Environmental Biology

नमूना • SAMPLE

SAMPLE

Environmental Biology

Dr. S.Z. Ali

नमूना • SAMPLE

AKHAND PUBLISHING HOUSE
DELHI (INDIA)

Published by



AKHAND PUBLISHING HOUSE

Publisher, Distributor, Exporter having an Online Bookstore

L-9A, First Floor, Street No. 42,
Sadatpur Extension, Delhi-110094 (INDIA)
Phone No.: 9968628081, 9555149955 & 9013387535
E-mail : akhandpublishinghouse@gmail.com,
akhandpublishing@yahoo.com
Website : www.akhandbooks.com

Environmental Biology

© Authors
IInd Edition 2019
ISBN 978-93-88998-49-9

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, transmitted or utilized in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright owner Author/Editors. Application for such permission should be addressed to the Publisher and Author/Editors. Please do not participate in or do not encourage piracy of copyrighted materials in violation of the author's rights. Purchase only authorized editions.

The responsibility for facts stated, opinion expressed or conclusions reached and plagiarism, if any, in this book is entirely that of the author. Neither the publishers nor the editor will be responsible for them whatsoever.

Printed in India

Published by Jhapsu Yadav for Akhand Publishing House, Delhi.

SAMPLE

Contents

	Preface	*vii*
1.	Environmental studies	1
2.	Matter, Energy, & Life	27
3.	Biosphere	42
4.	Ecosystem	58
5.	Community & Population Ecology	74
6.	Conservation & Biodiversity	97
7.	Environmental Hazards & Human Health	124
8.	Water Availability and Use	137
9.	Food & Hunger	156
10.	Conventional & Sustainable Agriculture	162
11.	Air Pollution, Climate Change, & Ozone Depletion	175
12.	Conventional & Sustainable Energy	189
13.	Environmental Engineering	208
	Bibliography	*231*

SAMPLE

नमूना • SAMPLE

Preface

Environmental science is the dynamic, interdisciplinary study of the interaction of living and non-living parts of the environment, with special focus on the impact of humans on the environment. The study of environmental science includes circumstances, objects, or conditions by which an organism or community is surrounded and the complex ways in which they interact.

The need for equitable, ethical, and sustainable use of Earth's resources by a global population that nears the carrying capacity of the planet requires us not only to understand how human behaviors affect the environment, but also the scientific principles that govern interactions between the living and non-living. Our future depends on our ability to understand and evaluate evidence-based arguments about the environmental consequences of human actions and technologies, and to make informed decisions based on those arguments.

From global climate change to habitat loss driven by human population growth and development, Earth is becoming a different planet—right before our eyes. The global scale and rate of environmental change are beyond anything in recorded human history. Our challenge is to acquire an improved understanding of Earth's complex environmental systems; systems characterized by interactions within and among their natural and human components that link local to global and short-term to long-term phenomena, and individual behavior to collective action. The complexity of environmental challenges demands that we all participate in finding and implementing solutions leading to long-term environmental sustainability.

Dr. S.Z. Ali

SAMPLE

नमूना • SAMPLE

CHAPTER 1

Environmental Studies

Environmental studies is a multidisciplinary academic field which systematically studies human interaction with the environment in the interests of solving complex problems. Environmental studies brings together the principles of the physical sciences, commerce/economics and social sciences so as to solve contemporary environmental problems. It is a broad field of study that includes the natural environment, the built environment, and the sets of relationships between them. The field encompasses study in basic principles of ecology and environmental science, as well as associated subjects such as ethics, geography, anthropology, policy, politics, law, economics, philosophy, sociology and social justice, planning, pollution control and natural resource management. There are also many degree programs in Environmental Studies including the Master of Environmental Studies and the Bachelor of Environmental Studies.

HISTORY

The New York State College of Forestry at Syracuse University established a BS in environmental studies degree in the 1950s, awarding its first degree in 1956. Middlebury College established the major there in 1965.

The Environmental Studies Association of Canada (ESAC) was established in 1993 "to further research and teaching activities in areas related to environmental studies in Canada". ESAC's magazine, A\J: Alternatives Journal was first published by Robert A. Paehlke on 4 July 1971.

The Association for Environmental Studies and Sciences (AESS) was founded in 2008 as the first professional association in the interdisciplinary field of environmental studies in the United States. In 2010, the National Council for Science and the Environment (NCSE) agreed to advice and support the Association. The Association's scholarly journal, the Journal of Environmental Studies and Sciences (JESS), commenced publication in March 2011. Explore the basics of environmental studies and the unique interdisciplinary methods used to address the most challenging environmental issues. This segment will give you a brief overview of types of problems and the solutions examined within environmental studies.

TEXT SAMPLE

Definition of Environmental Studies

As residents on Earth, our actions can impact the planet and the rest of its inhabitants. Just as major environmental catastrophes, such as hurricanes, earthquakes, and volcanic eruptions, can affect us, our actions can have major impacts on the environment. Human activities, such as pollution released into the environment, cutting down forests, and damning rivers, have all created significant impacts for environmental health and society. Environmental studies is the field that examines this relationship between people and the environment.

Environmental studies is an interdisciplinary subject examining the interplay between the social, legal, management, and scientific aspects of environmental issues. Interdisciplinary means that issues are examined from multiple perspectives. Unlike environmental science, which focuses mainly on the scientific component of these environmental issues, environmental studies investigates the scientific and the humanitarian aspects. Students of environmental studies learn the causes, effects, and possible solutions to address important environmental problems.

Environmental Issues

Environmental studies majors must first investigate the broad range of issues that our society is facing now and in the future. Broad issues to be addressed include population and consumption concerns, energy use, biodiversity, and global climate change. Each issue requires consideration of the political, social, and economic concerns, in addition to a scientific understanding.

Let's consider the 2014 drought in California. From a scientific perspective, we know that the entire state is facing drought conditions due to low amounts of rain and snowfall over the past few years. In addition, growing populations and agriculture businesses have further strained the decreasing water supply. Economically, this drought is creating large stresses to the extensive agricultural communities in California, who rely on water to irrigate their crops. From a social viewpoint, several communities have faced dwindling water supplies, which have prompted government officials to place restrictions on water use and develop relief efforts to supply water to those in need.

This example of the drought in California shows the importance of an interdisciplinary approach in understanding and resolving environmental issues. The drought is caused by a combination of natural (low rainfall), social (growing population), and economic (farming) causes.

Some issues may only affect a local community, such as regional water use policies and their effects on agriculture and local businesses. Other environmental issues have global implications, such as growing industry causing carbon dioxide levels to rise in the atmosphere.

Environmental Management

To help resolve some of the environmental issues, policy makers, scientists, and government planners are looking for the most efficient ways to use our natural resources with the least negative impact possible. Environmental management strives to oversee man's impact on the environment through several management techniques. Management techniques include the development of new technologies, environmental

SAMPLE

policies, and sustainability measures. Environmental management is where the interdisciplinary nature of environmental studies truly shines, because you must consider the scientific, economic, and social aspects of the area to be managed. Environmental managers identify the potential impact an area is facing, the goal of the management plan, and methods to achieve their goal.

Sustainability is an environmental management practice that has been gaining popularity in recent years. Sustainability addresses ways that we can use natural resources now without compromising the economic and social development of future generations. In other words, how should we behave now to ensure that our grandchildren have the clean water, air, and basic resources that they will need?

ENVIRONMENTAL POLICY

A major portion of environmental management is the creation of environmental policies to ensure industrial activities do not negatively impact the environment. Environmental policiesare rules and regulations created by the government to set standards that cannot be exceeded. These standards include maximum allowable pollutant levels in water, air, and soils, which are determined through scientific research. Policy makers often include industry and community leaders in the process of developing new regulations.

In the United States, the Environmental Protection Agency (EPA) was created in 1970 to establish and enforce environmental regulations. These regulations cover a wide range of concerns, including air quality, water quality, disposal of hazardous materials, and handling of waste. The policies set national pollution standards that cannot be exceeded. Environmental policies are also created and enforced on the local and state levels.

Scope and Components of Environmental Studies

Environment literally means Surrounding in which we are living. Environment includes all those things on which we are directly or indirectly dependent for our survival, whether it is living component like animals, plants or non living component like soil, air water.

Environmental Studies involves scientific study of the environmental system and the status of its inherent or induced changes on organisms.

In addition to study of physical and biological characters of environment, it also describes the social and cultural factors and the impact of man on environment.

According to UNESCO (1971), the Objectives of environmental studies are:

(i) Creating awareness about different environmental problems.
(ii) Imparting fundamental knowledge regarding environment and its allied problems.
(iii) Developing an attitude of concern for environment.
(iv) Motivating public to participate in environmental protection and environmental improvement.
(v) Striving to attain harmony with nature.
(vi) Acquiring skills to help the concerned individuals in identifying and solving environmental problems.

SAMPLE

The broad term environmental studies include environmen-tal sciences, environmental engineering and environmental man-agement.

(i) Environmental Science

This branch of environmental studies deals with the scientific study of environmental compo-nents (air, water, land and soil), the inherent or induced changes on organisms and the environmental hazards occurring due to uninterrupted interactions of human beings with environment.

(ii) Environmental Engineering

ADVERTISEMENTS:

This branch of environmen-tal studies discusses the study of technical processes involved in the protection of environment from the potentially deleterious effects of anthropogenic activities and improving the environmen-tal quality.

(iii) Environmental Management

This branch of environ-mental studies covers environment and enterprise objectives, scope and structure of environment, interaction of nature, soci-ety and enterprise, environmental impact assessment, econom-ics of pollution, prevention, environmental management stand-ards environmental audits etc. Thus, environmental studies are multidisciplinary in nature.

Environment

The term environment means the surrounding of a species to which it remains totally adapted and to which it continuously interacts for every activity of life in some or other way for its survival. Biologically environment constitutes the abiotic component of nature such as soil, water, air, light, energy, humidity, temperature etc. which affect the existence, growth and metabolism of the organism.

Environment can be defined in a number of ways

ADVERTISEMENTS:

(i) "Environment is the sum of all social, economical, biological, physical and chemical factors which constitute the surrounding".

(ii) According to C.C. Park (1980), "Environment refers to sum total of conditions which surround man at a given point in space and time".

(iii) "Environment is the combination of all the organic and inorganic substances surrounding man".

(iv) According to a 'Goudie (1984), "Environment is the representative of the physical components of the earth wherein man is the important factor influencing its environment."

(v) According to K.R. Dikshit (1984), "the space we live in, the air we breath, the food we eat, the water we drink and the other sources we need, constitute our environment".

(vi) According to B.K. Sharma (1994), "Environment consists of an inseparable whole system constituted by physical, chemical, biological, social and cultural

SAMPLE

elements, which are interlinked individually and collectively in myriad ways."

Classification of Environment

Since the environment is both physical and biological concept, it encompasses both the living and non-living components of the planet earth.

Thus on the basis of basic structure, the environment may be divided into two basic units:

(i) Physical or Abiotic environment
(ii) Biotic environment.

On the basis of physical characteristic and state, abiotic environment may be further subdivided into three broad categories:

(i) Solid;
(ii) liquid and
(iii) Gas.

Thus, the three basic division of physical environment may be termed as:

(i) Lithospheric environment (solid);
(ii) Atmospheric environment (Gas), and
(iii) Hydrosphere environment (liquid).

These may be further broken into smaller units based on different spatial scales e.g.

(i) mountain environment;
(iii) plain environment;
(iii) plateau environment;
(iv) lake environment;
(v) River environment;
(vi) Maritime environment; and
(vii) Glacier environment etc.

The physical environment may also be viewed in terms of climatic conditions providing certain suits of habitat for biological communities e.g. tropical environment temperate environment, polar environment etc.

The biotic component of the environment consists of plants (flora) and animals (fauna) including man as an important factor.

Thus, the biotic environment may be divided into:

(i) Floral environment; and
(ii) Faunal environment.

All the organisms work to form their social groups and organizations at several levels and thus are formed social environment wherein the living organisms work to derive the matter from the physical environment for their sustenance and development. This process generates economic environment.

Man derives and utilizes resources from the physical and biotic environment with his skills and technologies which may be termed as physical, social and economic functions of man. The economic function of man makes him an environmental geomorphic process because through him matter and energy from one ecosystem can be transferred to other.

SAMPLE

The biotic and abiotic components constitute together the Biome environment. The energy component includes solar energy, geochemical energy, thermo-electrical energy, hydro-electrical energy, nuclear and atomic energy etc.

Factors Influencing Environment:

The life of an organism is surrounded and effected by a number of external forces. These forces are known as environmental or ecological factors. There are actually four categories of ecological factors which affect the environment.

These factors may be outlined as below:

(a) Topographic or Physiographic factors:

These factors include altitude, direction of mountain chains, plateaus, plains, lakes, rivers, sea level and valleys etc.

(b) Climatic or Aerial factors:

These include atmosphere, light temperature, humidity, rainfall etc.

(c) Edaphic factors:

These comprise lithosphere or soil.

(d) Biotic factors:

These include all types of interactions between different forms of life. For example, man, animals, plants, micro-organisms etc. All these ecological factors operate in conjunctions and not individually, affecting the life of organisms.

Components of Environment:

Environment consists of four components or segments, they are:

(1) Atmosphere;

(2) Hydrosphere;

(3) Lithosphere; and

(4) Biosphere.

(1) Atmosphere:

The invisible protective thick gaseous cover of air which envelopes the earth is known as atmosphere. It sustains life on earth and saves living organisms from the hostile environment of outer space. It extends to a height of about 1600km. from the earth's surface. The major components of the atmosphere are nitrogen and oxygen while the minor components are argon, carbon dioxide and some trace gases (shown in Table 1.1.)

TABLE 1.1 : COMPOSITION OF THE ATMOSPHERE BELOW 25 km.

Components	*Name of the gas*	*Per cent by volume*
1. Major components	(i) Nitrogen	78.09
	(ii) Oxygen	20.94
	(iii) Water vapour	0.1 to 5.0
2. Minor components	(i) Argon	9.3410^{-1}
	(ii) Carbon dioxide	5.2510^{-2}
3. Trace components	(i) Neon	1.8210^{-3}
	(ii) Helium	5.2510^{-4}
	(iii) Methane	210^{-4}
	(iv) Krypton	1.1410^{-4}
	(v) Nitrous oxide	2.510^{-5}
	(vi) Hydrogen	510^{-5}
	(vii) Xenon	8.710^{-6}
	(viii) Sulphur dioxide	210^{-6}
	(ix) Ammonia	110^{-6}
	(x) Carbon monoxide	1.210^{-5}
	(xi) Nitrogen dioxide	110^{-6}

SAMPLE

Some important functions of atmosphere are outlined below:

(i) It maintains heat balance of the earth through absorption of infrared radiation emitted by the sun and re-emitted from the earth.

(ii) It absorbs most of the cosmic rays from outer space and a major portion of the electromagnetic radiation from the sun.

(iii) It filters tissue damaging ultraviolet radiation below 300 nm.

(iv) It is a source of oxygen (for respiration), carbon dioxide (for photo-synthesis) and nitrogen (for nitrogen fixation).

(v) It is a medium for the operation of different bio- geochemical cycles.

(vi) It acts as a carrier of water from ocean to land.

(vii) It maintains and stabilises weather and climate.

2. Hydrosphere:

The hydrosphere includes all types of water resources such as oceans, seas, rivers, lakes, streams, reservoirs, glaciers, polar ice caps and ground water. Out of the total water resources, 97% is present in oceans as salty water, 2% is present as ice cap and rest 1 % is available as fresh water for our day-to-day use.

Some important uses of water are as follows:

(i) It is used for drinking, cooking and cleaning purposes

(ii) It is used for irrigation and power generation.

(iii) It is used in different industrial operations.

(iv) It is used for navigation, fisheries and aquaculture.

(v) Its most important use is waste disposal.

3. Lithosphere (Land):

Land forms the crucial platform for a dynamic interaction in between the biotic and abiotic environment. It is the outer mantle of the solid earth, consisting of minerals occurring in the earth's crust and the soil. The soil consists of a complex mixture of minerals, organic matter, air and water.

In the present technologically developed world, changes in the farming practices with continued use of agricultural chemicals, industrial proliferation, mining activities and unplanned urbanization have altered the land forms and their quality, making land more and more scarce.

Some important uses of land are as follows:

(i) It is used for agriculture and horticulture (to get food)

(ii) It is used for afforestation.

(iii) It is used for industrialisation and urbanisation.

(iv) It is used for transportation by road and rail.

(v) It is used for amenity and recreation.

4. Biosphere:

Biosphere is that part of atmosphere, hydrosphere and lithosphere where all the living organisms survive together and interact with one-another.

In atmosphere, the living organisms exists up to a distance of 6 km from the surface of the earth and in ocean, the living organism exists up to a depth of 7 km from the surface. Such a distance of 13 km is known as biosphere. The living species in biosphere may be animals or plants. The living organisms in biosphere differ from one-another by their shape, size, distribution and characteristics.

OPEN SAMPLE