destruction of the ozone gas in the ozone layer. Low temperatures and, an increase in the level of chlorine and bromine gases in the upper stratosphere are some of the reasons that lead to ozone layer depletion. But the one and the most important reason for ozone layer depletion is the production and emission of chlorofluorocarbons (CFCs). This is what leads to almost 80 percent of the total ozone layer depletion.

Many other substances lead to ozone layer depletion such as hydrochlorofluorocarbons (HCFCs) and volatile organic compounds (VOCs). Such substances are found in vehicular emissions, by-products of industrial processes, aerosols and refrigerants. All these ozone-depleting substances remain stable in the lower atmospheric region, but as they reach the stratosphere, they get exposed to the ultraviolet rays. This leads to their breakdown and release of free chlorine atoms which react with the ozone gas, thus leading to the depletion of the ozone layer.

The depletion of the ozone layer allows the entering of UV rays from the sun into the earth's atmosphere which is associated with some health-related and environmental issues. Its major impacts on human beings are:

Skin Cancer: Exposure to UV rays from the sun can lead to an increased risk developing of several types of skin cancers.

Eye Damage: Direct exposure to UV rays can lead to Cataract problems, and also Photo-keratitis or snow blindness.

Damage to the Immune System: Increased exposure to UV rays can lead to weakening of the response of the immune system and even impairment of the immune system in extreme cases.

Ageing of Skin: exposure to UV rays can lead to an acceleration of the ageing process of your skin.

In humans, exposure to UV rays can also lead to difficulty in breathing, chest pain, and throat irritation and can even lead to hampering lung function. UV rays affect other life forms too. It adversely affects the different species of amphibians and is

one of the prime reasons for the declining numbers of the amphibian species UV rays also have adverse effects on the marine ecosystem. It adversely affects the plankton which plays a vital role in the food chain and oceanic carbon cycle. Affecting phytoplankton will in turn affect the whole ocean ecosystem. UV rays will also affect the plants. UV radiation can alter the time of flowering in some plant species. It can also directly affect plant growth by altering the physiological and developmental processes of the plants.

3.3 DESERTIFICATION

The cycle by which ripe land becomes desert, ordinarily because of the dry season, deforestation, or on the other hand improper horticulture.

"About one-fifth of the world's property is compromised with desertification". The growth of industrial (oil-based) agriculture and the sharp increase in desertification of the planet have also contributed to its acceleration.

Desertification and climate change are, to put it briefly, interdependent. Collectively, they have caused numerous civilizations to collapse in different parts of the planet, and they currently pose a threat to civilization everywhere. The steady deterioration of dry land ecosystems brought on by climatic fluctuations and human activity is known as desertification.

Millions of people who depend on the advantages that dry-land ecosystems can offer are impacted by desertification. Consequently, one of the biggest environmental problems of our day is desertification, which makes it extremely difficult to supply basic human needs in arid regions.

3.3.1 Reasons for Desertification:



- Overgrazing: Animal brushing is an immense issue for some regions that are beginning to become desert biomes. If there are such a large number of creatures that are overgrazing in specific spots, it makes it hard for the plants to develop back, which harms the biome and causes it to lose its previous green brilliance.
- Deforestation: When individuals are hoping to move into a territory, or they need trees altogether to make houses and do different errands, at that point they are adding to the issues identified with desertification. Without the plants (particularly the trees) around, the remainder of the biome can't flourish.
- Farming Practices: Some ranchers don't have the foggiest idea of how to utilize the land successfully. They may strip the place where there is all that it has before proceeding onward to another plot of land. By stripping the dirt of its supplements, desertification turns out to be increasingly more of a reality for the territory that is being utilized for cultivating.
- Urbanization and different kinds of land advancement. As referenced above, advancement can make individuals experience and execute the vegetation. It can likewise cause issues with the dirt because of synthetics and different things that may hurt the ground. As regions become more urbanized, there are fewer places for plants to develop, in this way causing desertification.
- Climate Change: Climate change plays an enormous part in desertification. As the days get hotter and times of dry season becomes more successive, desertification turns out to be more and more famous. Except if the environmental change is eased back down, immense territories of land will turn into deserts; a portion of those zones may even get dreadful over the long haul.
- Stripping the place that is known for assets. On the off chance that a region of land has normal assets like gaseous petrol, oil, or minerals, individuals will come in and mine it or take it out. This generally strips the dirt of supplements, which thusly executes the vegetation, which thus begins the cycle toward turning into a desert biome over the long haul.
- Natural Disasters: There are a few situations where the land gets harmed in view of regular catastrophes, including dry spells. In those cases, there isn't a ton that individuals can do aside from work to help restore the land after it has just been harmed naturally.

3.3.2 Effect of Desertification on Environment:

The characteristic asset base of land, water and vegetation in dry and semi-bone-dry regions is profoundly delicate and significantly helpless against corruption. There is a difficult issue of desertification in numerous pieces of Pakistan. Populace pressure alongside the interest for more food, feed and fuel wood has created a

chain of interrelated financial, social and ecological issues related to the land corruption inside Pakistan. An assortment of characteristic and human components are adding to desertification and seriously disables the natural profitability of grounds over the nation, including decreasing vegetation spread, overgrazing, flooding, over abuse of water also, land assets, over development of minor grounds, deforestation, soil disintegration, salinization and the utilization of unseemly advancements.

Unreasonable agrarian exercises including lacking soil protection, development of steep slants, development without satisfactory decrepit periods, unequal compost use and inappropriate water systems the executives combined with the abuse of prime horticultural land for urbanization/industrialization devastatingly affected land assets. The expanded weight ashore with low profitability and ecological contamination through modern squanders has additionally exacerbated the predominant condition. Regardless of the coordinated public endeavors to relieve the impacts of dry spells, fighting desertification is still one of the significant difficulties to the individuals of the nation. The activity important to help deflect desertification is to teach individuals with regards to the estimation of valuable land and water assets. The present abandoned circumstance is legitimately identified with the disappointments of the ridiculous asset the board approaches. Different methodologies are being applied to capture the threat of desertification. The institutional set-up for detailing and usage of projects and strategies is being fortified in the nation. Quantities of land recovery ventures have been dispatched.

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environment and Development World, principles policies and management by Avijit Gupta and Mukil G. Asher.
2. The Uninhabitable Earth: Life After Warming by David Wallace Wells. 2019.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 What are the primary pollutants that are responsible for producing acid rain?

Q2 Why is the ozone not formed above or below the stratosphere?

UNIT 4

STATE OF THE ENVIRONMENT IN PAKISTAN

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT – 4: STATE OF THE ENVIRONMENT IN PAKISTAN

4.1 Environmental Problems in Pakistan

4.1.1 Floods

4.1.2 Air Pollution

4.1.3 Water Insecurity

4.1.4 Food Insecurity

4.1.5 Waste Pollution

4.2 Deforestation

4.2.1 Causes of Deforestation in Pakistan

4.2.2 Effects of Deforestation

4.3 Erosion of Sedimentation

INTRODUCTION

Pakistan is a country with a high population density, a high reliance on natural resources, severe physical capital shortages, and few opportunities for skill development. As a result, the next unit highlights Pakistan's main environmental problems and clarifies the country's current standing in this area.

LEARNING OBJECTIVES

After studying this unit, you should be able to:

- Identify the current environmental problems in Pakistan.
- Learn about Pakistan’s Status and contribution on the global level.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

4.1 ENVIRONMENTAL PROBLEMS IN PAKISTAN

Pakistan, despite its contribution of only 0.9 percent to global greenhouse gas (GHG) emissions, is highly vulnerable to the impacts of climate change. While the government of Pakistan has made commendable efforts in addressing environmental challenges through its current climate change policy, there are critical areas that require evaluation and improvement. Specifically, issues such as coal-based power generation, importation of used vehicles, operation of traditional brick kilns, rapid urbanization, and agricultural burning significantly contribute to pollution and environmental degradation in the country.
To effectively tackle these challenges, a comprehensive policy reorientation at the national level is essential.

Pakistan has sought support from the international community, particularly in light of the damages caused by the floods in 2022.
The government appealed for recognition that the costs of climate change should be shared by developed countries, as they are the primary contributors.

The challenges in the environmental sector include:

- Water and air pollution causing widespread diseases
- Adaptation to the impact of climate change on energy, water and food securities
- Preparedness for adaptation/mitigation due to climate change and to avail opportunities under Clean Development Mechanism (CDM)
- Preparedness for effective disaster management to avoid damage to the environment
- Watershed degradation and deforestation
- Management of solid, liquid, and hazardous waste
- Green economy improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities initiatives and their impact on Pakistan. Linking natural resource-based livelihoods to the production of ecosystem services, the green economy can help reduce poverty and enhance environmental sustainability
- Implementation of planned initiatives with efficacy to increase forest cover and biodiversity
- Reducing land degradation
- Effluent treatment at source to avoid discharge of polluted industrial and domestic sewage to freshwater bodies and marine environment
- Increasing energy efficiency with a focus on conservation measures

- Rapid urbanization and industrialization leading to serious environmental concerns: natural resources depletion resulting from accelerated economic and social transformation.

4.1.1 Floods

Floods constitute one of the world's most serious environmental hazards. Four thousand years of recorded history tells of man's repeated failure to evade the destructiveness of floods.

Despite many years of experience and highly developed scientific techniques, floods even now continue to play havoc almost in every part of this planet. Losses from floods annually destroy about million acres of crops land and affect hundreds of thousands of people with a monetary loss of billions of rupees. The major reasons for floods are:

- Deforestation
- Inadequate water reservoirs
- Heavy rainfall
- Unpreparedness
- Allowing the population to reside on river planes and flood-risk lands
- Climate Change

Floods are a common occurrence in Pakistan, particularly in low-lying states like Sindh and Punjab. In fact, because of the nation's historically intense monsoon seasons, which can produce up to 70% of the yearly rainfall in a few months, its climate is frequently studied. The events of 2022, however, were the worst in Pakistan's seventy-five-year history. Scientists attributed it to changes in climate. Major direct flood damages in Pakistan are to crops, urban and rural areas, besides, other private & public utilities. It is generally recognized that complete prevention from floods is humanly impossible, but protection from floods is feasible and is a vital necessity.

It is generally recognized that complete prevention from floods is humanly impossible, but protection from floods is feasible and is a vital necessity. By proper planning, means can be devised to harness the fury of floods to safeguard human life and property. To reduce their destructive power, floods can be used in the service and the welfare of a community.

The following options can be considered to prevent floods are as follows;

- Construction of additional drains, wherever needed

- Identification of natural depressions and their strengthening to enhance their storage capacities
- Identification of accessible high-elevation areas for settlement of rain/flood affectees in future floods
- Increasing water storage capacity by building dams and other reservoirs like lakes, ponds etc
- Planting trees to avoid soil erosion silting of riverbeds and increasing their capacity to hold
- Emptying the flood plain in case of forecast to avoid life loss.
- Keeping riverbed and flood plains unpopulated.
- Providing a way for the rainwater by building proper adequate canal systems and drains.
- Provide training and awareness regarding emergency action plans.
- Protection of wetlands, they act like sponges to storm water, snow melts and rainfalls thus reducing the risk and effects of floods.

4.1.2 Air Pollution

Air is composed of 78% nitrogen, 21% oxygen, 0.9% argon. The remaining elements include carbon dioxide, water vapour, hydrogen, and other trace elements. Air pollution is caused by a combination of gaseous and particulate pollutants such as carbon dioxide, methane, and nitrogen dioxide emitted from point sources such as factories and motor vehicles that burn fuel.

Some gaseous emissions are visible and sometimes may even diffuse into the atmosphere and become invisible. Particulate pollution, on the other hand, such as soot and black carbon, is always visible.

Pakistan would have many different polluting sources, all of which would come together to compound the situation further, with both man-made pollution as well as geographical and meteorological factors playing a role in its excessively high PM2.5 ratings.

One of these sources would be the excessive use of vehicles, with cars, rickshaws and motorbikes all adding to the pollution along with heavy-duty vehicles such as trucks, lorries and buses, many of which run on diesel or other unclean fuel sources, putting out far larger amounts of pollution than is considered safe.

Other causes of pollution would be from factory and industrial emissions, both on a large and small scale, with locally run brick kilns putting out heavy amounts of smoke along with major factories that contribute their own fossil fuel-based pollution alongside whatever unique chemical effluence comes from the manufacturing of their products. Many factories in Punjab province and indeed the

whole of Pakistan have been targeted in recent years for their excessive contribution to pollution levels.

Many Pakistani cities have had dangerously high air pollution levels in recent years. Lahore, Faisalabad, and Karachi are frequently ranked among the most polluted cities in the nation, according to data from the World Air Quality Index (AQI).

The Air Quality Life Index (AQLI) data indicates that all 238 million people in Pakistan live in areas where the annual average particulate pollution level exceeds the WHO guideline, while 98.3% of the population lives in places where air pollution exceeds the nation's safety standards, even though these cities routinely exceed the WHO's guidelines for air quality.

Only Chad and Iraq were higher on IQAir's 2022 ranking of the world's most polluted countries and areas than Pakistan, which came in third. India and Pakistan accounted for the majority of the world's 50 most polluted cities in terms of location in 2022. Lahore, the capital of Pakistan and home to over 11 million people was also rated the world's most polluted city in that same year and is still considered to be one of the most polluted urban areas today.

4.1.3 Water Insecurity

Pakistan ranks sixth in the world's population, making it one of the most water-stressed countries in the world, according to the World Bank.

Additionally, Pakistan has relatively low water availability per person due to its enormous population. Pakistan is thought to have experienced significant water scarcity, with per capita water availability estimated to have dropped from 5,260 cubic meters in 1951 to roughly 1,000 cubic meters in recent years.

According to these statistics, the nation is rapidly approaching the "water stress line." According to UNDP predictions, Pakistan may experience absolute water scarcity by 2025, meaning there won't be enough water to meet all of the country's needs.

About 60% of Pakistan's population does not have access to safe drinking water, and poor water quality is a contributing factor in 30% of all diseases and 40% of all deaths, according to research published by the Pakistan Council of Research in Water Resources (PCRWR). Women and children are especially at risk, especially in rural areas where most sources are contaminated and sanitation is particularly poor.

The WHO estimates that waterborne illnesses like cholera, typhoid, and diarrhea kill over 55,000 children in Pakistan under the age of five every year.

The nation's high levels of water pollution are caused by a variety of issues, including inadequate sanitation facilities and a lack of a complete sewerage system in cities, as well as poor waste management and overuse of chemical pesticides, fertilizers, and untreated industrial effluents.

4.1.4 Food Insecurity

Pakistan faces a serious problem with food insecurity since a large portion of the population does not have consistent access to enough food that is both nutritious and sufficient. Pakistan's food security was placed 92nd out of 116 countries in the Global Hunger Index 2021.

Although it is challenging to pinpoint the precise number of people who are food insecure, it is thought that approximately 40% of people suffer from food insecurity to some degree.

In Pakistan, there is a considerable correlation between food insecurity and climate change. The nation is extremely susceptible to climate-related hazards, and shifting weather patterns negatively impact water availability, natural resource availability, and agricultural productivity.

It is estimated that between now and 2040, climate change will be partially responsible for an 8–10% decline in agricultural productivity. This is especially true for the crops of wheat and rice, which will decline by 6% and 15–18%, respectively.

4.1.5 Waste Pollution

Pakistan's trash production has increased due to rapid urbanization and population growth; according to World Bank estimates, the nation produces 48.5 million tons of solid garbage annually, of which 20 million tons are produced in urban areas alone.

The government is unable to adequately handle the unprecedented amounts of waste generated. The accumulation of waste in public areas, rivers, and open spaces has been facilitated by inadequate waste management infrastructure, as well as by improper waste collection, segregation, and disposal methods.

As a result, burning and dumping of garbage have become commonplace practices.

Most of the solid trash produced in the nation is disposed of carelessly, which contaminates the land and waterways. Harmful gases including carbon monoxide (CO), particulate matter, and volatile organic compounds (VOCs) are released when garbage is burned or discarded, and these pollutants greatly worsen air pollution.

4.2 DEFORESTATION

Forests play a major role in supplying timber and other products and maintaining vital ecological processes. At the global scale, they serve as sinks for carbon dioxide and help ensure a continuous supply of clean water.

Watershed forests are particularly important because they help conserve soil cover and protect downstream areas from excessive flooding.

Deforestation is the clearing, destroying, or otherwise removal of trees through deliberate, natural, or accidental means. The loss of trees and other vegetation can cause climate change, desertification, soil erosion, fewer crops, flooding, increased greenhouse gases in the atmosphere, and a host of problems for indigenous people. The Worldwide recommended level for forests is 20-25% of land area whereas in Pakistan only about 4.8% of its total land area is under forests.

At a global level, Pakistan is primarily affected and not a major contributor towards increased global warming due to deforestation.

The Brazilian Amazon alone accounts for 60% of the World's total Amazon rainforest. Deforestation is highly affecting the animals that inhabit the area, the population density and communities nearby, and air pollution around the World, which in turn can cause detrimental effects on our future.

4.2.1 Causes of Deforestation in Pakistan:

Deforestation occurs for some reasons. Some major causes of human-induced deforestation are:

- Conversion of forests into agricultural plantations
- Livestock Ranching
- Infrastructure Expansion
- Wide gap in the production and consumption of wood
- Timber mafia and timber traders involved in smuggling wood regardless of the government ban
- Commercial exploitation and harvesting of forests by the contractors with the involvement of the concerned officials
- Poor communities consume available natural resources for their immediate survival. It includes cutting trees, using wood as fuel and selling it for livelihood
- The natural factors affecting forests are arid climate, heavy dependence on irrigation water, long gestation periods of forestry, and fragile watershed & rangeland

- Stakeholder's lack of involvement in the policy-making process has held the policymakers back from designing a broad-based forest policy

4.2.2 Effects of Deforestation:

- Forests control many aspects of climate, therefore, deforestation will result in massive flooding, droughts and desertification
- Deforestation makes the tropics hotter and drier, and the temperate regions colder
- Forests are major sinks for carbon dioxide, a greenhouse gas, whose levels if not maintained in the atmosphere, would increase global warming. The increase in temperature will melt ice caps and raise water levels around the globe, threatening cities and agricultural areas
- Forests are major producers of ozone (protects all life on earth from harmful UV radiations). With deforestation, the ozone holes would get worse

Deforestation affects biodiversity in many areas. Large-scale forest damage causes mass extinction of species that cannot migrate to nearby areas. Also, human populations relying on wood for food and fuel are affected

- Deforestation results in soil erosion and coastal flooding as the trees help the land to retain water and topsoil, which provides rich nutrients to sustain additional forest life

4.3 EROSION OF SEDIMENTATION

Erosion is the transport by wind, water and ice, of soil, sediment and rock fragments produced by weathering of geological features. Sedimentation occurs when eroded material, transported by water, settles out of the water column onto the surface.

While erosion and sedimentation are natural processes, inappropriate land use and management practices in the catchment can accelerate these processes. Land use changes, clearing native vegetation, mining, urban and other land development and road construction, need to be carefully planned and managed near waterways to prevent excessive erosion and sedimentation. Identifying and protecting an adequate foreshore is a key approach.

Erosion is also caused by activities that interfere directly with waterways, such as straightening or deepening channels for flood control, building dams, bridges or crossings, uncontrolled livestock access and removing riparian (fringing) vegetation.

Soil erosion is accelerating in developing countries of Asia, Africa, and Latin America. It has threatened the livelihood of millions of peasants, for agriculture is

their economic mainstay. The countries located in Asia are facing major issues related to land degradation, soil erosion, droughts, flooding and deforestation.

- Example: Sedimentation is a main concern in the Tarbela reservoir in Pakistan. The dam and the reservoir were commissioned in 1974 to regulate flow for irrigation and power production. The dam impounds the waters of the Indus River, which carries a heavy sediment load, most of which is trapped in the reservoir. This has led to the loss of one-third of its total volume. In addition, the advancing sediment deposits potentially present a threat to the operation of the dam. Rising sediment levels near the dam may block the low-level outlets and impede their continual operation. Sand-sized sediment is starting to pass into the hydropower intakes and this will cause abrasion of turbine blades, leading to increasing cost of maintenance and time when the turbines are out of operation.

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environmental and Growth Factors Review: A Case of Pakistan: Environmental challenges and issues of Pakistan. Khalid Zaman, Qureshi M. I, Khan M. M.
2. The Uninhabitable Earth: Life After Warming by David Wallace Wells. 2019.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 What is the harm of the loss of the top layer of soil?

Q2 What environmental changes can we expect in Pakistan in response to global warming?

UNIT 5

ENVIRONMENT & HUMAN SETTLEMENT

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT – 5: ENVIRONMENT & HUMAN SETTLEMENT

5.1 Human Settlements as Ecological Systems

5.2 Urbanization and Environment

5.3 Natural Disaster and Human Settlements

5.3.1 Natural Disaster in Pakistan and its Impact on People

5.3.2 Man-made Disaster in Pakistan and Its Impact on People

5.3.3 Effects of disasters on dwellers

INTRODUCTION

The environment depends heavily on humans and is subject to significant change at any time. We want to talk about how human activity affects nature in this unit, specifically how calamities are brought on by civilization's expansion and growth. Nonetheless, it is unavoidable that some natural disasters that are not caused by humans have severe impacts on human communities, sometimes to the point of eradication. In a nutshell, we claim that nature and humans hurt one another.

LEARNING OBJECTIVES

After studying this unit you should be able to:

- Compare a complete and an incomplete ecosystem.
- Measure the effect of natural disasters on human settlements and vice versa.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

5.1 HUMAN SETTLEMENTS AS ECOLOGICAL SYSTEMS

Ecological systems, the natural environment, and human settlements have a complex, dynamic connection that is always evolving. The natural world provides the necessities for human survival such as food, drink, and shelter. Humans impact the environment throughout the resource-harvesting process when they consume non-renewable resources excessively or exploit them, produce waste products and pollution (such as greenhouse gases, ozone-depleting compounds, and hazardous materials), and so on. As a result, the ecosystem on which humans depend is deteriorated. Population growth, settlement expansion, economic growth, and rising consumption all have an increasing effect on how human settlements affect the environment. Every sign points to a rising impact of human settlements on environmental resources.

5.2 URBANIZATION AND ENVIRONMENT

The process of turning vacant or poorly inhabited land into densely populated cities is known as urbanization. Urban areas can expand due to migration into urban regions or increases in human population. Deforestation, habitat loss, and the removal of freshwater from the ecosystem are all common effects of urbanization, which can change the ranges and interactions of species and reduce biodiversity. The burning of fossil fuels and the disposal of industrial waste are two examples of human activities in metropolitan areas that contribute to environmental pollution that can hurt human and animal health.

Urbanization can have of effects on the environment, such as:

- Rising local temperatures. In metropolitan areas, the amount of sunlight absorbed is increased by the use of asphalt and other dark-coloured materials. Urban heat islands are the result of this when cities have hotter temperatures than their surroundings.
- Concrete paving can worsen soil quality, increase erosion, and increase water flow. Due to an increase in silt and pollutants in rivers and streams, this can potentially lower the quality of the water.
- The spread of illnesses. Due to the accessibility and volume of transit, people living in densely populated areas can quickly spread diseases both within and among communities.

The trend of Urbanization in Pakistan has been increasing over the past years due to an increase in the migration rate, mergers of small towns into big cities an excess of birth rates, decrease in death rates which caused population increase and an increase in the living population of the big cities.

Karachi specifically has been facing immense challenges regarding socio-economic and environmental circumstances, i.e., informal settlements, improper basic facilities, lack of clean water, inadequate sanitation and solid waste management

facilities, environmental pollution, inconvenient public transport, stagnation of economic activities, poor governance, and so on. Urbanization if not managed properly may place an immense burden on an already-stressed labor market, and severely test the state's ability to provide basic services in cities. Increased private transport on urban roads has caused severe congestion. The government has responded by upgrading urban roads and construction of metro lines.

However, infrastructure for the most common modes of travel in Pakistan such as pavements for walking or special lanes for bicycles, motorcycles and animal carts either do not exist or have been encroached upon.

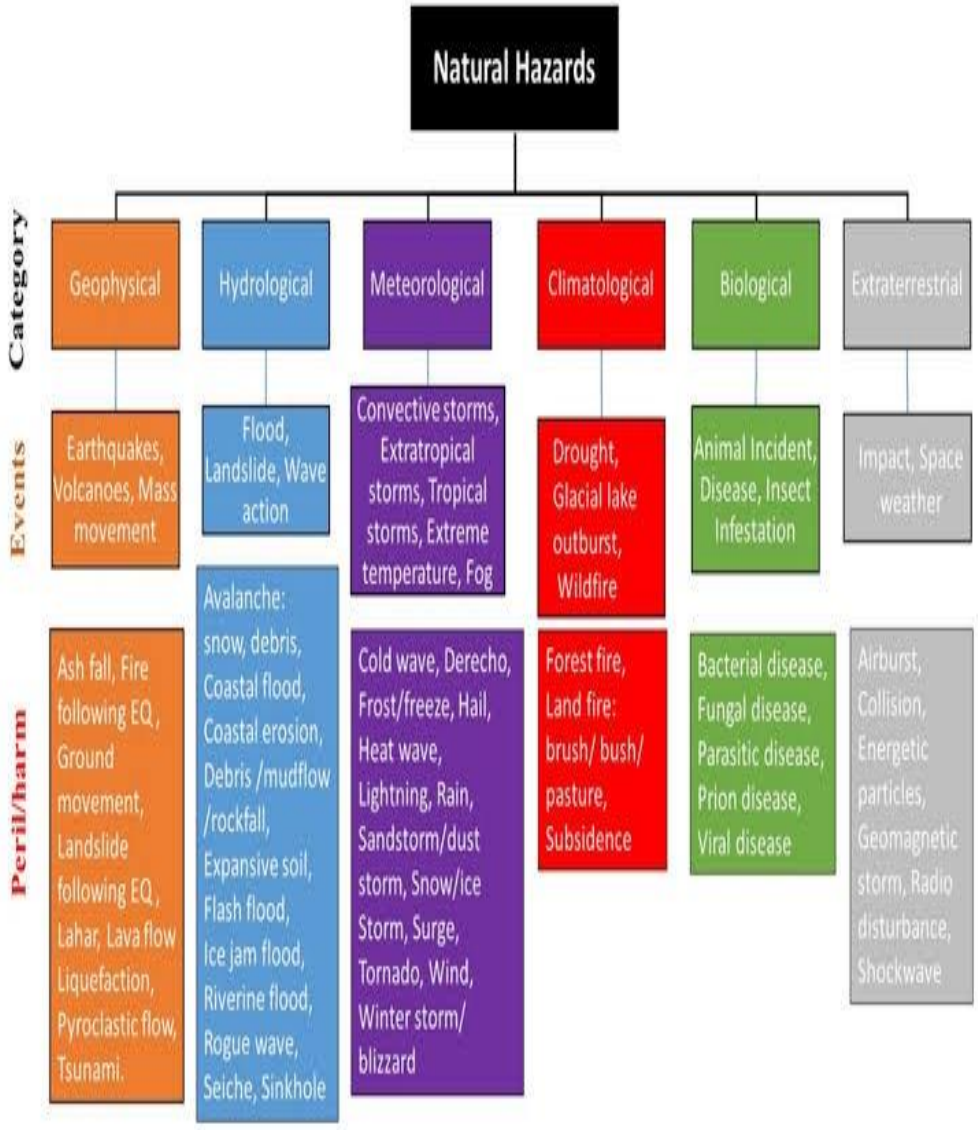
Industrialization

Industrialization is the process by which an economy is transformed from primarily agricultural to one based on the manufacturing of goods. Individual manual labour is often replaced by mechanized mass production, and craftsmen are replaced by assembly lines. Industrialization' is a generic name for a set of economic and social processes related to the discovery of more efficient ways for the creation of value. These more efficient ways are lumped together under the label 'industry' or 'the secondary sector' (the primary sector of economic activity referring to agriculture, hunting, fishing, and resource extraction, and the tertiary sector referring to services). Beginning with the late-seventeenth century, industrial activity has dramatically enlarged its scope and scale, as machin of acuter began to replace manufacture. Historically, industrialization studies have concerned themselves primarily with the period known as the Industrial Revolution, although in geography this area of enquiry has been the focus of many economic geographers interested in the contemporary logic of the global economic landscape.

5.3 NATURAL DISASTER AND HUMAN SETTLEMENTS

Areas where people live, work, and participate in different activities are known as human settlements. These settlements might be anything from little rural towns to bustling metropolitan centres. Human settlements give people a place to live, but they can also be at risk from a variety of natural disasters. Natural disasters like floods, storms, droughts, wildfires, landslides, and earthquakes can seriously harm human communities, resulting in property destruction, population displacement, and a halt to economic activity. The influence of natural disasters on human settlements is growing in importance as the world's population and settlements continue to grow. Additionally, the susceptibility of human communities to natural disasters is being exacerbated by climate change.

Natural catastrophes can have a major impact on infrastructure and human settlements in susceptible locations. Depending on the type of disaster, its severity, and the preparedness and resilience of the impacted community, the precise effects may differ. The following are some well-known ways that cataclysmic disasters might affect human communities and frameworks:



5.3.1 Natural Disaster in Pakistan and its Impact on People:

Natural disasters are naturally occurring physical phenomena, which have caused wide-spread damage and losses in Pakistan in the past. They occur either by rapid or slow onset of events including:

- Climatological (Extreme temperatures, fog, droughts)

- Geophysical (Earthquakes, landslides, tsunamis, volcanoes)
- Hydrological (Floods, avalanches)
- Meteorological (Cyclones, storms, hurricanes, tornados)
- Biological (Epidemics, pandemics, pest attacks i.e.: locusts etc.) Natural disasters affecting Human Settlements:
- Floods (The most recurring and devastating disasters in Pakistan)
- Earthquakes and volcanoes
- Hurricanes and tornados

earthquake in kashmir, the worst natural disaster to hit South Asia:

Pakistan lies between a seismic belt (Indus-Tsangpo Suture zone with the highest seismicity and largest earthquakes in the Himalayan region) and therefore, suffers from frequent small and medium magnitude earthquakes. Northern and western parts of Pakistan are particularly vulnerable to earthquakes. A 7.6 magnitude Richter scale quake struck the Kashmir region on the India-Pakistan border (affecting Muzaffarabad, Balakot, Neelum valley, Bagh, Mansehra) and parts of northwestern Pakistan (affecting Islamabad) on 8th October 2005.

As per the government of Pakistan, the official death toll as of November 2005 stood at 87,350. Around 138,000 were wounded and over 3.5 million became homeless. Instep to government figures, 19,000 children died in the earthquake. Most of their deaths were due to widespread collapses in school buildings. The earthquake affected more than 500,000 families. Around 250,000 livestock died because of the collapse of stone barns, and over 500,000 large animals needed immediate shelter from the severe winter.

5.3.2 Man-made Disaster in Pakistan and Its Impact on People:

Sometimes natural disasters occur in response to the development of human settlements, urbanization, clearing of forests for agricultural purposes, construction of roads, railway tracks, parks and human activities like combustion of fossil fuels and burning of wood. Human-induced environmental/ natural disasters include:

- Deforestation
- Soil Erosion & Desertification
- Water Pollution
- Degradation of Wetlands
- Wildlife/ Biodiversity Loss
- Fires/ Forest Fires

5.3.3 Effects of disasters on dwellers

- Fatality: refers to the number of people who lost their lives because of natural hazards.
- Homeless: stands for the total number of people whose house is destroyed or heavily damaged and therefore who need shelter.
- Affected: refers to the total number of people requiring immediate assistance during a disaster.
- Displaced Population: One of the most immediate effects of natural disasters is population displacement. When countries are ravaged by earthquakes or other powerful forces of nature, many people have to abandon their homes and seek shelter in other regions. A large influx of refugees can disrupt the accessibility of health care and education, as well as food supplies and clean water.
- Injuries: refers to people suffering from physical injuries, trauma, or an illness requiring medical treatment as a direct consequence of a disaster.
- Health Risks: Aside from the obvious immediate danger that natural disasters present, the secondary effects can be just as damaging. Severe flooding can result in stagnant water that allows the breeding of waterborne bacteria and malaria-carrying mosquitoes without emergency relief from international aid organizations and others, death tolls can rise even after the immediate danger has passed.
- Emotional Impacts: Natural disasters can be particularly traumatic for young children. Confronted with scenes of destruction and the deaths of friends and loved ones, many children develop post-traumatic stress disorder (PTSD), a serious psychological condition resulting from extreme trauma. Left untreated, children suffering from PTSD can be prone to lasting psychological damage and emotional distress.
- Damage: refers to the amount of damage to property, crops, and livestock.
- Direct economic loss: Direct economic loss refers to disaster-induced loss of materials or properties, such as houses, factories, and infrastructures.
- Basic services: Basic services refer to the disruption of public services or time loss due to low quality services, which are caused by hazardous events. Basic services include health facilities, educational facilities, transportation systems (including train and bus terminals), ICT systems, water supply, solid waste management, power supply system, emergency responses, etc.
- Wealth: People living in poverty cannot afford adequate housing or infrastructure. They are unable to acquire the resources needed before and after a disaster strikes.
- Education: Education increases awareness about avoiding or reducing the impact of disasters. A better-educated population will have more professionals trained to prepare for catastrophic natural events.

- Governance: Governments can set policies and establish infrastructure to reduce vulnerability to hazards. Some governments have more resources available to dedicate to disaster risk reduction.
- Technology: Technology allows us to forecast weather, significantly reducing vulnerability.
- Age: Children and the elderly are more vulnerable because they have less physical strength and weaker immune systems. Children and the elderly are more dependent on others for survival but may not have anyone to depend upon after disaster strikes.

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environmental Science 13th Edition by Miller, G. Tyler, Spool man, Scott.
2. Environmental Science- A Study of Interrelationships by Enger& Smith.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 Enlist the major industries that are creating environmental hazards?

Q2 What are the three components that make an ecosystem functional?

UNIT 6

LEGISLATION FOR ENVIRONMENTAL PROTECTION

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT – 6:LEGISLATION FOR ENVIRONMENTAL PROTECTION

6.1 Environmental Legislation in Pakistan

6.2 Steps for the Implementation of Environmental Legislation

6.3 Barriers to the Implementation of Environmental Laws

6.4 Particular Problems & Legislative Reactions

6.4.1 Water Pollution

6.2 Air Pollution

6.3 Noise Pollution

6.4 Cultural Environment

INTRODUCTION

You have learned about the significant environmental phenomena and the current environmental issues that the planet is facing in the earlier units. Globally, environmental regulations are developed and put into effect to address such situations. A significant number of international laws and treaties are ratified by Pakistan. You will be able to access how your state is associated with the rest of the world in this unit.

LEARNING OBJECTIVES

After studying this unit you should be able to:

- Be familiar with the components of environmental law.
- Learn the significance of environmental law
- Evaluate the role of Pakistan in participating the world environmental law
- Be familiar with the concept of cultural environment.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

A complicated network of rules, guidelines, and statutes known as environmental legislation is created to deal with problems including pollution control, waste management, and the quality of the air and water. Protecting human health, maintaining the environment for current and future generations, and promoting sustainable development are the three main goals of environmental legislation.

6.1 ENVIRONMENTAL LEGISLATION IN PAKISTAN

Pakistan Environmental Protection Act, 1997 is the basic environmental law of Pakistan. The apex body established under the act, 1997 is the Pakistan Environmental Protection Council. There also exists Pakistan Environmental Protection Agency (a federal agency) under the Pakistan Environmental Protection Council. Apart from the said Federal Agency Provincial Environmental Protection Agencies also exist in each province of Pakistan.

Environmental planning is the process of facilitating decision-making to carry out land development with consideration given to the natural environment, and social, political, economic and governance factors and provides a holistic framework to achieve sustainable outcomes. A major goal of environmental planning is to create sustainable communities, which aim to conserve and protect undeveloped land. Environmental management consists of organizing different environmental initiatives to address various ecological issues that are affecting the globe.

Environmental management deals with trying to prevent ecological disasters as well as aiding in environmental crises and trying to find appropriate solutions. Environmental management looks at land, marine and atmospheric conditions, such as global warming, marine life preservation and deforestation. The main aim of environmental management is to ensure that we leave the planet in a healthy state for future generations and to help preserve all forms of life, including marine life and vegetation. To do so, environmental managers need to consider the carbon footprint of the current human generation and look at ways to minimize any irreversible damage we are leaving behind. One of the main studies of environmental managers is investigating possible renewable sources of energy, to ensure there is enough fossil fuel, which takes millions of years to regenerate, left once our generation is gone.

6.2 STEPS FOR THE IMPLEMENTATION OF ENVIRONMENTAL LEGISLATION:

Today it is needed to bring about a consciousness among mass for the Promotion of environmental protection, Prevention of pollution and Improving NEQS National Environmental Quality Standard. For the implementation of

Environmental law and the betterment of the environment following steps should be taken;

- Effective Enforcement of environmental laws should be done
- Exemplary Heavy Punishments should be given to the polluters of the environment.
- Proper legislation should be made
- Environmental Education from the school level should be made compulsory
- A proper budget for the betterment of the environment should be established
- Institutions for Environmental Laws should be made
- Environmental Laws should be in the National Agenda
- An Environmental Task Force should be established
- Only those factories should be allowed to work which installing treatment plants.
- There should be a proper system for the disposal of Noxious and hazardous water and wastes.
- Financial help should be provided to the industries
- There should be task sharing and coordination among the industries, Environmental NGO's and Governmental Environmental Departments
- There should be taxation-free measures for the industries
- There should be establishment of plans to prevent corruption
- There should be political support for the implementation of environmental laws
- Incentives should be given to the industries for the implementation of environmental laws
- Proper national strategies should be developed for environmental betterment
- The security situation of the country should be made better
- Solid waste plants should be established even at the villages level
- Overpopulation and pressure of Urbanization should be controlled
- Campaigns should be started for environmental awareness.
- Mass, Media, Education, availability of literature and establishment of Green Houses.
- It should be our moral duty to grow Plants and preserve biodiversity.
- The use of fuel should be minimized
- Deforestation should be banned
- Environmentalists should be appointed at Tehsil levels and should be given proper powers.

6.3 BARRIERS TO THE IMPLEMENTATION OF ENVIRONMENTAL LAWS

- **Lack of Environmental Awareness**

People are unaware of the problems which are deteriorating the environment. They have no sound knowledge of the environment. They are not addressed by any person about the environment. They do not know about global warming, deforestation, or pollution effects. So they are reluctant to follow the environmental laws.

- **Environmental Priorities:**

All countries have drafted environmental strategies, programs and plans and have set ambitious environmental targets with a view to following the practices used in EU member countries. Since the first round of EPRs, National environmental strategies (NES) and national environmental action plans (NEAP) have been readjusted to fit new situations and objectives in some countries increasing their implementation benefits. Despite the overall progress in developing environmental strategies and programs, most of the reviewed countries have not yet prepared specific implementation plans including priority action, timetables and financial requirements. Pakistan is one of those countries that have not made environmental laws in their priority list.

- **No Implementation of Multilateral Environmental Agreements**

Political will is vital for the implementation of these multi-lateral environmental agreements. In recent years a lot of international conventions have been made and ratified by Pakistan. However, there is no complete fulfillment of the regulations. The governments fail to implement the Environmental Laws and regulations in the country due to corruption and other such acts.

- **Lack of Institutional Capacity**

In Pakistan, there are very low environmental institutions. The present institutions do have not much capacity to play their role in the fulfilment of the environmental laws. Governments in most reviewed countries have established environment ministries and regional or local authorities; only a few State Committees for Nature Protection are still in place (e.g. in Uzbekistan and Tajikistan). However, ministries of environment generally are not in a strong enough position to ensure that environmental issues get high priority on the government's political agenda.

- **Poor National Strategies and Plans**

Many countries have developed their national strategies for the management of

biodiversity, watersheds, persistent organic pollutants, hazardous wastes, desertification climate change and other important environmental issues but Pakistan has yet been unable to do this. Due to this environmental issues have not been solved. Pakistan has made no massive strategy to implement the environmental laws in the country due to which environmental disasters have been taking place. The implementation of environmental laws is causing much loss to the country.

- **Inadequate Legislative Frameworks**

The legislative frameworks and procedures in the country are inadequate. The environmental tribunals are not playing their effective role. No legislation is in its better shape. No steps have been taken the better-shaped shape environmental laws and regulations in the country.

- **Financial Resources**

Finance plays an important role in the implementation of the Environmental Laws. The industries in Pakistan are reluctant to invest in environmental practices. They are just making money. They don't think about environmental depletion. They never take care of the pollution their industry is spreading. They just want to save their money at the cost of public health and environmental deterioration

- **Improper Check & Balance**

Check and balance plays a very important role in every department. In Pakistan, there are no checks and balances about the activities taking place deteriorating the environment. The governmental institutions like ease and never bother to have checks and balances on the industries, construction works and all other places where harm is being done to the environment or the public health. No one follows the environmental laws in the country but they are not checked and brought to the court.

- **Low Involvement of Civil Society in Environmental Decision making**

Civil society's participation in environmental decision-making is gradually increasing in most of the reviewed countries. In Armenia, for example, there are public hearings concerning draft laws in the National Assembly but in Pakistan, there is no such civil society involvement in environmental decision-making and in the implementation of environmental laws. There is a need for a democratic process of public participation in environmental decision-making and sustainable development in the country. In Pakistan, public hearings are not so good because people don't know about the damages of the proposed action or project. People have low involvement in Environmental decision-making Making due to which the

losses are taking place regarding public health and the environment

- **Improper Role of Environmental NGOs.**

The NGOs are working all over the world for the betterment of the environment and the implementation of environmental laws. But in Pakistan, there are no such effective NGOs to work for the environment in a better way. They don't play their role in the implementation of the environmental laws and regulations. 11. Lack of Political Support Political support is also important in the implementation of environmental laws. Political parties can effectively implement the environmental laws but no political party in Pakistan is willing to support the environment. Mostly political leaders are uneducated and they just make money doesn't matter if the environment deteriorates.

- **Political Destabilization**

Political destabilization is also a barrier to the implementation of environmental laws. If a party proposes some projects which are helpful for the environment then the opposition will oppose it. The political parties always oppose each other even in the decisions relating to the environment and progress of Pakistan.

- **Capitalist's Power**

The owners of the industries are mostly politicians. They oppose all the laws better for the environment otherwise they will have to invest money in environment-friendly practices. Other capitalists and industrialists have so much power that they influence governmental matters. They oppose every environmental law in which they will have to use their money.

- **Institutional Task Sharing and Coordination**

The frequent restructuring and/or fragmentation of functions among several institutions without a clear division of responsibilities for their implementation has caused a general lack of continuity in environmental policymaking. Political instability has in many cases led to repeat Reorganizations of national, regional and local environmental structures. The ensuing changes in geographical coverage and the consequent transfers of files, changes in staff, leadership and priorities hamper the development of inter-ministerial coordination mechanisms. A key problem is that in almost all reviewed countries, coordination mechanisms between ministries, whether Formal or informal, are rather weak.

- **Economic Crisis**

Pakistan has been facing an economic crisis since 1947. Now the situation of the country is extremely critical. GDP is going low. Due to this the budget for

environmental betterment is very low. For the implementation of environmental law capital is required which is not used. So implementation of Environmental Law is in very poor condition.

- Corruption

Corruption is a very big issue in Pakistan. Environmental Law implementation is hindered by corruption. The industry doesn't follow the environmental rules and degrades the environment.

6.4 PARTICULAR PROBLEMS & LEGISLATIVE REACTIONS

6.4.1 Water Pollution

When the composition of water unnecessarily changes to the point where it is unfit for use for any purpose that it would be in its natural form, this is referred to as water pollution. One essential resource that allows life to exist is water. The availability of water frequently establishes the boundaries and pace of economic development. The amount and quality of freshwater resources that are currently available have declined as a result of the intense pressure that has been placed on them in recent years due to the growing demand for water for human activities.

Pakistan has of laws about water, such as:

- Pakistan Penal Code 1860
- The forest Act 1921 section 26(1) poisons water
- The Factories Act 1934 section 14
- Land Improvement Act 1883
- Karachi joined the water board ordinance in 1949 and Karachi joined water Rules in 1956
- PEPA Act 1997 section 2 (10)

6.4.2 Air Pollution

Pakistan is home to some of the world's worst air pollution. Pakistanis' lives are shortened by air pollution by an average of more than 4 years, and by up to 7 years in some places. Pakistan is attempting to lessen these realities through planning and policy, such as the National Clean Air Plan being created by the Ministry of the Environment with assistance from Clean Air Asia, the Stockholm Environment Institute (SEI), and the Climate and Clean Air Coalition (CCAC). This plan describes a strategy for coordinating efforts related to air quality management, defines strategies to mitigate air pollution, and sets targets for air pollutant concentration.

In addition, Pakistan has signed the Global Methane Pledge, a voluntary effort to

cut methane emissions by at least 30% by 2030. If successful, this pledge could prevent global warming by more than 0.2˚C by the year 2050. Pakistan's Clean Air Plan lays out some strategies to further reduce the nation's methane emissions, such as better waste management, better manure management in the agriculture sector, and leak detection and repair in the oil and gas industry. Pakistan has a big chance to lower methane emissions if it receives more money and assistance.

Pakistan is advancing its ambitious Nationally Determined Contributions (NDCs), which, subject to international assistance, bind the government to a goal of cutting projected emissions by 50% by 2030. Pakistan intends to achieve this by switching to 60% renewable energy, which will entail importing no coal and turning 30% of its cars to electric power. To reduce SLCPs, the nation has also announced intentions to switch to zig-zag brick kiln technology.

Along with the manufacturing of iron and steel, brick kilns are one of the main sources of black carbon emissions worldwide, accounting for 20% of total emissions. The implementation of Euro-5 standard gasoline is another goal.

6.3 NOISE POLLUTION

Regretfully, there is no law in Pakistan to address noise pollution from airports, trains, aero planes, factories, and building sites.

The federal and provincial Environmental Protection Agencies frequently receive complaints from the public regarding noise pollution, but they do not pursue legal action since there are no national regulations for noise pollution. In Pakistan's urban regions, road traffic noise is another cause of noise pollution.

As the density of traffic on city roads rises, especially in Karachi, the situation is becoming concerning.

There are currently no national regulations dictating noise thresholds for commercial, industrial, residential, or quiet zones. The majority of the areas especially the urban side have excessively loud conditions because of manufacturing, traffic, construction, and leisure activities.

There hasn't been a nationwide poll to gauge how noisy cities are. Random tests conducted in several cities, however, revealed that the majority of the sites had noise levels as high as 70 to 90 dB (A), which is far higher than the permitted limits.

There isn't currently any comprehensive regulation in place to regulate noise pollution. To address the unique conditions of Pakistan, the government ought to enact the "Noise Pollution Control Act."

6.4 CULTURAL ENVIRONMENT

Since natural and cultural heritage are inextricably linked to the human environment, heritage law is a specific subset of environmental law that is also vital to it. Because of this, the field of heritage law is specialized and has drawn fewer

Year	National Landmarks	Provincial Landmarks
1947	Antiquities Act 1947 (retitled of AMP-1904)	-
1960	-	Conservation Cell in Punjab
1968	Antiquities Act 1968	-
1975	Antiquities Act 1975	-
1985	-	Punjab Special Premises Act
1990	Major amendment in Antiquities Act 1975	-
1994	-	Sindh Cultural Heritage (Preservation) Act
1997	National Fund for Cultural Heritage Act	North-West Frontier Province (now Khyber Pakhtunkhwa) Antiquities ordinance
2002	-	Karachi Building & Town Planning Regulations
2005	-	Punjab Heritage Foundation Act
2011	Transfer of responsibilities and power from federal to provincial governments	-
2014	-	Balochistan Antiquities Act 2014
2016	-	Khyber Pakhtunkhwa Antiquities Act 2016

analysts than environmental law as a whole. In addition to being a component of international environmental law, which it can overlap with, especially when it comes to world heritage, modern heritage law must also be understood from an international, national, and sub-national level (including states, provinces, and municipal levels).

The British colonial authority instilled a long-standing custom of historical preservation in Pakistan. The Ancient Monuments Preservation Act (AMP Act, 1904), the preceding legacy statute, was a product of the knowledge and expertise gathered in the areas of archaeological survey, conservation, and monument protection. This Act mandates that all monuments, regardless of their cultural or religious significance, be preserved. The following are Pakistan's principal national and provincial laws about heritage:

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environmental Education in the 21st Century - Theory Practice, Progress and Promise by Palmer J. A.
2. Key Developments in Environmental Law, 2023 Edition. Stanley D Berger.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 What are the three factors the environmental planners must be aware of before planning a project?

Q2 Why is the government of Pakistan not as successful in controlling marine pollution as it should be?

UNIT 7

ORGANIZATIONAL & INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL PROTECTION & MANAGEMENT

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

Unit–7: ORGANIZATIONAL & INSTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL PROTECTION & MANAGEMENT

7.1 Pakistan Environmental Protection Council

7.1.1 Institutional Framework

7.2 Pakistan Environmental Protection Agency

7.2.1 Institutional Framework

INTRODUCTION

Students learned about environmental problems, risks, and damages brought on by human interference in the earlier modules. In Pakistan, the Environmental Act was created to restrict any actions related to the removal of forests, effluent emissions, and other related issues.

LEARNING OBJECTIVES

After studying this unit learners should be able to understand:

- Rules and regulations, penalties and tribunals that exist in Pakistan.
- How to protect the environment and conservation of nature.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

Today we face new classes of environmental problems that are scattered than in the past and thus demand different approaches. e.g.: Sediment. Pesticides, fertilizers that run off farmland, oil and toxic heavy metals that wash off city streets and air pollutants.

Now we have environmental problems on a global scale i.e.: Biodiversity loss, Ozone depletion, Climate change etc. These problems require cooperative international responses.

The trend can be changed if we are willing to develop strong environmental policies, develop new strategies and closely coordinate the action of public and private sectors towards a set of shared and long-term goals.

7.1 PAKISTAN ENVIRONMENTAL PROTECTION COUNCIL

Environment was handled by the Environment and Urban Affairs Division (EUAD) as soon as the current Constitution was adopted in 1973.

Since the Division only employed four professionals in 1975—none of whom had experience with the environment—the benefits of environmental protection were, nevertheless, rather limited.

The Ministry of Environment (MoE) became a legitimate ministry in 2002. The MoE's formal mandate included the creation and execution of national environmental policies, plans, and programmers, encompassing environmental planning, pollution control and prevention, and ecology.

The MoE was ranked second among environmental institutions, following the Pakistan Environmental Protection Council (PEPC). All these duties were transferred to the provinces by the 18th amendment to the constitution, and in October 2011, the Ministry of National Disaster Management (MNDM) took over the functions of the Ministry of Education.

The ministry was granted an extra function to combat climate change when the GOP raised the matter to the cabinet level.

As a result, in April 2012, the ministry changed its name to the Ministry of Climate Change (MoCC). But in June 2013, the MoCC's budget was cut by more than sixty percent, and it was demoted from a ministry to a division.

7.1.1 Institutional Framework:

PEPC, chaired by the prime minister, is the highest environmental policy-making body in Pakistan and has broad supervisory functions with responsibilities for environmental protection and promotion of sustainable development. Members of the council include the federal minister for climate change and provincial ministers responsible for the environment, the federal secretary dealing with climate change, and other federal appointees.

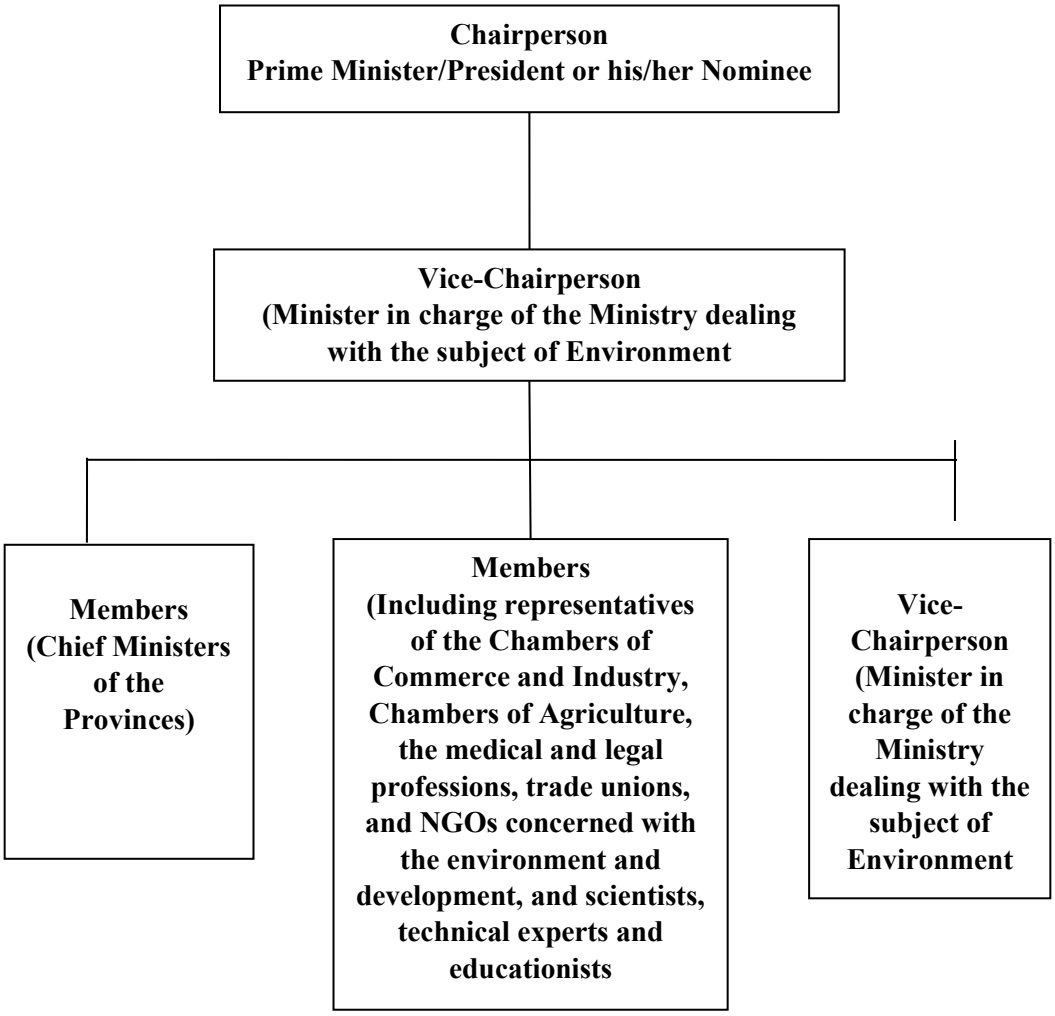
Functions and Powers of the Council:

i. The council shall:

- Co-ordinate and supervise enforcement and provision of this Act
- Approve comprehensive national environmental policies and ensure their implementation within the framework of a national strategy
- Provide guidelines for conservation of biodiversity and environmental protection considerations in natural resource management
- Coordinate integration of the principles and concerns of sustainable development into national development plans and policies
- Consider the National Environmental Report and give appropriate directions thereon
-

ii. The council may either itself or on the request of any person or organization, direct the Federal Agency or any Government Agency to prepare, submit, promote or implement projects for the protection, conservation, rehabilitation and improvement 23 of the environment, the prevention and control of pollution and the sustainable development of resources or to undertake research in any aspect of the environment.

Institutional Framework of the Pakistan Environmental Protection Council



7.2 PAKISTAN ENVIRONMENTAL PROTECTION AGENCY

Under the supervision of the Ministry of Climate Change and Environmental Coordination, the Pakistan Environmental Protection Agency (PEPA) is an executive agency of the Pakistani government. The agency's job is to write and implement regulations based on laws established by Parliament to preserve human health and the environment. As per PEPA 1997, section (5), Pak-EPA was founded. The primary duties of the Pak-EPA are;

- To carry out the PEPA-1997 at regulations & guidelines.
- Accept the Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA).
- Certifies the development of environmental labs in the Capital Territory of Islamabad.
- With permission from the Pakistan Environmental Protection Council (PEPC), Pak-EPA is required to create, amend, and compile the National Environmental Quality Standards (NEQS).
- Take steps to encourage scientific and technological advancements and research that could help reduce pollution. Sustainability in development and environmental protection.
- Determine which environmental areas require legislation, then start the process of drafting it.
- Give the public advice and information about environmental issues.
- Encourage the establishment and operation of nongovernmental organizations, community organizations, and village organizations to prevent and control pollution and promote sustainable development. Specify safeguards for the prevention of accidents and disasters which may cause pollution.
- The Agency may, on its initiative or in response to a complaint from any individual or group, conduct research or investigations into environmental issues.

7.2.1 Institutional Framework

Pakistan Environmental Protection Agency is charged with protecting human health and the environment, by writing and enforcing regulations based on laws passed by Parliament. Pak-EPA began its operations in 1997 after Parliament

passed a law to establish a Federal Executive Agency.

Functions of the Federal Agency:

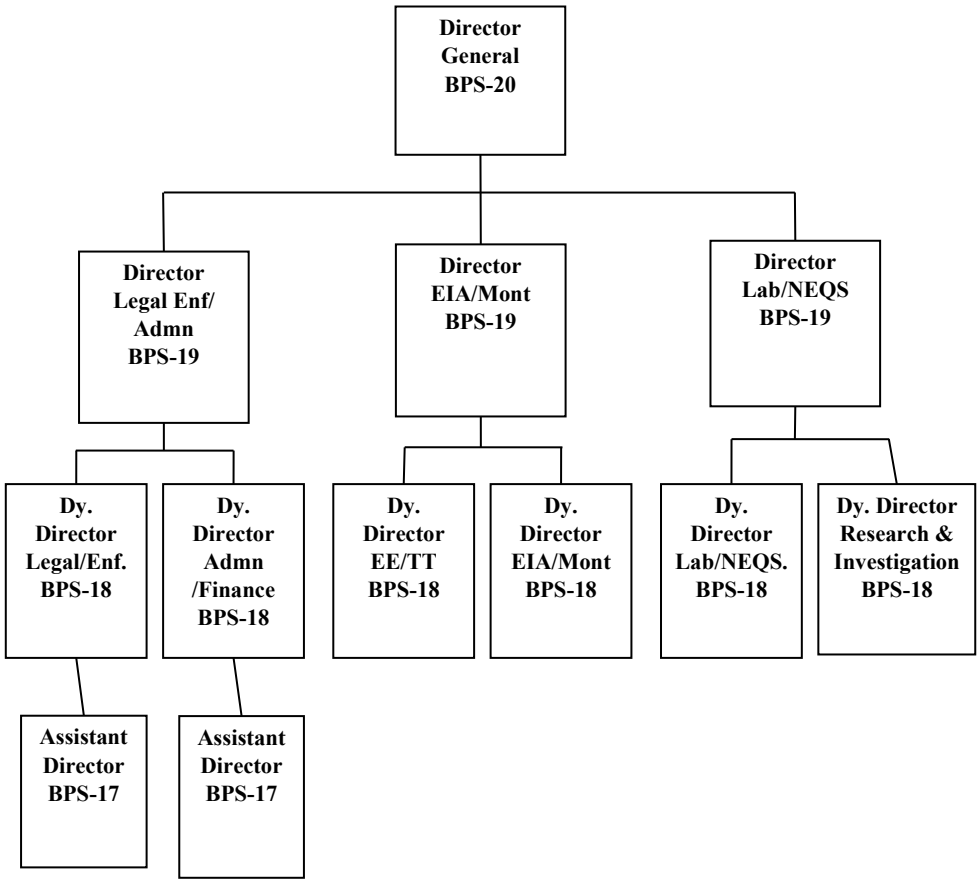
i. **The Federal Agency shall:**

- Administer and implement this Act as per its rules and regulations
- Prepare Environmental policies for approval by the Council
- Implement the national environmental policies approved by the Council
- Prepare and publish an annual National Environment Report
- Formulate enforcement and carryout revisions of NEQS
- Establish ambient standards for air, water and land
- Coordinate environment control programs nationally and internationally
- Conduct environmental monitoring wherever required
- Conduct research and development
- Certify environmental laboratories
- Coordinate and assist all levels of government and community institutions for the safe disposal of waste under NEQS
- Promote environmental awareness and education
- Undertake safeguards from environmental disasters
- Be responsible for establishing guidelines on how implementing agencies should undertake EIA procedures during planning, reviewing and sanctioning of projects

ii. **The Federal Agency may:**

- Undertake inquiries or investigations into environmental issues either on its own accord or upon complaint from any person or organization
- Request any person to furnish any information or data, relevant to its functions
- Initiate (with the approval of the Federal Government) requests for foreign assistance in support of the purposes of this Act
- Establish and maintain laboratories to conduct research in various aspects of the environment

Institutional Framework of the Pakistan Environmental Protection Agency



Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environmental Education in the 21st Century - Theory Practice, Progress and Promise by Palmer J. A.
2. Key Developments in Environmental Law, 2023 Edition. Stanley D Berger.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 Enlist the Departments that are responsible for protecting the environment.

Q2 How can monetary incentives or disincentives work?

UNIT 8

ENERGY CONSERVATION

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT–8: ENERGY CONSERVATION

8.1 Energy Conservation

8.1.1 Methods of Energy Conservation

8.2 Energy Development & Environment

8.2.1 Greenhouse Gas Emissions

8.2.2 Climate Change

8.2.3 Air and Water Quality

8.3 Renewable and Non-renewable energy resources

8.3.1 Renewable Resources Energy Resources

8.3.2 Nonrenewable energy sources

8.4 Saving the Non-Renewable

8.5 Enhancing the Renewable

INTRODUCTION

220 million people are living in Pakistan, and providing electricity to such a large population is a challenge that is as significant and concerning in terms of its volume and urgency as providing food and other requirements. This area focuses on energy conservation and waste reduction in various industries, including transportation, agriculture, and building and architecture. This is also PGD SED's primary focus.

LEARNING OBJECTIVES

After studying this unit, you should be able to:

- Understand the basics of energy and its conservation.
- Realize the importance of saving energy in the growth development and prosperity of a country.
- Become familiar with the methods and techniques to save energy in industry, building design, agriculture and transport section.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

8.1 ENERGY CONSERVATION

Generally speaking, energy conservation involves taking steps to lower end-use energy use. One way to increase efficiency is to install energy-efficient lighting. Conserving energy can be achieved by manually turning off lights when not in use or by using timers or motion sensor switches. Energy conservation and energy efficiency are related strategies to prevent or minimize energy use that frequently work in tandem or overlap. In general, energy efficiency refers to the technical performance of building materials, energy-converting equipment, and energy-consuming gadgets.

All human activities require energy. The utilized energy varies from simple human efforts to the use of following:

- Biomass
- Solid Fuels (coal, lignite and peat)
- Petroleum products and natural gas
- Nuclear power

Other uncommon forms of energy include

- Geothermal Heat
- Wind
- Tides
- Solar Heat

The consumption of energy in developing countries is low with large populations, indicating that the major consumers of energy are massive infrastructures, industries and technological advancement, transportation etc. The factors of the rise in commercial energy consumption are

- Increase in urban population
- Increased energy-intensive consumption
- Rapid industrialization

The construction of mass transits, and urban mega projects is the main energy consumers. This is one of the main causes of environmental degradation and results in

- Deforestation for fuel wood

- Pollution of air, land and water by both accession and burning of solid fuels and petroleum derivatives.
- Environmental problems associated with large hydroelectric projects
- Release of radioactive matter.

Without energy conservation, the world will deplete its natural resources. Some people don't see that as an issue because it will take many decades to happen and they foresee that by the time the natural resource is gone there will be an alternative; the depletion also comes at the cost of creating an enormous destructive waste product that then impacts the rest of life. The goal of energy conservation techniques is to reduce demand, protect and replenish supplies, develop and use alternative energy sources, and clean up the damage from the prior energy processes.

8.1.1 Methods of Energy Conservation

Below are energy conservation techniques that can help you reduce your overall carbon footprint and save money in the long run.

- Install CFL Lights: CFL bulbs cost more upfront but last 12 times longer than regular incandescent bulbs. CFL bulbs will not only save energy but over time you end up saving money.
- Lower the Room Temperature: The more the difference between indoor and outdoor temperature, the more energy it consumes to maintain room temperature.
- Fix Air Leaks: During winter months, you could be letting out a lot of heat if you do not have proper insulation.
- Use Maximum Daylight: This will reduce the burden on the local power grid and save you a good amount of money in the long run.
- Get Energy Audit Done: Getting an energy audit done by hiring an energy audit expert for your home is an energy conservation technique that can help you conserve energy and save a good amount of money every month.
- Use Energy-Efficient Appliances: Energy-efficient appliances with an Energy Star rating consume less energy and save you money.
- Drive Less, Walk More and Carpooling: Yet another energy conservation technique is to drive less and walk more. This will not only reduce your carbon footprint but will also keep you healthy as walking is good exercise.
- Switch Off Appliances When Not in Use: Electrical appliances like coffee machines, idle printers, desktop computers keep on using electricity even when not in use. Just switch them off if you don't need them immediately.

- Plant Shady Landscaping: Shady landscaping outside your home will protect it from intense heat during hot and sunny days and chilly winds during the winter season.
- Install Energy-Efficient Windows: Some of the older windows installed at our homes aren't energy efficient. Double-panel windows and other vinyl frames are much better than single-pane windows. Choosing the correct blinds can save on your power bills.

Other Energy Conservation Techniques

- There are practical methods such as insulation, changing light sources, using alternate fuels and carpooling rather than walking Understanding the core techniques beneath them will show you more about what to do in life.
- Education: Education is probably the most powerful of the energy conservation techniques that can be used. Education is about more than teaching people the importance of conservation, it is about showing the choices that can be used in construction, manufacturing and other processes.
- Zero Energy Balance: Zero Energy Balance is more than techniques of conserving energy in green construction.
- Alternative Power: More processes are starting to use alternative power and fuel sources in many different areas of life. The use of alternative power is one of the key energy conservation techniques.
- Cap and Trade Agreements: Cap and trade agreements are used as part of the process of regulating and conserving consumption and pollution for manufacturing industries.
- Reduced Demand: Numerous initiatives are working to reduce the overall demand on the energy resources of the world. This can range everywhere from education programs to changing the type of required insulation in new construction.
- Research & Development: Continued funding of research and development projects in the energy conservation field is how we discover the changes that can be made to reduce consumption and discover renewable methods to provide us with the energy that modern life requires. It should be one of the energy conservation techniques that are most valued as it is what holds the promise of leading to a solution to the world's energy crisis.

8.2 ENERGY DEVELOPMENT & ENVIRONMENT

When humanity learned how to employ fire extensively, civilization was born. By burning wood, they were able to achieve temperatures high enough to melt metals, extract chemicals, turn heat into mechanical power, and use it for heating and

cooking. When wood burns, the carbon in it reacts with oxygen to produce CO_2, which is absorbed by plants and transformed back into carbon so that it can be burned again. Fossil fuels, such as oil, coal, and gas, were used to start the industrial revolution because wood could not supply the needed fuel. The use of these fuels has raised the air's CO_2 concentration, which has sparked global warming. Many experts now believe that global warming is happening despite several prior warnings about the dangers of greenhouse gas emissions. This is because substantial steps to prevent environmental pollution were not done. The public's awareness has grown over the past 20 years, and scholars, policymakers, and others have concentrated on these and related concerns by taking the environment, energy, and sustainable development into consideration.

One of the key factors influencing the sustainability of our world is the interaction between energy and the environment. The influence of energy production and use on air quality, climate, and ecosystems highlights how urgent it is to implement eco-friendly methods. A thorough understanding of the relationships between these two crucial factors is necessary to maintain the delicate balance between providing for the world's energy requirements and protecting the environment. This thorough investigation will focus on some of important facets of this partnership.

8.2.1. Greenhouse Gas Emissions

The primary connection between energy and the environment is the emissions of greenhouse gases, such as nitrous oxide (N_2O), carbon dioxide (CO_2), and methane (CH_4). These emissions are mostly responsible for the greenhouse effect and global warming when fossil fuels are burned for energy. Achieving a sustainable balance between greenhouse gas emissions and other factors requires mitigation of both.

8.2.2 Climate Change

The energy sector contributes significantly to global warming, which causes changes in weather patterns, rising sea levels, and an increase in the frequency of extreme weather events like heat waves and hurricanes. Ecosystems and human societies are both greatly impacted by the effects of climate change. To confront and adapt to climate change, sustainable practices in the production and consumption of energy are essential for promoting a positive link between energy and the environment.

8.2.3 Air and Water Quality

In addition to emitting greenhouse gases, burning fossil fuels releases particulate matter, which further contaminates the air. Aquatic habitats may suffer from the

pollution of water sources caused by energy-generating operations. Water is frequently used in power plants for cooling, and thermal pollution can result from the release of hot water into bodies of water. Achieving a sustainable balance between energy and the environment requires giving priority to actions that improve the quality of the air and water.

8.3 RENEWABLE AND NON-RENEWABLE ENERGY RESOURCES

We use all kinds of natural resources: minerals, wood, coal, natural gas, wind, water, plants, animals and many more. Some of these are renewable and some are non-renewable. The difference is that some renew at faster rates than others, making them more sustainable than those that do not renew very fast.

8.3.1 Renewable Resources Energy Resources

Renewable resources are resources that are replenished by the environment over relatively short periods.

This type of resource is much more desirable to use because often a resource renews so fast that it will have regenerated by the time you've used it up. Below are the main Renewable energy resources in the natural environment:

Solar energy is one such resource because the sun shines all the time. Imagine trying to harness all of the sun's energy before it ran out! Wind energy is another renewable resource.

You can't stop the wind from blowing any more than you can stop the sun from shining, which makes it easy to 'renew.'

Geothermal energy is a renewable resource that provides heat from the earth - 'geo' means 'earth' and 'thermal' means 'heat.' Volcanoes on Earth that spew hot lava when they erupt. That lava has got to come from somewhere.

It's sitting underneath the earth's surface as incredibly hot rock and magma.

Biofuels are renewable resources made by the living organisms. Ethanol for example is derived from corn. Biodiesel is vehicle fuel made from vegetable oil.

Some other biofuels are firewood, animal dunk and peat burned for heat and cooking purposes are also biofuels because they come from animals.

8.3.2 Nonrenewable energy sources

Some energy sources are classified as nonrenewable because they do not form or replenish in a short period. The four major nonrenewable energy sources are

- Crude oil (petroleum)
- Natural gas
- Coal
- Uranium (nuclear energy)

Nonrenewable energy sources come out of the ground as liquids, gases, and solids. We use crude oil to make liquid petroleum products such as gasoline, diesel fuel, and heating oil. Propane and other hydrocarbon gas liquids, such as butane and ethane, are found in natural gas and crude oil.

All fossil fuels are nonrenewable, but not all nonrenewable energy sources are fossil fuels Coal, crude oil, and natural gas are all considered fossil fuels because they were formed from the buried remains of plants and animals that lived millions of years ago.

Uranium ore, a solid, is mined and converted to a fuel used at nuclear power plants. Uranium is not a fossil fuel, but it is classified as a nonrenewable fuel.

Crude oil is a mixture of hydrocarbons that formed from plants and animals that lived millions of years ago. Crude oil is a fossil fuel, and it exists in liquid form in underground pools or reservoirs, in tiny spaces within sedimentary rocks, and near the surface in tar (or oil) sands.

Petroleum products are fuels made from crude oil and other hydrocarbons contained in natural gas. Petroleum products can also be made from coal, natural gas, and biomass.

Natural gas and crude oil are mixtures of different hydrocarbons. Natural gas occurs deep beneath the earth's surface. Natural gas consists mainly of methane, a compound with one carbon atom and four hydrogen atoms.

Natural gas also contains small amounts of hydrocarbon gas liquids and non-hydrocarbon gases. We use natural gas as a fuel and to make materials and chemicals.

Coal takes millions of years to form. Coal is a combustible black or brownish-black sedimentary rock with a high amount of carbon and hydrocarbons.

Coal is classified as a nonrenewable energy source because it takes millions of years to form. Coal contains the energy stored by plants that lived hundreds of millions of years ago in swampy forests.

Nuclear energy is energy in the core of an atom. Atoms are the tiny particles in the molecules that make up gases, liquids, and solids.

Enormous energy is present in the bonds that hold the nucleus together. This nuclear energy can be released when those bonds are broken. The bonds can be broken through nuclear fission, and this energy can be used to produce electricity.

8.4 SAVING THE NON-RENEWABLE

Energy sources classified as non-renewable are those with limited supply that cannot be naturally renewed or replaced.

These energy sources are produced by organic matter breaking down naturally or by nuclear reactions taking place in the Earth's core. While non-renewable energy contributes significantly to our current energy needs, its finite nature and environmental effect present concerns.

The most widely used nonrenewable resources are nuclear energy derived from uranium and fossil fuels including coal, natural gas, and crude oil.

For centuries, non-renewable energy has propelled economic progress and served as the foundation of contemporary industrialization. However, because these resources are limited, it is necessary to investigate and create sustainable substitutes, such as renewable energy sources like solar and wind.

8.5 ENHANCING THE RENEWABLE

Energy from renewable natural resources is energy that is produced more quickly than it is used. Examples of such sources that are continuously replenished are sunlight and wind. There are several renewable energy sources available to mankind.

Burning fossil fuels produces significantly more emissions than producing renewable energy. Solar, wind, geothermal, hydroelectric, oceanic, and biofuel are

a few examples of renewable energy sources. There are two primary approaches to augment the energy supply:

- Develop and increase the use of renewable (sustainable) sources of energy, such as wind, solar and HEP.
- Continue to exploit non-renewable fossil fuels such as oil and gas and develop the use of nuclear power.

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Energy Conservation. 4th Edition. Dale R. Patrick, Stephen W. Fardo, Ray E. Richardson, Brian W. Fardo, Mark Barron. 2023
2. The Visual Handbook of Energy Conservation: A Comprehensive Guide to Reducing Energy Use at Home. Charlie Wing. 2013.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 To enable efficient utilization of the building environment what basic facilities should be kept in consideration?

Q2 What are the advantages of conservation of energy?

UNIT 9

ENVIRONMENTAL EDUCATION

Written by:
Dr. Muhammad Farooq Mustafa

Reviewed by:
Dr. Rabeea Zafar
Ar. Nazia Iftikhar

CONTENTS

UNIT–9: ENVIRONMENTAL EDUCATION

9.1 Environmental Education

9.1.1 Benefits of Environmental Education

9.2 Public Awareness and Participation

9.3 Environmental Education Goals

INTRODUCTION

The field of environmental education is relatively new, active, and intricate to research and analysis. Yes, it has to do with learning and teaching. The same goal, which is the necessity and significance of environmental education, is emphasized in this unit. It includes details on the history of the idea of environmental education as well as strategies for advancing it, such as integrating it into curricula taught to students in universities and schools and setting up quick activities that encourage interaction between the students and their surroundings.

LEARNING OBJECTIVES

After studying this unit, you should be able to:

- Understand the importance of the incorporation of environmental education in the formal education system.
- Trace the origin and promotion of environmental education in the past and be able to design future strategies.
- Realize the importance of acquiring knowledge values, attitudes, skills and commitment needed to protect and improve the environment.

INDICATIVE CONTENTS AND SUMMARY OF THE MAIN TOPICS

9.1 ENVIRONMENTAL EDUCATION

Environmental education is a process that allows individuals to explore environmental issues, engage in problem-solving, and take action to improve the environment. As a result, individuals develop a deeper understanding of environmental issues and have the skills to make informed and responsible decisions. Environmental education does not advocate a particular viewpoint or course of action. Rather, environmental education teaches individuals how to weigh various sides of an issue through critical thinking and it enhances their own problem-solving and decision-making skills.

Environmental Education is a methodology in which people pick up familiarity with their surroundings and secure learning, abilities, values, experiences, and passion, all of which will empower them to act separately and aggregately to take care of present and future environmental issues. It is the study of relationships and interactions between natural and human systems. In short, environmental education is provided so that people can have a better understanding of the world around them and know how to take care of it properly so that the world can be a better place.

Environmental education is a complex field, and it covers a variety of different topics that are related to the environment. It even has some aspects of engineering in it, which means that a person can even start to understand how they can play a role in environmental engineering. Environmental education furnishes individuals with the mindfulness required to build up organizations, comprehend NGO exercises, create participatory methodologies for urban planning, and guarantee future markets for eco-business. All of these are not only good for the environment, but they will also end up being very good for the economy as well, so everyone gets to benefit from the efforts of those who are going through environmental education.

There are many different parts to environmental education. The most common segments of environmental education that you will come across during your studies can include the following:

- **Awareness and Mindfulness:**

Mindfulness and affectability to nature‘s turf and related environmental difficulties create the vital abilities and mastery to address the difficulties, instil confidence and stewardship and cultivate inspirations, and responsibilities to settle on educated choices and make dependable moves in the field that they are working with.

- **Knowledge and Learning:**

Learning and understanding of nature and environmental difficulties that are holding people back and/or causing the world to change in negative ways.

- **Attitudes:**

Disposition of sympathy toward nature‘s domain and inspiration to enhance or keep up the environmental quality, which will spill over into any plans that you make or anything else that you do that is related to the organization that you currently are working in or developing.

- **Skills:**

Aptitudes to recognize and help resolve environmental difficulties in a practical manner that matches up with the current trends and technologies that are out there today.

- **Participation:**

Investment in programs and projects that help reduce the effect of environmental difficulties, this making sure that the money you‘re investing is going to help the environment instead of harming it.

So, environmental education is actually an incredibly important part of running a business, company, or organization. Without this vital component, companies would be a lot more reckless with natural resources and/or the land that they are using in order to move their company forward. It also empowers an individual, community, or organization to enhance their decision-making skill by weighing various sides of an issue and not advocating a particular viewpoint or action. With environmental education, you can be sure that your staff will be more mindful of the environment around them and that they will be more savvy when it comes to making plans that are more environmentally friendly and beneficial. Environmental education connects us to the world around us, teaching us about both natural and built environments. EE raises awareness of issues impacting the environment upon which we all depend, as well as actions we can take to improve and sustain it.

9.1.1 Benefits of Environmental Education

1. Imagination and enthusiasm are heightened:

Environmental education is hands-on, interactive learning that sparks the imagination and unlocks creativity. When EE is integrated into the curriculum, students are more enthusiastic and engaged in learning, which raises student achievement in core academic areas.

2. Learning transcends the classroom:

Not only does environmental education offer opportunities for experiential learning outside of the classroom, it enables students to make connections and apply their learning in the real world. EE helps learners see the interconnectedness of social, ecological, economic, cultural, and political issues.

3. Critical and creative thinking skills are enhanced:

Environmental education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues. By developing and enhancing critical and creative thinking skills, Environmental education helps foster a new generation of informed consumers, workers, as well as policy or decision-makers.

4. Tolerance and understanding are supported:

Environmental education encourages students to investigate varying sides of issues to understand the full picture. It promotes tolerance of different points of view and different cultures.

5. State and national learning standards are met for multiple subjects:

By incorporating environmental education practices into the curriculum, teachers can integrate science, math, language arts, history, and more into one rich lesson or activity, and still satisfy numerous state and national academic standards in all subject areas. Taking a class outside or bringing nature indoors provides an excellent backdrop or context for interdisciplinary learning.

Biphobia and nature deficit disorder decline:

By exposing students to nature and allowing them to learn and play outside, environmental education fosters sensitivity, appreciation, and respect for the environment. It combats nature deficit disorder‖ and it‘s fun too.

1. Healthy lifestyles are encouraged:

Environmental education gets students outside and active and helps address some of the health issues we are seeing in children today, such as obesity, attention deficit disorders, and depression. Good nutrition is often emphasized through environmental education and stress is reduced due to increased time spent in nature.

2. Communities are strengthened:

Environmental education promotes a sense of place and connection through

community involvement. When students decide to learn more or take action to improve their environment, they reach out to community experts, donors, volunteers, and local facilities to help bring the community together to understand and address environmental issues impacting their neighborhood.

3 .Responsible action is taken to better the environment:

Environmental education helps students understand how their decisions and actions affect the environment, and builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. Service-learning programs offered by PLT and other environmental education organizations provide students and teachers with support through grants and other resources for action projects.

4. Students and teachers are empowered:

Environmental education promotes active learning, citizenship, and student leadership. It empowers youth to share their voice and make a difference at their school and in their communities. Environmental education helps teachers build their own environmental knowledge and teaching skills.

9.2 Public Awareness and Participation

Public knowledge has the power to protect the environment's quality and integrity. The greatest hazard to human life is a diminishing environment. Abiotic stress on plants and animals is brought on by pollution and the loss of priceless natural resources. In environment management, one of the fundamental ideas is public awareness. It includes:

- Growing awareness and sensitivity to environmental issues.
- Instilling in people the strict necessity of protecting the environment and natural resources.
- Encouraging people to actively participate in environmental development and protection.
- Gaining knowledge to actively identify environmental issues and discover solutions.
- Evaluation of the effects of several environmental programmes started to enhance environmental health, taking into account socioeconomic, ecological, and aesthetic factors.

9.3 ENVIRONMENTAL EDUCATION GOALS:

Environmental education aims to influence people's perspectives, increase

awareness, impart knowledge, and provide them with the tools they need to tackle actual environmental issues. The general public has to be aware of integrated, multidisciplinary, and comprehensive education for this reason. This can only be achieved by a novel approach to education, which ought to be offered in colleges and universities.

According to UNESCO, the objectives of environmental education are to raise global public awareness of environmental issues and the problems they face, as well as to inspire people to take personal and collective action to address current issues and stop the emergence of new ones.

Recommended Reading List

Prescribed Reading

1. Notes from Study Guides

Prescribed Reading

1. Environmental Education in the 21st Century - Theory Practice, Progress and Promise by Palmer J. A.
2. Climate change education: Knowing, Doing and Being. Chang Chew Hung.2023.

SELF-ASSESSMENT QUESTIONS/EXERCISE QUESTIONS FOR REVIEW

Q1 What is the classical definition of environmental education?

Q2 How can teachers participate in making children aware of environmental issues?