



ENVIRONMENTAL PROTECTION AND ECOLOGY

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Abstract : Ecology is the science which concerns with relationship between living organisms with their physical environment. It is the study of the interactions of organisms and their environments. We consider it from the angle of organisms and how these organisms adjust to environment. A ecosystem consists of mutually interacting organisms and their environment in which matter is interchanged. The environment in which a particular organism lives is called 'habitat'. Its role is called as 'niche'. Environment is then divided into four categories as terrestrial environment, fresh water environment, marine environment and symbiotic environment. The methods of ecology fall roughly into three categories: descriptive surveys of patterns of species and resource distribution and abundance, theoretical modeling, and experimental manipulations. Ecological systems are "open" systems, and patterns and processes are products of a huge number of interacting forces. Ecology and the environmental sciences have made enormous advances since the mid-twentieth century in the understanding of ecological systems, as well as in the human impact on the environment. Theory in ecology usually centers on the development of models. Environmental outcomes are uncertain and when making decisions under uncertainty, there are a variety of options available. The word 'environment' means surrounding in which organisms live. It is the sum total of conditions that surround us at a given point in time and space. The environment can be biotic (living) or abiotic (physical or non-living). It influences the growth and development of living forms. Environment regulates the life of the organisms including human beings. Human beings interact with the environment more vigorously than any other living beings. Ordinarily, environment refers to the materials and forces that surround the living organism. It provides us with all the resources for leading a comfortable life. Ecology may be defined as the scientific study of the relationship of living organisms with each other and with their environment. The term ecology was first coined in 1869 by the German biologist Ernst Haeckel. It has been derived from two Greek words, 'oikos', meaning home or estate and 'logos' meaning study. The emphasis is on relationships between organisms and the components of the environment namely abiotic (non-living) and biotic (living). Environment is the surrounding in which the organisms live whereas the ecosystem involves the interaction between the environment and the organisms living in it.

IndexTerms - Ecology, Environment, Population growth, Degradation of soils, Global atmospheric changes, Loss of biodiversity/Habitat destruction, Pollution

INTRODUCTION

Human concern for the environment has evolved and grown over the years. Though many of the problems are tackled, problems still exists and new problems originated. Concern about the degradation of the natural world is the major challenge, even today. Clearly many environmental issues merit our immediate attention. However, the major issues of particular concern are discussed in this paper. The term "ecology" (from the Greek oikos, which means house or dwelling) was coined by Haeckel in 1866, to refer to the study of "the economy of nature" and "the complex interrelations referred to by Darwin as the struggle for existence." Ecology's antecedents in plant physiology, biogeography, demography, and evolutionary biology (Edgerton 1976; McIntosh 1985; Kingsland [1985]1995) investigated how individual organisms adapt to their physical environment, how populations grow, and what shapes the patterns of distribution and abundance of different species. Ecology today is a "patchwork" of subdisciplines (Sarkar 2005): physiological ecology, behavioral ecology, population ecology, community ecology, evolutionary ecology, and ecosystem ecology. Within these subdisciplines, there are even further divisions, e.g., between terrestrial and marine community ecology. McIntosh (1985) calls ecology a "polymorphic" discipline, due in part to the fact that ecology is so diverse in its subject matter.

Human activities in past decades have raised serious issues related to environment and its conservation. Air pollution, poor management of its waste, growing water scarcity, falling ground water tables, water pollution, waste disposal, desertification, endangered species, preservation and quality of forest, biodiversity loss, and land/soil degradation, Global Climate change, pollution, environmental degradation, Global Warming, Greenhouse effect, Acidification, Ozone depletion and other local, regional and global level environmental problems and genetically modified foods are the current environment problem that make us vulnerable to disasters and tragedies now and in the future. An ecosystem is a functional unit of nature where a community of living organisms interact among themselves and with the surrounding physical environment. An ecosystem is a sub part of Ecology.

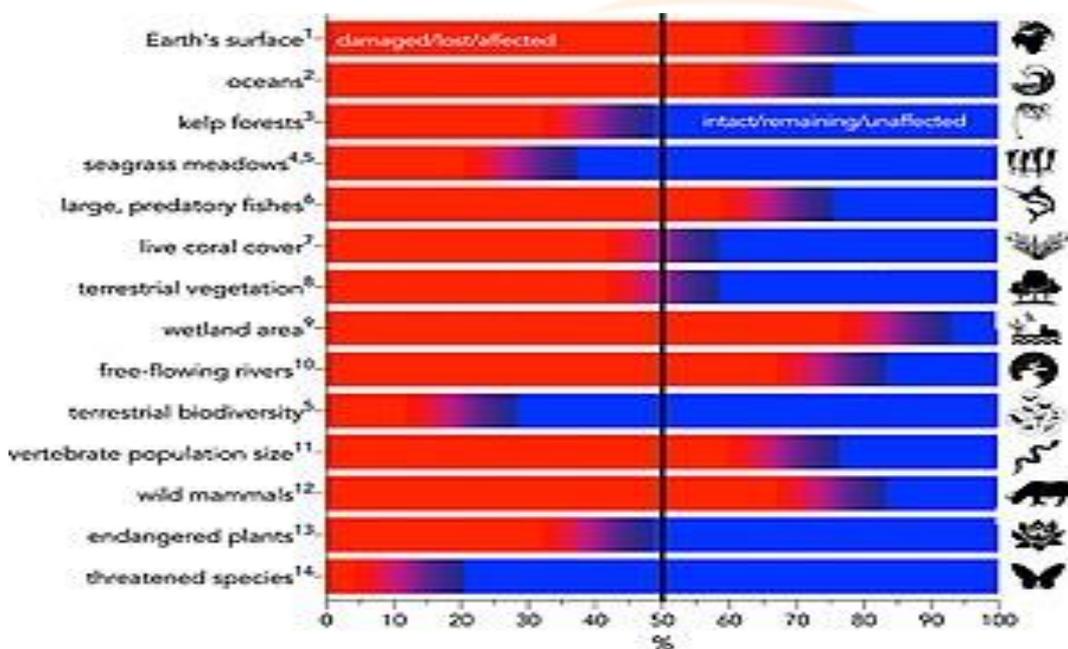
Ecosystem accounts for population explosion which leads to depletion of resources. Ecosystem ecology and population ecology are two important areas of consideration. The functional ecology explains how things work. At this stage we must consider biosphere. Biosphere is part of an environment consisting of living organism specially biological entities. This is made of hydrosphere and geosphere. Environment influences biosphere. This is based upon plant synthesis fixing solar energy in form of photochemical reactions. The degradation in the presence (aerobic) or absence of (anaerobic) oxygen leads to reduction of bio mass with liberation of CO₂ gas. Biosphere and anthrosphere are closely related. Human being depends upon biosphere. The anthrosphere is that part of the environment made or modified by human being and used for their activities.

What is Environment?

The word environment refers to all ecological units which are naturally present on earth in the form of land, water, air, soil, forest, sunlight, minerals, living organisms etc. This earth is full of natural surroundings, some are biotic and some are non- biotic. Biotic element are those elements like human, birds, animals, plants, and microorganisms. Whereas non-biotic elements are those which have no life like air, sunlight, water, land, soil, minerals etc. further it is also divided among four different sphere viz. biospheres, lithosphere, atmosphere and hydrosphere. In which hydrosphere is the largest part on the earth among all life on earth has become possible due to some kind of action and reactions between different kinds of resources that are present in environment. Currently, the situation of environment is very poor that could never be imagine by our ancestor in previous time. We have endlessly spoil our environment by using its resources in very wrong way. We can see that every day and everywhere pollution is rapidly increasing on earth where it is air, land, water or soil pollution, deforestation, acid rain, and other dangerous disasters created by the human beings through technological advancement. Use of natural resources should be carefully planned and executed. For providing a better and healthy life to our forth coming generation.

Environmental issues

An environmental problem occurs when there comes a change in quality or the quantity of the environmental factor that directly or indirectly affect everything on earth. “Environmental issues are defined as problems with the planet's system (air, water, soil etc.) that have developed as a result of human interference or mistreatment of the planet.” A variety of environmental problems now affect our entire world. As globalization continues and the earth's natural processes transform local problems into international issues. Some largest problems now affecting the world are: acid rain, air pollution, global warming, hazardous wastes, ozone depilation, smog, water pollution, overpopulation and rain forest destruction. It is related to not only environment bur with everyone that live in the planet. It effect every human, animal, and nation on this planet. Human have faced poor environmental conditions throughout history, but what we think of as environmental problems become more common and apparent with industrialization and urbanization. In the United State for the example, air and water pollution from the factories and dense urban living conditions attracted growing attention throughout the last centuries, and by the 1960s become recognized as significant problems. Concern over air and water pollution rapidly spread to a range of other conditions- soil erosion, pesticides contamination, deforestation, declining animal population and species and so on through the efforts of environmental scientist, activists, and policy-makers. These diverse concerns gradually merged into environmental problems, and the 1970 Earth Day in United States and then the 1972 United Nation Conference on the Human Environment in Stockholm helped turn “Environmental Quality” into a major international issue. By the time of the United Nation Conference on Environment and Development in Rio De Janeiro in 1992, significant “Green Parties” had been formed in Europe and environmental problems were the subject of citizen and governmental attention worldwide. Environmentalist, a social and environmental movement addresses environmental issues through advocacy, education and activism. The environmental issues can occurs at three levels local, regional and global. Local environmental issues-Some major local environmental issues are given below- 1. Pollution 2. Waste Disposal 3.Desertification 4. Water Scarcity 5. Endangered Species



Summary of major environmental-change categories expressed as a percentage change relative to the baseline . Red indicates the percentage of the category that is damaged, lost, or otherwise affected, whereas blue indicates the percentage that is intact, remaining, or otherwise unaffected.

Ecology is the scientific analysis and study of interactions among organisms and their environment. It is an interdisciplinary field that includes biology, geography, and Earth science. Ecology includes the study of interactions organisms have with each other, other organisms, and with abiotic components of their environment. A natural ecosystem is an ecosystem that occurs as it would without the influence of human beings. The term “ecosystem” refers to all of the plants, animals, fungi, protozoans, bacteria and other organisms that live in the same area. All of these distinct species share highly interconnected lives and, in many ways, function

as one unit. Ecosystem management is a process that aims to conserve major ecological services and restore natural resources while meeting the socioeconomic, political and cultural and needs of current and future generations. The principal objective of ecosystem management is the efficient maintenance and ethical use of natural resources. It is a multifaceted and holistic approach which requires a significant change in how the natural and human environments are identified.

Environment is living things and what is around them. It can be living or non-living things. It includes physical, chemical and other natural forces. Living things do not simply exist in their environment. They constantly interact with it. Organisms change in response to conditions in their environment. In the environment there are interactions between plants, animals, soil, water, temperature, light, and other living and non-living things. Strategic management encourages the establishment of goals that will benefit the ecosystem while keeping socioeconomic and politically relevant issues in mind. Strategic management differs from other types of ecosystem management because it keeps stakeholders involved and relies on their input to develop the best management strategy for an ecosystem. Similarly to other modes of ecosystem management, this method places a high level of importance on evaluating and reviewing any changes, progress or negative impacts and prioritizes flexibility in adapting management protocols as a result of new information.

Environmental law - or "environmental and natural resources law" - is a collective term describing the network of treaties, statutes, regulations, and common and customary laws addressing the effects of human activity on the natural environment.

Different Environmental Laws

Waste management: Waste management laws govern the transport, treatment, storage, and disposal of all manner of waste, including municipal solid waste, hazardous waste, and nuclear waste, among many other types

Forest resources: Forestry laws govern activities in designated forest lands, most commonly with respect to forest management and timber harvesting.

Wild life and plants: Wildlife laws govern the potential impact of human activity on wild animals, whether directly on individuals or populations, or indirectly via habitat degradation.

Fish and game: Fish and game laws regulate the right to pursue and take or kill certain kinds of fish and wild animal (game).

Environmental philosophy is a branch of philosophy that is concerned with the natural environment and humans' place within it. Environmental philosophy includes environmental ethics, environmental aesthetics, eco feminism, environmental hermeneutics, and environmental theology.

Human concern for the environment has evolved and grown over the years. Though many of the problems are tackled, problems still exists and new problems originated. Concern about the degradation of the natural world is the major challenge, even today. Clearly many environmental issues merit our immediate attention. However, the major issues of particular concern are Population growth, Degradation of soils, Global atmospheric changes, Loss of biodiversity/Habitat destruction, Pollution.

Population Growth

Human populations have grown at alarming rates in the last few centuries. More than 5.5 billion people occupy the earth, and we are adding about 100 million more each year. The major question is whether there are sufficient resources to support even 5 billion humans on a sustainable basis. Vital resources are stressed by the dual demands of increasing population and increasing consumption per person. Food shortages and famines are too familiar in many places and may increase in frequency and severity if population growth, soil erosion, nutrient depletion, shortage of oil reserves, etc, continue in the future, as they have in the past.



Water deficits and pollution of existing sources threaten to be critical environmental issues in the future for agricultural production as well as for domestic and industrial uses. Population growth is one of the most serious obstacles to world prosperity and sustainable development. The world may soon be facing new famine, mass migration, destabilization and even armed struggle as people compete for ever more scarce land and water resources. Today's new borns will be facing the ultimate collapse of vital resource bases. Realizing that increasing population is causing a large segment of the population to become locked in poverty, many countries are actively promoting family planning which is the basis for family welfare. As population, poverty and environmental degradation are recognized to be the major problems. However, it is established that poverty, environmental degradation and high fertility rates (population) are locked in a self-perpetuating vicious cycle.

DEGRADATION OF SOIL

Food production on the earth mainly depends on land based agricultural systems. For sustainability, protecting and nurturing agricultural soils is a major task. Soil which is the major component of land is a living resource, which supports life. Soil is a complex mixture of weathered rocks, decomposed organisms and numerous living organisms. An ecosystem by itself, soil is one of the three important components of biosphere. Productivity depends on healthy soil, water, nutrients, energy, pest control and static ecological systems. Soil is a renewable resource that can be replenished and renewed indefinitely. However, modern agricultural practices deplete soil nutrients and expose the soil to the erosive forces of wind and moving water. As such, this resource is being removed much faster than it is being replaced. Soil formation is a very slow process. Soil is mainly minerals for about 50% and the remaining being air, water and organic residues. Weathering processes are responsible for formation of mineral particles from bed rock. Glaciers, rivers, ocean currents and landslides are the popular weathering agents.



Fertile soils form a basis for plant growth and food production. Soils are prone to degradation by erosion, overgrazing, deforestation, etc., leading to loss of productive lands. In addition, irrigated lands are becoming salty (salinization) to support crops, water supplies for irrigation are being depleted and irrigated lands are converted to different land uses in the process of development.

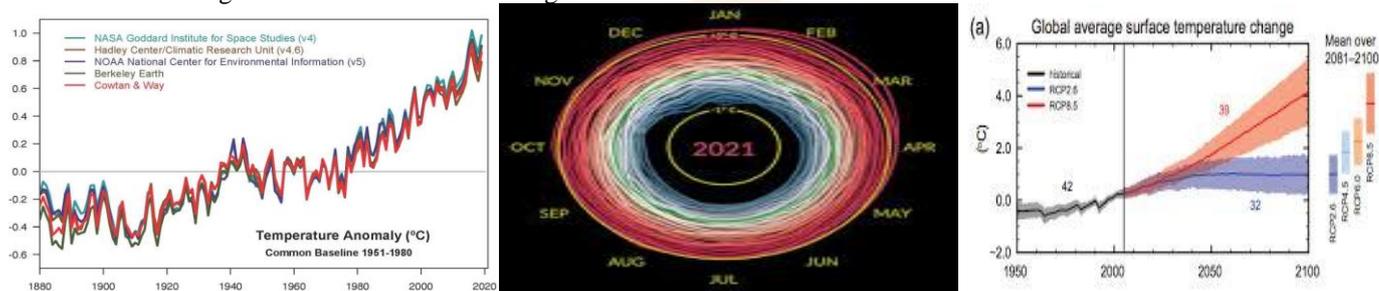
The intervention of humans in the natural ecosystem results in degradation. In fact, agriculture both causes and suffers from environmental degradation and more so due to land degradation by erosion. Degradation refers to loss of biological productivity or loss of originality in soil. Natural processes like drought and floods also lead to degradation and several times, it is difficult to distinguish between human intervention and natural forces. Agriculture is recognized to be responsible for 28% of all land degradation, while water and wind erosion provide the motive force for the vast majority of all soil losses. The mechanisms that lead to degradation are either chemical or physical. Physical deterioration refers to compaction by heavy machinery or cattle, water logging (water depletion, salt accumulation (soil salinity), acidification, etc.

GLOBAL ATMOSPHERIC CHANGES

Humans are altering the atmosphere in ways that could lead to disastrous, worldwide climate change. The increasing concentrations of infrared absorbing gases released into the atmosphere by human activities trap heat and raise global temperatures. Some climatologists predict a grim future in which summer heat is unbearable, farms are turned to deserts, famines sweep the globe, melting polar ice caps rise sea levels and flood coastal regions and thousands or even millions of species die that can't migrate or adapt to sudden climatic changes. In the temperate regions, the winter will be shorter and warmer; the summer will be longer and warmer. A warmer climate is likely to make some cities extremely hot. There will be enormous increase in rainfall but the problems of desertification, drought and soil erosion will further worsen. The tropics may become wetter and the subtropics, which are already dry are expected to be drier. Industrialization and urbanization coupled with deforestation can convert the planet earth to a desert. Plants and animals will be effected leading to ecosystem imbalance. The crop yields will be severely effected. Cropping patterns need to be changed to suit climatic conditions.

In the modern civilization, energy plays a crucial role. Fossil fuels (oil, coal, and natural gas) presently supply 80% of the energy in industrialized countries. Supplies of these fuels are diminishing at an alarming rate and problems associated with their acquisition and use- air and water pollution, climate change, accidents, political insecurity, etc- may limit the future use of these reserves. As fossil fuels are burnt, carbon dioxide and other heat absorbing gases are released which cause global warming.

This may bring about rise in sea level and catastrophic climate change in many places. Acids formed in the air as a result of fossil fuel consumption already have caused damage to buildings and components of ecosystem. Continued fossil fuel use without pollution control measures could cause even more extensive damage. Chlorinated compounds, such as the chloro-fluoro carbons used in refrigeration and air conditioning contribute to global changes in addition to damaging ozone layer that protects living things from cancer causing ultra violet radiation in sunlight.

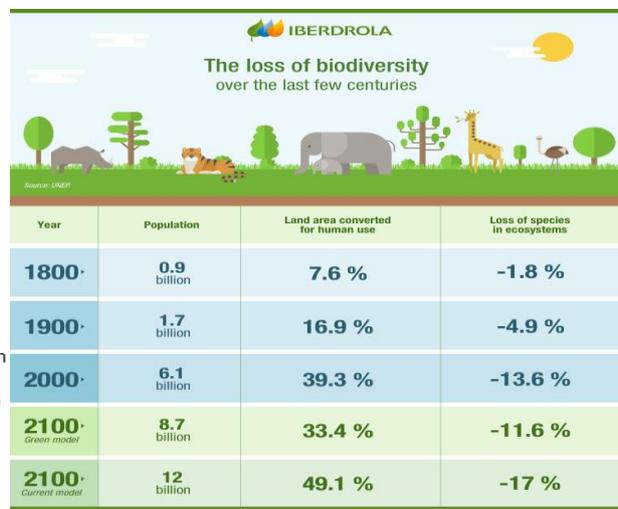
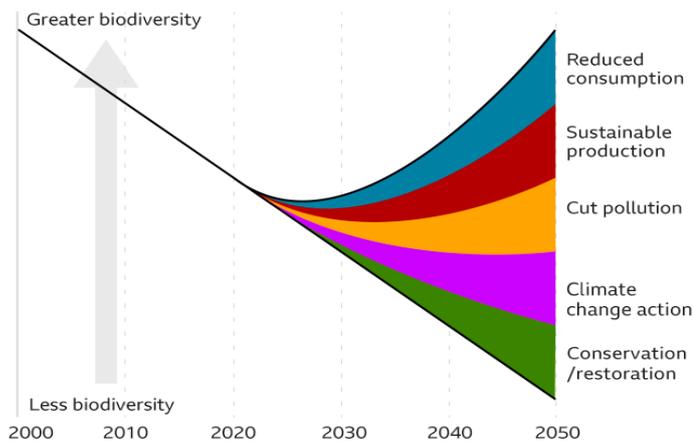


Latest NASA GIF showing change in earth's temperature shocks

LOSS OF BIODIVERSITY:

Increasing human population, along with increasing consumption are accelerating the conversion of forests, grass lands, coral reefs, etc. into urban development. The inevitable result is the extermination of most of the wild plants and animals that occupied those natural habitats. Habitat alterations lead to reduction of species population and extinction in the long run. Pollution alters additional habitats – particularly aquatic and marine habitats - abiotic or biotic factors change. These ecosystems, biologically rich in plant and animal species are subjected to extinction. This leads to enormous loss of species and a reduction in biological variety/ diversity and abundance, that could further limit our future options. Many rare and endangered species are threatened by human activities. In addition to practical values, aesthetic and ethical considerations suggest that we should protect these species and the habitat required for their survival.

How different actions could help restore biodiversity



Loss of biodiversity is critical for the following reasons.

- ✓ All domestic plants and animals used in agriculture are derived from wild species. We still rely on introducing genes from wild species into our domestic species to keep them vigorous and able to adapt to different conditions.
- ✓ Many of the drugs are originally derived from higher plants, even though only few of them are thoroughly studied.
- ✓ Biodiversity is the mainstay of agricultural crops and medicines and the loss of biodiversity can only curtail potential development in these areas.
- ✓ Also biodiversity is a critical factor in maintaining the stability of natural systems and enabling them to recover after disturbances such as fires or volcanic eruptions.
- ✓ The other reasons for maintaining biodiversity include aesthetic and moral arguments.
- ✓ Over centuries, the net balance of specialization and extinction has favoured the gradual accumulation of more and more species, in other words, biodiversity. The concept is often extended to the genetic diversity within species, as well as the diversity of ecosystems and habitats. However, the main focus is species diversity. Although multiple causes are usually attributed to loss of diversity, the greatest loss is caused by physical alteration of habitat through processes of conversion, fragmentation and simplification. The other causes, however include population factor, pollution, exotic species (non-native species), exploitation of resources, etc.
- ✓ Value of Biodiversity: Natural species of living things, collectively known as biota, are responsible for the structure and maintenance of all ecosystems. They and the ecosystems they form, represent biological wealth that sustains human life and economic activity. The value of natural species can be categorized into five areas: i) Sources of Agriculture, Forestry, Aquaculture, and Animal Husbandry, ii) Sources of Medicine iii) Commercial value iv) Recreational, Aesthetic and Scientific value v) Intrinsic value

POLLUTION

- ✓ Pollution was considered to be a local phenomena, till few centuries back. However, today environmental pollution is analysed on global scale, due to its impacts on a wider scale. The demand for energy in modern society leads to increasing dependence on fossil fuels – gasoline and other liquid fuels from crude oil, coal and natural gas. An unavoidable by product of burning fossil fuels to derive energy is carbon dioxide. Although, its requirement for plants for performing photosynthesis is highly essential, higher concentrations of carbon dioxide tend absorb infrared heat energy radiated from earth's surface. This process warms the lower atmosphere and is referred to as green house effect. Estimates indicate that there is 4% increase per year in CO₂ levels and is expected to double during the next century.



- ✓ Human activities including the burning of fossil fuels are increasing the atmospheric concentrations of green house gases. These changes are projected to change regional and global climate and climate related parameters such as temperature, rainfall, soil moisture and sea levels. Other consequences of pollution on global scale include, acid rains and depletion of ozone layer.
- ✓ Toxic air and water pollutants, along with mountains of solid and hazardous wastes are becoming overwhelming problems of the future. Numerous varieties of dangerous materials are released annually and much of it is disposed of in dangerous and irresponsible ways. The health effects of pollution, toxic wastes, stress and the other environmental ills of modern society have become greater threat than infectious diseases.

Environmental protection:

- ✓ It is a practice of protecting the natural environment on individual, organisation controlled or governmental levels, for the benefit of both the environment and humans. Due to the pressures of over consumption, population and technology, the biological environment is being degraded, sometimes permanently. This has been recognized, and governments have begun placing restraints on activities that cause environmental degradation.
- ✓ Since the 1960s, activity of environmental movements has created awareness of the various environmental issues. There is no agreement on the extent of the environmental impact of human activity, so protection measures are occasionally debated. In India Environment Improvement Trust (EIT) working for environment & forest protection since 1998. A group of Green Volunteers get a goal of Green India Clean India concept. In developing countries, such as throughout Latin America, these agreements are more commonly used to remedy significant levels of non-compliance with mandatory regulation

**International Environmental Agreements**

- ✓ Many of the earth's resources are especially vulnerable because they are influenced by human impacts across many countries.
- ✓ As a result of this, many attempts are made by countries to develop agreements that are signed by multiple governments to prevent damage or manage the impacts of human activity on natural resources.
- ✓ These international environmental agreements are sometimes legally binding documents that have legal implications when they are not followed and, at other times, are more agreements in principle or are for use as codes of conduct.
- ✓ These agreements have a long history with some multinational agreements being in place from as early as 1910 in Europe, America and Africa. Some of the most well-known multinational agreements include the Kyoto Protocol and others.

Government

- Many countries have organizations and agencies devoted to environmental protection. There are international environmental protection organizations, such as the United Nations Environment Programme.
- Decisions that impact the environment will ideally involve a broad range of stakeholders including industry, indigenous groups, environmental group and community representatives.

Government protection

- The National Environment Management Council (NEMC) is an institution that was initiated when the National Environment Management Act was first introduced in year 1983.
- This council has the role to advise governments and the international community on a range of environmental issues.
- The NEMC the following purposes provide: technical advice; coordinate technical activities; develop enforcement guidelines and procedures; assess, monitor and evaluate activities that impact the environment; promote and assist environmental information and communication; and seek advancement of scientific knowledge

The United Nations Environment Programme (UNEP) has identified 17 mega diverse countries. These countries represent a major concern for environmental protection because they have high rates of deforestation, ecosystems loss, pollution, and population growth. Since 1969, the United States Environmental Protection Agency (EPA) has been working to protect the environment and human health.

All U.S. states have their own state departments of environmental protection.

- The EPA has drafted "Seven Priorities for EPA's Future", which are:
- "Taking Action on Climate Change"
- "Improving Air Quality"
- "Assuring the Safety of Chemicals"
- "Cleaning Up Our Communities"
- "Protecting America's Waters"
- "Expanding the Conversation on Environmentalism and Working for Environmental Justice"
- "Building Strong State and Tribal Partnerships"

How to protect environment

- Painting your house? Use a latex paint. Oil-based paints release hydrocarbon fumes.
- Get a tune-up. Properly maintained vehicles get better gas mileage and emit fewer pollutants.
- Conserve energy. You'll lower your utility bills and help avoid peak demands on utility plants
- Plant a tree. Trees absorb carbon dioxide, a greenhouse gas.

Hence we should make a world which doesn't need protection by taking few preventions which are easier and are needed to our environment.

Methodological Challenges for Ecology

The balance-of-nature debate illustrates a number of persistent methodological challenges in ecology. Ecological systems are “open” systems, and what patterns and processes we see are products of a huge number of interacting forces. So, holding factors constant and testing hypotheses about various relationships between different factors, or estimating even simple ecological parameters in the field, are all difficult. Ecologists have become increasingly aware that ecological associations are “contingent” (in the sense of being products of historical forces) and “local” (in the sense that local associations have specific characteristics relative to local climates or geological conditions). However, it does not follow that generalized skepticism about the science of ecology is in order, for two reasons. First, most sciences are subject to some of the same difficulties of uncertainty and formalization, though in different respects and to different degrees. Second, ecology and the environmental sciences have made enormous advances since the mid-twentieth century in our understanding of ecological systems, as well as in the human impact on the environment. Despite the many challenges to a science of the environment, scientists are optimistic about developing more-predictive models (Moorcroft, forthcoming) and integrating data from a wide variety of fields (Clark and Gelfand, forthcoming).

SUMMARY

Major issues relating to environmental pollution and depletion of valuable natural resources vary in dimension from local, regional to global levels. Air pollution primarily results from burning of fossil fuel, e.g., coal and petroleum, in industries and in automobiles. They are harmful to humans, animals and plants, and therefore must be removed to keep our air clean. Domestic sewage, the most common source of pollution of water bodies, reduces dissolved oxygen but increases biochemical oxygen demand of receiving water. Domestic sewage is rich in nutrients, especially, nitrogen and phosphorus, which cause

eutrophication and nuisance creating algal blooms. Industrial waste waters are often rich in toxic chemicals, especially heavy metals and organic compounds. Industrial waste waters harm living organisms. Municipal solid wastes also create problems and must be disposed off in landfills. Disposal of hazardous wastes like defunct ships, radioactive wastes and e-wastes requires additional efforts. Soil pollution primarily results from agricultural chemicals (e.g., pesticides) and leachates from solid wastes deposited over it. Two major environmental issues of global nature are increasing greenhouse effect, which is warming Earth, and depletion of ozone in the stratosphere. Enhanced greenhouse effect is mainly due to increased emission of carbon dioxide, methane, nitrous oxide and CFCs., and also due to deforestation. It may drastically change rainfall pattern, global temperature, besides deleteriously affecting living organisms. Ozone in the stratosphere, which protects us from harmful effects of ultraviolet radiation, is depleting fast due to emission of CFCs thus increasing the risks of skin cancer, mutation and other disorders

Conclusion:

Global trends today are recognized to be unsustainable by all groups of people. In fact all the human activities are considered to be causing environmental problems. Common sense dictates that these trends and activities are all on a collision course not only with basic human needs, but also with fundamental systems that maintain our planet as a tolerable place to live in. On the contrary, humans have made considerable progress in many areas in controlling air and water pollution and reducing wasteful resource uses. Population growth has stabilized in most countries and even in some very poor countries, where social security and democracy have been established. The incidence of life threatening infectious diseases has been controlled and the average life expectancy has increased. Many new resources are discovered and more efficient ways of using existing supplies are evolved. Still, individual and collective efforts to protect and restore environment are highly essential. Public awareness needs to be created through media coverage of the environmental issues. The growing understanding and concern for environment go a long way towards sustainable development. Although we still have far way to go in protecting our environment, some progress is already made towards a sustainable world. Environmental protection has always been practiced by humans in one form or another. However, as anthropogenic pressures on the environment have escalated over the past century, the need for systematic environmental protection has increased. This has led to considerable experimentation with the domestic and international measures that are used to achieve environmental protection objectives. Some of these have been successful, but the overall picture is one of failure. Due to the failings of the past and greater awareness of the complexity of environmental problems, there is a growing acceptance that environmental protection is best achieved through the use of a multipronged approach. This requires the use of a combination of regulatory, economic, voluntary, and information instruments, where the policy mix is determined on the basis of the available evidence regarding cost-effectiveness. The international challenge lies in the development of effective and equitable approaches to global environmental problems that are supported by a well-resourced bureaucracy and appropriate financial mechanisms. The threat posed by climate change has added greater urgency to the push for effective international environmental governance arrangements.

We must recognise that ecology is the ‘heart’ and ‘backbone’ of environmental science, that humans are only one of the millions of organisms that are subject to the laws of nature and that the social sciences, which deal with the multitude of human species, form its soul because environmental problems are created by the humans and have to be managed by the humans for the humans. Environmental problems result from complex interactions between the physical components of the environment and all other living organisms on one hand and the humans which alter both, on the other. Ecology is a biocentric discipline that deals these complex interactions and must form the core of environmental science. If environmental degradation is to be prevented and also reversed, and if our limited natural resources are to be conserved, ecology must be given its rightful place in education and research at all levels. Ecological research needs strengthening in the areas of ecosystem functioning and restoration ecology by focusing on long-term interdisciplinary, holistic studies in problem-solving mode. Ecologists should rise to the occasion and demonstrate how they can indeed help mitigate, if not reverse, the environmental degradation.

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