SYLLABUS

Class – B.Com. III Sem.

Subject – Environmental Studies

UNIT – I	Study of environmental and ecology – (a) Definition of importance (b) Environmental pollution and problems (c) public participation and public awareness
UNIT – II	Environmental and social problems – (a) Air, water, noise, heat and nuclear pollution (b) causes, effect and prevention of pollution; (c) disaster management – Flood, earthquake, cyclones and land sliders.
UNIT – III	Environmental pollution – (a) Development – non-sustainable (b) Energy problem of cities (c) water prevention – rain water collection
UNIT – IV	Role of mankind in conserving natural resource – (a) Food resources – world food problems (b) Energy resources – increasing demand for energy (c) Land resources – land as resources
UNIT – V	Environment conservation laws – (a) Conservation laws for air and water pollution (b) wildlife conservation laws (c) Role of information technology in protecting environment & health.

UNIT-I

DEFINITIONS OF ENVIRONMENT

Word 'environment" is most commonly used describing "natural" environment and means the sum of all living and non-living things that surround an organism, or group of organisms. Environment includes all elements, factors, and conditions that have some impact on growth and development of certain organism. Environment includes both biotic and abiotic factors that have influence on observed organism. Abiotic factors such as light, temperature, water, atmospheric gases combine with biotic factors (all surrounding living species). Environment often changes after some time and therefore many organisms have ability to adapt to these changes. However tolerance range is not the same with all species and exposure to environmental conditions at the limit of an certain organism's tolerance range represents environmental stress.

Environmentalism is very important political and social movement with goal to protect nature environment by emphasizing importance of nature role in protection of the environment in combination with various actions and policies oriented to nature preservation. Environmentalism is movement connected with environmental scientists and many of their goals. Some of these goals include:

1. to reduce world consumption of fossil fuels-
2. to reduce and clean up all sorts of pollution (air, sea, river...) with future goal of zero pollution
3. emphasis on clean, alternative energy sources that have low carbon emissions
4. sustainable use of water, land, and other scarce resources
5. preservation of existing endangered species
6. protection of biodiversity

1. the aggregate of surrounding things, conditions, or influences; surroundings; milieu.
2. Ecology . the air, water, minerals, organisms, and all other external factors surrounding and affecting a given organism at any time.

An environment is what surrounds a thing or an item. The environment is the surrounding. It could be a physical element - physical environment, that includes the built environment, natural environment - air conditions, water, land, atmosphere etc or it could be human environment - people surrounding the item or thing. This is also known as the social environment and includes elements like the spiritual environment, emotional environment, home, family etc. The environment is a fluid dynamic thing,

The environment is defined as the whole physical and biological systems in which man and other organisms live. Environmental studies involves every issue that affects living organisms. Various interacting components of environment are biology, geology, chemistry, physics, engineering, sociology, health and economics. Positive and realistic planning is needed to balance them. Therefore, environmental science is essentially a multidisciplinary approach.

Composition of Environment

Importance of ENVIRONMENT

Our life-support system's health is maintained by all the species that make-up the bio-sphere-from the smallest to the largest (our biodiversity). The survival of all these species are interconnected and dependent on each other. Bacteria and insects break down organic material to produce soil and nutrients so plants can grow. Plants provide oxygen and food for animals and many other benefits. Bees, other insects, and animals pollinate the plants so they can reproduce and keep the cycle going. They also maintain the health of plants and spread their seeds. The actual processes that take place between r:,pecies and the environment are extremely complex and vulnerable. if humanity causes the extinction of one species--it's really the extinction of many species and the decline of our life-support system, for ourselves and future generations. God's gift must not be taken for granted—it must be cared for. If not; humanity will face the grim consequences of its actions.

Humanity has neglected to factor into the economic equation the tremendous benefits nature provides. Because the environment is our life-support system, it's impossible to truly estimate its value (it's priceless). However, economists and environmental. Scientists have estimated in dollars what it would cost us to accomplish the services nature provides. Using multiple datalaases,..they estimate, that nature provides $33 trillion dollars worth of services every year—that's nearly twice the annual Gross National Product or GNP of all the countries in the world combined) For example, forests prevent soil erosion, landslides, an flooding; maintain the purity of the air and water; affect local and global rainfall; temper climatic fluctuations; and promote watersheds and biodiversity. By retaining the proper moisture content within their foliage and soil, healthy forests prevent local fires from becoming widespread. Unfortunately, this moisture content is declining from over harvesting and fragmentation. Consequently, large-scale fires are becoming increasingly prevalent throughout the world. Other ecosystems like mangroves, wetlands, grasslands, shrubs, deserts, oceans, coral reefs, tundra-arctic regions, and so on provide similar and unique benefits.

Biodiversity provides problem-solving raw materials for shelter and useful products, creates medicines, and allows us to pollinate and maintain healthy crops from being infested with harmful insects and diseases (without the need or hazards of chemicals or genetic engineering, which kill beneficial insects, additional wildlife, and plants). Although tropical forests contain some of the highest concentration of biodiversity on the planet, we destructively log more than 10 million acres of these forests each year (that's approximately the size of a football field every 4 seconds) and efforts to promote sustainable forestry are largely failing.2 Scientists agree that the best way to protect biodiversity is to protect and maintain habitat large enough to accommodate a healthy ecosystem—tolerating small fragmented habitats will not preserve ecosystems or their biodiversity.

Approximately 40% of all prescriptions in the U.S. are either based on or synthesized from natural compounds found in microorganisms, plants, and animals.3 The economic value provided by just plant-based anticancer drugs in the U.S. is over $250 billion annually.' In addition to nature providing us with penicillin, aspirin, morphine, and steroids; the medicine Taxol, which fights breast and ovarian cancer, comes from the bark of the pacific yew tree; the foxglove plant provides the drug digitalis which boosts the pumping action of weak hearts; and the rosy periwinkle plant is used to fight Hodgkin's disease and childhood leukemia. Other candidates providing promising medicines include deep-sea sponges, tropical cone snails, dogfish sharks, the bark of the Holarrhena tree (found in Asia and Africa), and the plant Chonemerpha macrophylla (located in the foothills of the Himalayas). A microbe found in the hot springs of Yellowstone National Park provided an enzyme for mass-producing DNA. Physician and biochemist Michael Zasloff, "There's so much we don't know about the natural worid...And we're destroying large parts of it before we even appreciate our ignorance."

The National Geographic Society writes:
The fragile balance of plants and animals that share the Earth took millions of years 10 develop. Some life-furriers have persisted in nearly their original state, surviving episodes of mass extinction. Some, like ourselves, are relative newcomers. The ones that have perished will not return. Neither will the thousands of species that are disappearing-each year due-in large p-ifirto such human influences as habitat destruction, introduction of invasive species, and overharvesting. If we continue reducing Earth's biodiversity at this rate, the consequences will be profound. The web of life connects the smallest bacterium to the giant redwood and the whale when we put that web in peril, we become agents of calamity.

Furthermore, religions around the world have long understood that the beauty, diversity, and wonder of nature is humanity's physical link with God—encouraging us to develop a spiritual relationship with our Creator. The destruction of this link and our life-support system should enrage all of humanity—especially religious groups—stewards of God's creation.
People who believe exponential growth can go on forever in a finite world is either a madman or an economist --Kenneth Boulding

Concept of ECOLOGY

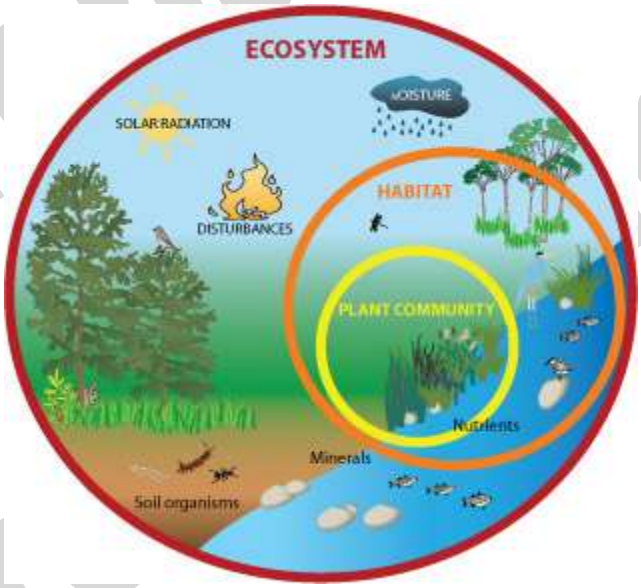
- Ecology (oekologies) - proposed by German biologist - Ernst Haekel (1869). Greek work oikos-house (place to live), logos-discourse or study.
- Ecology: Relationships between organisms or groups of organisms to their environment.

Ecology (from Greek: oikoc, "house; -Aoyid, "study of") is the scientific study of the relations that living organisms have with respect to each other and their natural environment. Topics of interest to ecologists include the composition, distribution, amount (biomass), number, and changing states of organisms within and among ecosystems.

Ecosystems are composed of dynamically interacting parts including organisms,
the communities they make up, and the non-living components of their environment. Ecosystem processes, such as primary production, pedogenesis, nutrient cycling, and various niche construction activities, regulate the flux of energy and matter through an environment. These processes are sustained by the biodiversitywithin them. Biodiversity refers to the varieties of species in ecosystems, the genetic variations they contain, and the processes that are functionally enriched by the diversity of ecological interactions. Ecology is an interdisciplinary branch of biology. The word "ecology" ("Okologie") was coined in 1866 by the German scientist Ernst Haeckel (1834-191). Ancient Greek philosophers such as Hippocrates and Aristotle laid the foundations of ecology in their studies on natural history. Modern ecology transformed into a more rigorous science in the late 19th century. Evolutionary concepts on adaptation and natural selection became cornerstones of modern ecological theory. Ecology is not synonymous with
environment, environmentalism, natural history, or environmental science. It is closely related to physiology, evolutionary biology, genetics, and ethnology. An understanding of how biodiversity affects ecological function is an important focus area in ecological studies. Ecologists seek to explain:

- Life processes and adaptations
- Distribution and abundance of organisms.
- The movement of materials and energy through living communities
- The succession development of ecosystems, and
- The abundance and-distribution of biodiversity-in the content of environment.

Ecology is a human science as well There are many practical applications of ecology in conservation biology, wetland management natural resource management (agriculture, forestry, fisheries), city planning (urban ecology), community health, economics, basic and applied science, and human social interaction (human ecology). Ecosystems maintain biophysical feedback mechanisms that modulate metabolic rates and evolutionary dynamics' between living (biotic) and nonliving (abiotic) components of the planet. Ecosystems sustain life-supporting functions and produce natural capital through the regulation of continental climates, global biogeochemical cycles, water filtration, soils, food, fibers, medicines, erosion control, and many other natural features of scientific, historical, economic, or intrinsic value.



Environmental Pollution

Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy such as noise, heat or light. Pollutants the components of Pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution.

Pollution has been found to be present widely in the environment. There are a number of effects of this:

- Biomagnifications describes situations where toxins (such as heavy metals) may pass through trophic levels, becoming exponentially more concentrated in the process.
- Carbon dioxide emissions cause ocean acidification, the ongoing decrease in the pH of the Earth's oceans as CO_2 becomes dissolved.
- The emission of greenhouse gases leads to global warming which affects ecosystems in many ways.
- Invasive species can out compete native species and reduce biodiversity. Invasive plants can contribute debris and bimolecular (allelopathy) that can alter soil and chemical compositions of an environment, often reducing native species competitiveness.
- Nitrogen oxides are removed from the air by rain and fertilize land which can change the species composition of ecosystems.
- Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis and leads to the production ofiropospheric ozone which damages plants.
- Soil can become infertile and unsuitable for plants. This will affect other organisms in the food web.
- Sulfur dioxide and nitrogen oxides can cause acid rain which lowers the pH value of soil.

A. Introduction and definition of environmental pollution —

We know that, a living organism cannot live by itself. Organisms interact among themselves. Hence, all organisms, such as plants, animals and human beings, as well as the physical surroundings with whom we interact; form a part of our environment. All these constituents of the environment are dependent upon each other. Thus, they maintain balance in nature; As we are the only organisms try to modify environment to fulfill our needs; it is our responsibility to take necessary steps to control the environmental imbalances.

The environmental imbalance gives rise to various environmental problems. Some of the environmental problems are pollution, soil erosion leading to floods, salt deserts and sea recedes, desertification, landslides, change of river directions, extinction of species, and vulnerable ecosystem in place of more complex and stable ecosystems, depletion of natural resources, waste accumulation; deforestation, thinning of ozone layer and global warming. The environmental problems are visualized in terms of pollution, growth in population, development, industrialization, unplanned urbanization etc. Rapid migration and increase. in population in the urban areas has also lead to traffic congestion, water shortages, solid waste, and air, water and noise pollution are common noticeable problems in almost all the urban areas since last few years.

Environmental pollution is defined as the undesirable change in physical, chemical and biological characteristics of our air, land and water. As a result of over-population, rapid industrializations, and other human activities like agriculture and deforestation etc., earth became loaded with diverse pollutants that were released as by-products. Pollutants are generally grouped under two classes:

(a) Biodegradable pollutants - Biodegradable pollutants are broken down by the activity of micro-organisms and enter into the biogeochemical cycles. Examples of such pollutants are domestic waste products, urine and faucal matter, sewage, agricultural residue, paper, wood and cloth etc.

(b) Non- Biodegradable pollutants - Non-biodegradable pollutants are stronger chemical bondage, do not break down into simpler and harmless products. These include various insecticides and other pesticides, mercury, lead, arsenic, aluminum, plastics, radioactive waste etc.

Public participation

Public participation in environmental decision-making has become an indelible feature of many environmental regulatory systems world-wide over the past few decades. Individuals and organizations affected by development approvals, pollution licenses, land use plans and other types of regulatory processes have increasingly demanded greater consultation, and more transparent and accountable decisions. Parliamentary democracy ratified through periodic electoral contests is widely viewed as insufficient to provide meaningful public input into day-to-day environmental decision-making. Governing elites' hostility to independent protest and community self-expression has encouraged the creation of 'surrogate political processes', wherein citizens' views are channeled into and considered in alternate administrative and judicial structures. In these structures, public participation assumes a variety of forms. It can occur through education, information dissemination, advisory or review boards, public advocacy, public hearings and submissions, and even litigator. By these means, public participation may assist decision-makers to understand and identify public interest concerns while formulating environmental policies. Greater citizen input may promote environmental justice and help integrate ecological and social considerations in governmental decisions. Further, participation may enhance the accountability, and thus acceptability, of environmental decisions. This may lead to less litigation, fewer delays and generally better implementation, of decisions. Thus, as Lawrence Tribe once warned, the way policy decisions are made has important implementations for the-outcomes-of those decisions Public participation is particularly significant in the context of sustainable development. Sustainability depends largely on the way economic, social and environmental considerations have been integrated in decision-making. The principles of inter and intra generational equity in sustainable development discourse reflect the centrality of public involvement and social justice.

Implementation of the precautionary principle, another part of sustainability discourse, also depends on public, input into the assessment of acceptable risks. Environmental threats, such as climate change or genetically modified organisms, are often characterized by scientific and technical uncertainties and risks for which people often hold very different and competing preferences. Public participation can help assess these uncertainties and risks, and weigh them against perceived benefits. Several interrelated factors have fuelled the growth of participatory processes iri decision-making. The first is increased public awareness and concern about the relationships between ecological health and human well-being. Secondly, the growth of human rights in legal and political systems has heightened people's expectations of participation in policy-making.

Thirdly, the prevailing concerns of the international community for 'good governance' and the strengthening of civil societies have contributed to increasing interest in the use of participatory mechanisms. Also. weaknesses in the legitimacy of the state and lack of trust in governments have fuelled popular demands for more grass-roots, direct involvement in decisions.

Different models have been proffered to analyze the range of forms of public participation. One model, known as Arnstein's 'ladder', shows the spectrum of participation opportunities, beginning with mere notification, and extending to consultation and even joint decision-making power. The lowest levels of participation may effectively amount to non-participation. The Highest level of participation, says Arnstein, is where the public has the power to negotiate with decision-makers and to veto. Proposed decisions. Another model of participation distinguishes between 'top-down' and 'bottom-up' approaches. The former is where the government initiates participation, the latter where communities do so. Thirdly, some commentators distinguish between substantive and procedural dimensions of participation. Participatory rights may derive from substantive human rights, such as a right to live in a healthy, unpolluted environment, and may be enshrined in a constitution or statutory bill of rights. By

contrast, procedural rights concern the methods of decision-making, and typically encompass public consultation, information provision and access to the courts. Substantive and procedural rights are often intertwined: for instance, a substantive right to a healthy environment usually requires procedural rights to be heard in decisions that might affect those substantive rights.

Law plays a crucial role in all these approaches. Open-ended discursive experiences based on custom or current controversy may be too fragile and insufficient to sustain the desired policy and political transformation. Law can provide two remedial functions in this respect. First, through decision rules and procedures it can enable democratic will to emerge. Secondly through its ability to codify norms and structure institutions, it can effectively channel this political power throughout society, as a force for social coordination. In other words, law creates a structure for participation that helps crystallize and protect society's environmental goals.

Public Awareness

After the scientific and industrial revolution in the recent past, there has been immense impact of man on his environment. Man has failed to realize that any new factor upsets the balance of the ecosystem as a whole/the environment.

Huge industrial installations every year. introduction of the faster mode of transport, sprouting up large crowded cities (urbanization), changing the food habits, deforestation and decreasing the agricultural land, the main outcomes of the modern civilization: wide spread use of insecticides, pesticides, improper use of fertilizers and chemicals in environment are some others contributing factors which challenged the life of man. animals specially birds and other organisms.

Industries are causing much danger to man's life (causing air pollution), Similarly water pollution, soil pollution, marine pollution, noise pollution, global warming, effects of nuclear hazards etc are some major factors for which public awareness is necessary.

The Active co-operation of every one, at every level of social organizations, scientist-educationists, social workers, politicians, administrators and public is needed for issues concerning environment. Individuals collectively make a society or a state.

Movements, which begin at gram root levels, effects the ideologies and policies of a country or the nation as a whole more effectively than the policies introduced from top to downwards.

When the opinion of the public will change. ii will affect the govt. policies, which transform in to actions. Therefore little efforts on the part of each individual shall add up to introduce significant improvements of the environment.

Over exploitation of natural resources is a basic concern for everybody. Food shortage we increase in frequency and severity if population growth, soil erosion and nutrient depletions we continue at the existing rate. Therefore, it is our duty and we can accept the family planning schemes this will not only reduce the population but also solve the problems of food and rehabilitation.

Burning fossil fuels (oil, coal and natural gas), we release carbon-dioxide and other heat absorbing; gases, that cause global warming and may bring about sea level rise and catastrophic climatic changes.

Acid rain is the result of it. Chlorinated compounds such as chlorofluorocarbons used in refrigerator and air conditioner also contribute to global warming as well as damaging the stratospheric ozone that protect us from cancer causing ultraviolet radiations in sunlight. Now a day's everybody talks about environment but how many of us are serious about it. How many of us (from all walks of life) have clear concepts of environment. There must be planning about the effects and control measures of environmental pollution. Govt. should initiate and help by awareness campaigns to save environment.

There should not be the political propaganda but should be the integral part of our educational programmes. By writing on walls the word "save water", "save oil" is not enough for Govt. or people.

We should opt some programmes relating to it. We should discourage to use fuel vehicles, until it is not necessary. For short routes, we should use bicycle; on foot. We should accompany the four seated or so with others over use of water, for cleaning and other purposes should be decreased."
Rain water harvesting is another example for using the rain water instead flowing out. Any government at its own level cannot achieve the goals of sustainable development until the public has a participatory role in it.—

It is only possible only when public aware about the ecological and environmental issues. For example ban the littering of polythene cannot be successful until the public understands the environmental implications of the same.

Public should understand about the fact that if we degrading our environment, we are harming ourselves. This is the duty of we educated people to educate the others about the adverse effect of environment.

For the first time, the attention of general public was attracted at global level when "Earth Summit" in 1992 was held in Rio de Jailed° on environment and development. Later on another world summit on "Sustainable Developmental Johannesburg in 2002 was also held to discuss the environment and aware the public to save the environment.

In these directions, United Nations has organized several conferences in different parts of the world (Stockholm 1972, Vienna 1985, Montreal 1987, Brazil 1992 etc) to work out the action plan from time to time for, fighting with menace of environmental pollution. We should keep the earth green and alive as it provides shelter, food and protective cover. The soil degradation, soil erosion, deforestation, losing wetlands, land conversion etc. are the measure issues which force ourselves to think and aware the public in this regard. Because human himself is responsible for these environmental deterioration. Therefore, it is necessary to check all these destructive processes. Govt. also doing some efforts on national level but still much more has to be done.
The marine ecosystem includes the oceans, seas, sea shores, bays and summaries of the world. The physical factors like wares, tides, currents, salinities, temperature, pressures and sunlight dominate life in the ocean and determine the makeup of biological communities.

These communities have significant effect on biomass, leakage from oil tankers, oil drilling, catchment area (coastline) and rivers polluted the sea water, which effects sensitive flora and fauna, various species of invertebrate, mammals, coral reps, fishes and other organisms. A Diesel vehicle emits particles in their exhaust which have a diameter less than 10 microns (PH-10). It is easily inhaled. Any amount of these particles in the air is dangerous for health (particularly effects lungs). In India about 20 million people are asthmatics. Mine waste and effluents from mining and metallurgical industries give a number of physical and chemical problems to human beings. Certain other industries like paper and pulp industries, fertilizer industries, explosive industries, soap and detergent industries, chemical industries, food processing industries, textile, tannery, leather, and petroleum industries release/discharge undesirable and harmful constituents which are responsible for air and water pollution, causes great public concern. Sewage begins to cause nuisance as it starts to become stale. It is therefore necessary to dispose it off as soon as possible. Proper methods of disposal and its treatment should be applied otherwise causes the chronic diseases. When sewage is applied continuously on a part of land, the pores or voids of the soil are clogged and free circulation of air is prevented. As a result anaerobic conditions are developed in place of aerobic conditions and the land is not capable of taking further sewage load. At this stage, decomposition of sewage takes placing offensive gases are produced.

This is called the sewage sickness-of !and.— --People should aware The noise which is increasing pollution is one of the important factors of environment due to population's explosion, rapid industrializations and urbanizations. We should know the consequences of noise pollutions. Ear drum ca' damage when exposed to very loud and sudden noise. Noise pollution affects human health, comfort and efficiency. It causes contraction of blood vessels, high blood pressure, mental distress, high cholesterol, heart attacks, neurological problems, birth defects, abortion etc. The department of environment realized the importance of creating a sound research base for scientific studies relating to environmental problems. Environmental protection act was introduced in 1976 as the 42nd amendment act in the constitution. Only by celebrating "World Environmental Day" we cannot get rid of this concern. Govt. along cannot do anything until unless every citizen is aware of the environmental pollution & their effects. This is the time to make aware and motivate each and every individual for environmental consciousness.

HARMFUL EFFECTS OF RADIATION POLLUTION

As radioactive materials ditty they produce ionizing radiation, which can damage any living tissue in the human body, notes the U.S. Environmental Protection Agency (EPA). Radioactive materials may he found in microwave ovens, medical X-ray machines and radon gas. However, the most dangerous source of radiation may be nuclear weapons, which can release isotopes that remain in the atmosphere for 100 years- ,Nuclear accidents can create environmental pollution, which is particularly devastating.

Contaminated Water:

Nuclear accidents may produce fallout which can pollute water supplies for years after the incident, warms the World Health Organization (W110). The 1986 explosion of a nuclear to generator Chernoby1 (Ukraine) created a large radioactive cloud which polluted existing water Supplies and produced contaminated rain in nein by countries.

Contaminated Soil and Plants:

Nuclear radiation can contaminate soil, leading to plants which contain radiation and pose a health threat to individuals. Researchers explored the Marshall Islands, an area widely known for nuclear bomb testing by the U.S. military in the 1950s and 1960s. They found that current soil samples and local foods, including coconut meat, contained radiation levels significant enough to pose a health risk to individuals.

Cancer: the Chernobyl explosion led to increased prevalence of cancer in young children in Belerus the Russian Federation, and tic & According to the Greenpeace 2006 report„
“Chernobyl Catastrophe Consequences on Human Health," over 2 billion people have been exposed to the radioactive fallout, which will result in 250,020 cases of cancer, nearly half of them fatal.

Brain Damage : High exposure to radiation early on in gestation can have damaging effects on the brain, notes the U.S. Centers for Disease Control (CDC). Infants between the eighth and 15th welts a pre whiney who were exposed to the atomic bombs dropped on Hiroshima and Nagasaki during World War 11 were discovered to have a great incidence of brain damage, with side effects including lower IQs and, in some cases, seve04nentral retardation.

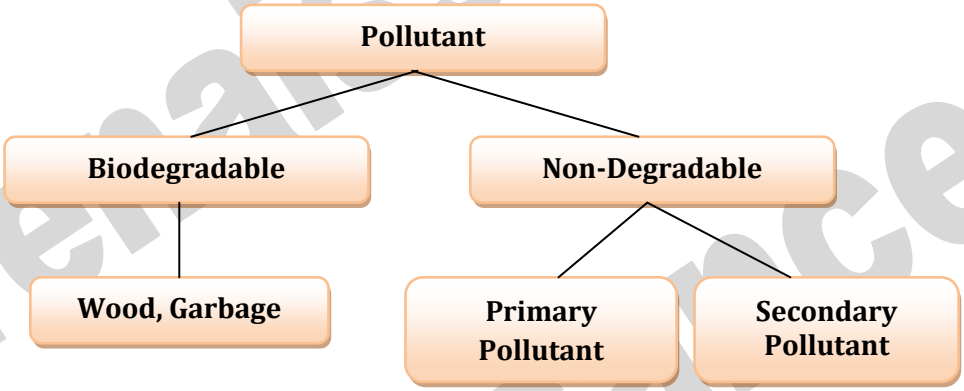
UNIT-II

ENVIRONMENTAL POLLUTION

WHAT IS POLLUTION

- Pollution is the introduction of harmful substances or products into the environment
- We will be examining following parts of pollution.
  - Water Pollution
  - Air Pollution
  - Land Pollution
  - Noise Pollution
  - Thermal Pollution
  - Nuclear Pollution

Types of Pollutant



WATER POLLUTION:

CAUSES

- Factors that contribute to water pollution can be categorized into two different groups
  - Point sources
  - Non-point sources
- Point sources are the easiest to identify and control
- Non point sources are ambiguously defined and harder to control

POINT SOURCES

- Some point sources of water pollution include
  - Waste products from factories
  - Waste from sewage system
  - Waste from power plants
  - Waste from underground coalmines
  - Waste from oil wells
- They are called point sources because they are direct sources of water pollution and can be reduced and monitored

NON-POINT SOURCES

- The term non-point source encompasses a large range of sources such as:
  - when rain or snow moves through the ground and picks up pollutants as it moves towards a major body of water
  - the runoff of fertilizers from farm animals and crop land
  - air pollutants getting washed or deposited to earth
  - storm water drainage from lawns, parking lots, and streets

AIR POLLUTION:

CAUSES

- One of the main causes of air pollution is the release of carbon dioxide into the atmosphere, this happens because of Deforestation and fossil fuel burning
- Sulfur dioxide is another air polluter and is released into the atmosphere by the burning of sulfur containing compounds of fossil fuels. Sulfur oxides are very dangerous to humans at a high concentration. Sulfur in the atmosphere is responsible for acid rain
- Chlorofluorocarbons (CFCs) also contribute to air pollution by reducing the amount of ozone the stratosphere. CFCs come from a variety of places such as:
    - the burning of plastic foam items
    - leaking refrigerator equipment
    - spray cans

NATURAL AIR POLLUTANTS

- Natural air pollutants can include:
    - Smoke from wild fires
    - Methane released from live stock
    - Volcanic eruptions

NOISE POLLUTION –

Causes –

- Means of Transportation,
- Industries
- Home Appliances
- Means of Recreation
- Social & religious activity
- Defense equipment
- Mining

Effect –

- At the level of audible sound
- At the level of physiology
- At the level of behavior

THERMAL POLLUTION –

Causes –

- Electricity production plants
- Industrialization
- Traffic
- Nuclear explosion & testing
- Wars
- Deforestation

Effect –

- Effect on human being
- Effect on animals
- Effect on vegetation
- Effect on weather and climate

NUCLEAR POLLUTION –

Causes –

- Natural radiation like sunlight & inhabited radioactive elements & their isotopes
- Nuclear explosion & testing
- Atomic furnaces and fuels

- Atomic power houses
- Nuclear weapons
- Medical technology

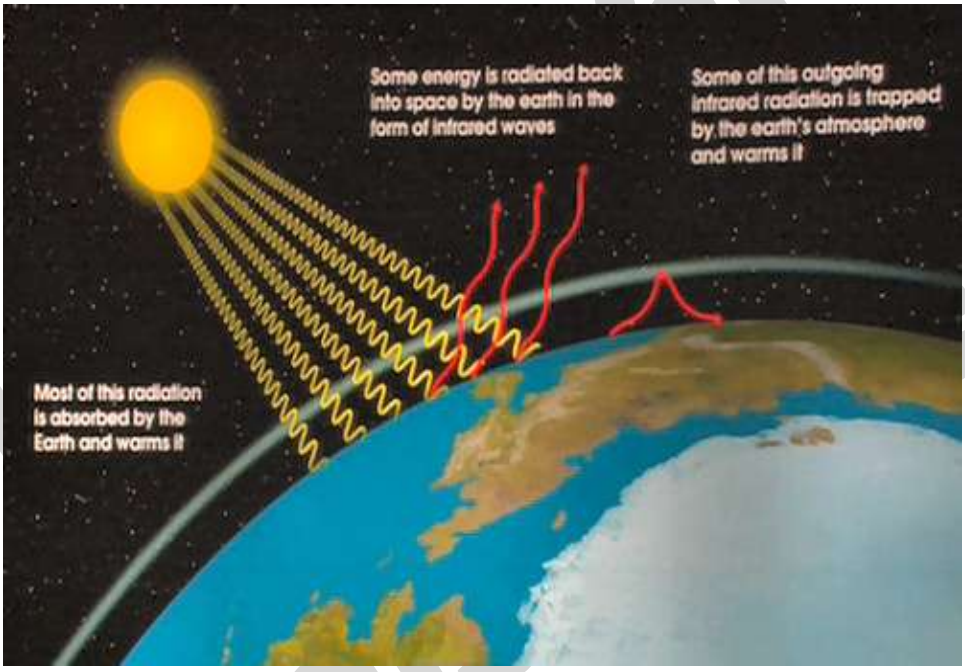
Effect –

- Effect on human being
- Effect on animals
- Effect on vegetation
- Effect on weather and climate

CONSEQUENCES

- CO2 is a good transmitter of sunlight, but it also partially restricts infrared radiation going back from the earth into space, which produces the so-called greenhouse effect that prevents a drastic cooling of the Earth during the night
- Increasing the amount of CO2 in the atmosphere reinforces this effect and is expected to result in a warming of the Earth's surface
- CO2 in atmosphere→GLOBAL WARMING
- Sulfur dioxide, nitrogen oxides, ozone and peroxyacl nitrates (PANs), cause direct damage to leaves of crop plants and trees when they enter leaf pores (stomates)
- Chronic exposure of leaves and needles to air pollutants can also break down the waxy coating that helps prevent excessive water loss and damage from diseases, pests, drought and frost
- "In the midwestern United States crop losses of wheat, corn, soybeans, and peanuts from damage by ozone and acid deposition amount to about $5 billion a year". (Miller 498)

GREEN HOUSE EFFECT



ACID RAIN

- When emissions of sulfur dioxide and nitric oxide from stationary sources are transported long distances by winds, they form secondary pollutants such as nitrogen dioxide, nitric acid vapor, and droplets containing solutions of sulfuric acid, sulfate, and nitrate salts
- These chemicals descend to the earth's surface in wet form as rain or snow and in dry form as a gases fog, dew, or solid particles, it is known as acid rain or acid deposition

SMOG

- With the introduction of petroleum to replace coal economies in countries, photochemical smog has become predominant in many cities, which are located in sunny, warm, and dry climates with many motor vehicles
- Worst episodes of photochemical smog tends to occur in summer

LAND POLLUTION:

CAUSES

- Four Main causes of land pollution
  - Construction
  - Agriculture
  - Domestic waste
  - Industrial Waste

CONSTRUCTION

- Buildings take up resources and land, the trees are chopped down and used to make buildings
- Takes away from places for animals and other organisms to live

AGRICULTURE

- As there are more and more people inhabiting the earth, food is in higher demand and so forests are chopped down and turned into farmland
- In addition, herbicides, pesticides, artificial fertilizers, animal manure (poop) are washed into the soil and pollute it

DOMESTIC WASTE

- Tons of domestic waste is dumped every day. Some waste from homes, offices and industries can be recycled or burnt in incinerators
- There is still a lot of garbage, such as refrigerators and washing machines that are dumped in landfills simply because they cannot be reused in anyway, nor recycled

INDUSTRIAL WASTE

- Plastics factories, chemical plants, oil refineries, nuclear waste disposal activity, large animal farms, coal-fired power plants, metals production factories and other heavy industry all contribute to land pollution

CONSEQUENCES

- Land pollution exterminates wild life
- Acid rain kills trees and other plants
- The vegetation that provides food and shelter is destroyed
- Land pollution can seriously disrupt the balance of nature, and, in extreme cases, can cause human fatalities
- Pesticides can damage crops; kill vegetation; and poison birds, animals, and fish. Most pesticides kill or damage life forms other than those intended. For example, pesticides used in an effort to control or destroy undesirable vegetation and insects often destroy birds and small animals. Some life forms develop immunity to pesticides used to destroy them

WAYS TO STOP POLLUTION

- You can help to reduce global air pollution and climate change by:
- Driving a car that gets at least 35 mpg
- Walking, biking, and using public transportation
- Using CFL bulbs over incandescent bulbs

- Buying only energy efficient appliances
- Recycling newspaper, aluminum, and others
- Planting trees!
- Avoid purchasing products that contain CFCs
- Supporting much stricter clean air laws and enforcement of international treaties to reduce ozone depletion and slow global warming

NOISE POLLUTION:

The word noise is derived from the Latin word nausea meaning seasickness. Like its root meaning, noise has a negative effect to human health and well-being. Noise resulting from road traffic, jet planes, jet skis, garbage trucks, construction equipment, manufacturing processes, lawn mowers, leaf blowers, and boom boxes, to name a few, are among the audible litter that are routinely broadcast into the air (Noise, Noise Pollution and Clearinghouse). They interfere with sleep, concentration, communication, and recreation. The potential health effects of noise pollution are numerous, pervasive, persistent, and medically and socially significant. Health problems related to noise include hearing loss, stress, high blood pressure, sleep loss, distraction and lost productivity, and a general reduction in the quality of life and opportunities for tranquility. Noise is among the most pervasive pollutants today, Its more severe and widespread than ever before, and it will continue to increase in magnitude and severity because of population growth, urbanization, and the associated growth in the use of increasingly powerful, varied, and highly mobile sources of noise. However, strategies such as noise mitigation and its three distinct methods: control, path control and receptor shielding (Noise Mitigation) can reduce environmental noise.

CAUSES

We are bombarded with sound even when we live in rural areas. From crop dusters to large farm equipment, we have plenty of sound in the country. In the urban areas, we not only have sound that is produced at unnatural decibel levels, the sound is reflected from hard surfaces that form at every kind of angle. We go to theaters and concerts where the ability to magnify sound has developed in incredible ways. We listen on headphones, where sound is not only concentrated, but the waves pound the eardrums with persistent and unnatural force.

Living next to airports, anywhere in the flight path of departing planes, and near maintenance facilities where engine run ups can blast sound for miles, is another source of unnatural and massive sound. Freeways, busy streets, moving trains, even the noise levels in hospital intensive care rooms, where a patient should be able to expect some peace and quiet are insane.

Sound pollution has resulted in days where there is virtually no period of time when some sound is not expected to intrude into our homes and lives.

The decibel measurement system is a very complicated matter, so for acoustic measurement, the amount of pressure on the eardrum is the important factor.

A decibel level of 225 is considered to be deafening. The most common source of that much sound is an aircraft taking off.

At a level of 130, pain begins. level 130 is also considered to be deafening. Close proximity to pneumatic concrete drills is the most common experience.

At level 110-120, fireworks displays, close proximity to trains, leaf blowers, music concerts, and thunder are recognizable sounds. 110 is the lowest level that is considered to be deafening. Between 90 and 110, we have far more common items: some sirens, passing trucks, trucks without mufflers, car horns, and lawn mowers. The category is "Very Loud".

Between 70 and 90, noise is "loud", and includes noisy restaurants and offices, vacuum cleaners, flush toilets.

EFFECT

Noise has a big impact on people all day every day. But with people not noticing it, makes it hard for anyone to do anything about it. It is causing many different problems to people mentally, socially, and physically. There are many ways to help or prevent it, but these changes are not immediately visible, so they are left unattended to.

Exposure to very loud sounds that are enjoyable, and not technically noise to the listener, can lead to hearing impairment. A survey of hearing was tested among youngsters between the ages of 6 and 19. They found that 1 out of 8 of them suffered a noise-related hearing problem. Teens attend dances, equip vehicles with systems, and even work in loud fast food restaraunts. Noises are especially bothersome at night when one is trying to sleep, which is vital to good health. Noise from snowmobiles, jet skis, and supersonic jets has also intruded on the environment, affecting animals' abilities to communicate, protect their young, and mate.

MENTAL HEALTH:

Noise pollution is not believed to be a cause of mental illness, but it is assumed to accelerate and intesify the development of latent mental disorders. Some of theses cases would be : anxiety, stress, nervousness, nausea, headache, emotionally instability, argumentatives, sexual impotence, changes in mood, and increase in social conflicts. The news media reguraly report violent behavior arising out of disputes over noise which in many cases these disputes ended in injury or death.

SOCIAL HEALTH:

Noise is a prominent feature of the environment including noise from transport, industry, and neighbors. Exposure to transport noise disturbs sleep I nthe laboratory, but not generally in field studies where adaptation occurs. Noise interferes in complex task performances, modifies social behavior and causes annoyance.

PREVENTION

Follow the below given steps for controlling and preventing noise pollution.

- Control of Noise pollution at Source
- Noise producing industries, railway stations, aerodrome, etc. should be located far away from the residential areas.
- We should play various music systems such as stereos, television, etc. at low volume.
- We should not use loud speakers during night. Even during time they should be used at low volumes.
- Various machines should be well maintained so that they produce less sound.
- It is observed that certain persons blow horns of their vehicles unnecessarily, or remove silencers of the exhaust pipes of vehicles. Such practices produce lot of noise and should be avoided**.**
- Laws should be framed so that the persons producing unnecessary noise are punished.

Control of Noise Pollution by obstructing the path of Noise

- By constructing soundproof buildings, the menace of sound pollution can be minimized.
- Plants also help in controlling noise pollution because they absorb high frequency sound waves. Thus, planting trees along the roads help in controlling noise pollution.

THERMAL POLLUTION:

Thermal pollution is generally defined as the discharge of heated water into aquatic biomes. But thermal pollution also covers releases of colder than normal water into the aquatic biomes. The general effect is to raise or lower the temperature of the aquatic biome in ways that kill off life that is sensitive to higher temperatures. If the heated water from industrial operations contains chemicals or radiation that is toxic to life in aquatic biomes, then the problem is compounded.

CAUSES

The most common human, or anthropogenic, causes of thermal pollution are coolant release from power production and manufacturing plants, urban runoff from storm drains that carry surface runoff from roads and warmer surfaces, and releases of colder than normal water from reservoirs into rivers and waterways.

In the industrial area, petroleum refineries, pulp/paper mills, chemical plants, steel mills and smelters are the big contributors to thermal heat pollution.

Natural causes include geothermal and volcanic activity, either under the oceans and seas or from above ground lava flow. Lightening strikes can also introduce massive amounts of heat, and the natural progress of warmer currents into colder biomes occur.

EFFECT

The effects of thermal pollution include damage to larvae and eggs of fish in rivers where there is a limited tolerance for temperature change. The other effects are on the biodiversity of aquatic biomes due to killing off of some species that are not resistant to temperature change, which disrupts the balance of the food and light chains for plants, fish, bacteria, and microscopic life forms. Fish and macroinvertibrates are most susceptible to temperature changes, as they have the most limited tolerance for sudden excessive heat and cold.

Heat affects the metabolic rate and enzymatic activity of aquatic animals, leading to more eating, which can upset the balance in food availability.

Dissolved oxygen and other chemical changes to the structure of the water are another effect of heat thermal pollution. The heat tends to decrease the amount of dissolved oxygen in the water.Another effect is that living entities attempt to migrate when their environment is untenable. The increased migration of life forms to areas that had a perfect balance can create a fight for limited resources, once the population increases.

PREVENTION

What can be done about anthropogenic thermal pollution? There are cooling ponds and towers that store and transition the water to more acceptable temperatures before release. There is also recycling of the heated water to direct it to areas where heat is needed.

Following are the means to reduce thermal pollution:

1. Theoretically, when efficiency of any heat engine is equal to 1.0 then it will convert 100% of heat energy to mechanical energy. So there will be no loss of heat to the environment. This is practically impossible. Rather, we should aim at maximizing the efficiency of heat engines (steam, IC, nuclear etc) so that heat loss is minimum.
2. Reduce mechanical friction in any rotating parts.
3. Avoid consuming energy more than necessity. Burn less coal, oil or gas.
4. Promote use of more nuclear energy because it will not generate Carbon di oxide.
5. One of the major cause of Global warming is increasing concentration of Carbon di oxide, leading to more green house effect. On the other hand, green plants have got the capacity to absorb Carbon di oxide. In the photo synthesis plants take water, sunlight and carbon di oxide to prpoduce their food. So, plant as many trees as possible. Massive plantation is the only solution for reducing global carbon di oxide level. Indirect effect of plantation is, It will reduce soil temperature, cause more rains, some of the carbon di oxide shall be dissolved in rain and shall go to the sea - which will ultimately form carbonate rocks and will help in the flora and fauna of the marine life.

5. If we can follow these, certainly we shall be successful in reducing thermal pollution and will be able to prevent the glaciers from melting and rising of sea levels.

Thermal can be prevented very easily. Most of the people who cause thermal pollution are big facctories which use the water then pour it back in the ocean. To prevent this all they have to do is just cool the water before they put it back in the ocean.

NUCLEAR POLLUTION:

The **environmental impact of nuclear power** results from the nuclear fuel cycle, operation, and the effects of nuclear accidents.

The routine health risks and greenhouse gas emissions from nuclear fission power are small relative to those associated with coal, but there are "catastrophic risks"[1] such as the possibility of over-heated fuel releasing massive quantities of fission products to the environment. The public is sensitive to these risks and there has been considerable public opposition to nuclear power. The 1979 Three Mile Island accident and 1986 Chernobyl disaster, along with high construction costs, ended the rapid growth of global nuclear power capacity.

A major EU funded research study known as ExternE, or Externalities of Energy, undertaken over the period of 1995 to 2005 found that the environmental and health costs of nuclear power, per unit of energy delivered, was €0.0019/kWh. This is lower than that of many renewable sources including the environmental impact caused by biomass use and the manufacture of photovoltaic solar panels, and was over thirty times lower than coals impact of €0.06/kWh, or 6 cents/kWh. However the energy source of the lowest external costs associated with it was found to be wind power at €0.0009/kWh, which is an environmental and health impact just under half the price of Nuclear power.

In March 2011 an earthquake and tsunami caused damage that led to explosions and partial meltdowns at the Fukushima I Nuclear Power Plant in Japan. Concerns about the possibility of a large scale radiation leak resulted in 20 km exclusion zone being set up around the power plant and people within the 20–30 km zone being advised to stay indoors. John Price, a former member of the Safety Policy Unit at the UK's National Nuclear Corporation, has said that it "might be 100 years before melting fuel rods can be safely removed from Japan's Fukushima nuclear plant"

Waste streams

Nuclear power has at least four waste streams that may harm the environment:

1. they create spent nuclear fuel at the reactor site (including plutonium waste)
2. they produce tailings at uranium mines and mills
3. during operation they routinely release small amounts of radioactive isotopes
4. during accidents they can release large quantities of dangerous radioactive materials

The nuclear fuel cycle involves some of the most dangerous elements and isotopes known to humankind, including more than 100 dangerous radionuclides and carcinogens such as strontium-90, iodine 131 and cesium -137, which are the same toxins found in the fall out of nuclear weapons".

Radioactive waste

High-level waste

Around 20–30 tons of high-level waste are produced per year per nuclear reactor.[6] The world's nuclear fleet creates about 10,000 metric tons of high-level spent nuclear fuel each year.[7] Several methods have been suggested for final disposal of high-level waste, including deep burial in stable geological structures, transmutation, and removal to space. So far, none of these methods have been implemented.[8] There is an "international consensus on the advisability of storing nuclear waste in deep underground repositories",[9] but no country in the world has yet opened such a site.[9][10][11][12][13] There are some 65,000 tons of nuclear waste now in temporary storage throughout the U.S., but in

2009, President Obama "halted work on a permanent repository at Yucca Mountain in Nevada, following years of controversy and legal wrangling".
Nuclear reprocessing may reduce the volume of high-level waste, but by itself does not reduce radioactivity or heat generation and therefore does not eliminate the need for a geological waste repository. Reprocessing has been politically controversial because of the potential to contribute to nuclear proliferation, the potential vulnerability to nuclear terrorism, the political challenges of repository siting (a problem that applies equally to direct disposal of spent fuel), and because of its high cost compared to the once-through fuel cycle.The Obama administration has disallowed reprocessing of nuclear waste, citing nuclear proliferation concerns.]
Nine U.S. states have "explicit moratoria on new nuclear power" until a long-term storage solution emerges.

Other waste

Moderate amounts of low-level waste are produced through chemical and volume control system (CVCS). This includes gas, liquid, and solid waste produced through the process of purifying the water through evaporation. Liquid waste is reprocessed continuously, and gas waste is filtered, compressed, stored to allow decay, diluted, and then discharged. The rate at which this is allowed is regulated and studies must prove that such discharge does not violate dose limits to a member of the public (see radioactive effluent emissions).
Solid waste can be disposed of simply by placing it where it will not be disturbed for a few years. There are three low-level waste disposal sites in the United States in South Carolina, Utah, and Washington. Solid waste from the CVCS is combined with solid radwaste that comes from handling materials before it is buried off-site.

Power plant emissions

Radioactive gases and effluents

Most commercial nuclear power plants release gaseous and liquid radiological effluents into the environment as a byproduct of the Chemical Volume Control System, which are monitored in the US by the EPA and the NRC. Civilians living within 50 miles (80 km) of a nuclear power plant typically receive about 0.1 μSv per year. For comparison, the average person living at or above sea level receives at least 260 μSv from cosmic radiation.
The total amount of radioactivity released through this method depends on the power plant, the regulatory requirements, and the plant's performance. Atmospheric dispersion models combined with pathway models are employed to accurately approximate the dose to a member of the public from the effluents emitted. Effluent monitoring is conducted continuously at the plant.

DISASTER MANAGEMENT

'Disaster management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular preparedness, response and recovery in order to lessen the impact of disasters

Types of disasters

There is no country that is immune from disaster, though vulnerability to disaster varies. There are four main types of disaster.

- **Natural disasters.** These disasters include floods, hurricanes, earthquakes and volcano eruptions that can have immediate impacts on human health, as well as secondary impacts causing further death and suffering from floods causing landslides, earthquakes resulting in fires, tsunamis causing widespread flooding and typhoons sinking ferries
- **Environmental emergencies.** These emergencies include technological or industrial accidents, usually involving hazardous material, and occur where these materials are produced, used or transported. Large forest fires are generally included in this definition because they tend to be caused by humans.

- **Complex emergencies.** These emergencies involve a break-down of authority, looting and attacks on strategic installations. Complex emergencies include conflict situations and war.
- **Pandemic emergencies.** These emergencies involve a sudden onset of a contagious disease that affects health but also disrupts services and businesses, bringing economic and social costs.

Any disaster can interrupt essential services, such as the provision of health care, electricity, water, sewage/garbage removal, transportation and communications. The interruption can seriously affect the health, social and economic networks of local communities and countries. Disasters have a major and long-lasting impact on people long after the immediate effect has been mitigated. Poorly planned relief activities can have a significant negative impact not only on the disaster victims but also on donors and relief agencies. So it is important that physical therapists join established programmes rather than attempting individual efforts.

Local, regional, national and (where necessary) international organisations are all involved in mounting a humanitarian response to disasters. Each will have a prepared disaster management plan. These plans cover prevention, preparedness, relief and recovery (see below).

Disaster prevention

These are activities designed to provide permanent protection from disasters. Not all disasters, particularly natural disasters, can be prevented, but the risk of loss of life and injury can be mitigated with good evacuation plans, environmental planning and design standards. In January 2005, 168 Governments adopted a 10-year global plan for natural disaster risk reduction called the Hyogo Framework. It offers guiding principles, priorities for action, and practical means for achieving disaster resilience for vulnerable communities.

Disaster preparedness

These activities are designed to minimize loss of life and damage – for example by removing people and property from a threatened location and by facilitating timely and effective rescue, relief and rehabilitation. Preparedness is the main way of reducing the impact of disasters. Community-based preparedness and management should be a high priority in physical therapy practice management.

Disaster relief

This is a coordinated multi-agency response to reduce the impact of a disaster and its long-term results. Relief activities include rescue, relocation, providing food and water, preventing disease and disability, repairing vital services such as telecommunications and transport, providing temporary shelter and emergency health care.

Disaster recovery

Once emergency needs have been met and the initial crisis is over, the people affected and the communities that support them are still vulnerable. Recovery activities include rebuilding infrastructure, health care and rehabilitation. These should blend with development activities, such as building human resources for health and developing policies and practices to avoid similar situations in future.

Disaster management is linked with sustainable development, particularly in relation to vulnerable people such as those with disabilities, elderly people, children and other marginalised groups.

Myths and Realities of Disaster Assistance summarises some of the common misunderstandings about disaster management.

FLOODS

A **flood** is an overflow of water that submerges land.[1] The European Union (EU) Floods Directive defines a flood as a covering by water of land not normally covered by water.[2] In the sense of "flowing water", the word may also be applied to the inflow of the tide. Flooding may result from the volume of water within a body of water, such as a river or lake, which overflows or breaks levees, with the result

that some of the water escapes its usual boundaries,[3] or may be due to accumulation of rainwater on saturated ground in an area flood.
While the size of a lake or other body of water will vary with seasonal changes in precipitation and snow melt, it is not a significant flood unless such escapes of water endanger land areas used by man like a village, city or other inhabited area.
Floods can also occur in rivers, when flow exceeds the capacity of the river channel, particularly at bends or meanders. Floods often cause damage to homes and businesses if they are placed in natural flood plains of rivers. While flood damage can be virtually eliminated by moving away from rivers and other bodies of water, since time out of mind, people have lived and worked by the water to seek sustenance and capitalize on the gains of cheap and easy travel and commerce by being near water. That humans continue to inhabit areas threatened by flood damage is evidence that the perceived value of living near the water exceeds the cost of repeated periodic flooding.
The word "flood" comes from the Old English *flod*, a word common to Germanic languages (compare German *Flut*, Dutch *vloed* from the same root as is seen in *flow, float*; also compare with Latin *fluctus*, *flumen*). Deluge myths are mythical stories of a great flood sent by a deity or deities to destroy civilization as an act of divine retribution, and are featured in the mythology of many cultures.

Principal types and causes

Areal

- Floods often happen over flat or low-lying areas when the ground is saturated and water either cannot run off, or cannot run off quickly enough to stop accumulating. This may be later followed by a river flood as water moves away from the areal floodplain into local rivers and streams.
- Floods can occur if water accumulates across an impermeable surface (e.g. from rainfall) and cannot rapidly dissipate (i.e. gentle orientation or low evaporation).
- A series of storms moving over the same area can cause areal flash flooding.
- A muddy flood is produced by an accumulation of runoff generated on cropland. Sediments are then detached by runoff and carried as suspended matter or bed load. Muddy runoff is more likely detected when it reaches inhabited areas. Muddy floods are therefore a hill slope process, and confusion with mudflows produced by mass movements should be avoided.

Reverie

- **Slow kinds:** Runoff from sustained rainfall or rapid snow melt exceeding the capacity of a river's channel. Causes include heavy rains from monsoons, hurricanes and tropical depressions, foreign winds and warm rain affecting snow pack. Unexpected drainage obstructions such as landslides, ice, or debris can cause slow flooding upstream of the obstruction.
- **Fast kinds:** include river flash floods resulting from convective precipitation (intense thunderstorms) or sudden release from an upstream impoundment created behind a dam, landslide, or glacier.
- Dam-building beavers can flood low-lying urban and rural areas, often causing significant damage.

Estuarine

- Commonly caused by a combination of sea tidal surges caused by storm-force winds and high river stages due to heavy rain.

Coastal

- Caused by severe sea storms, or as a result of another hazard (e.g. tsunami or hurricane). A storm surge, from either a tropical cyclone or an extratropical cyclone, falls within this category.

Catastrophic

- Caused by a significant and unexpected event e.g. dam breakage, or as a result of another hazard (e.g. earthquake or volcanic eruption). See outburst flood.

Human-induced

- Accidental damage by workmen to tunnels or pipes.

Effects

Primary effects

- Physical damage – damage to structures, including bridges, buildings, sewerage systems, roadways, and canals.

Secondary effects

- *Water supplies* – Contamination of water. Clean drinking water will become scarce.
- *Diseases* – Unhygienic conditions. Spread of water-borne diseases.
- *Crops and food supplies* – Shortage of food crops can be caused due to loss of entire harvest.[4] However, lowlands near rivers depend upon river silt deposited by floods in order to add nutrients to the local soil.
- *Trees* – Non-tolerant species can die from suffocation.[5]
- *Transport* – Transport links destroyed, so hard to get emergency aid to those who need it.

Tertiary and long-term effects

- Economic – economic hardship due to temporary decline in tourism, rebuilding costs, food shortage leading to price increase, etc.
- Psychological – flooding can be highly traumatic for individuals, in particular where deaths, serious injuries and loss of property occurs.

EARTHQUAKE

An **earthquake** (also known as a **quake**, **tremor** or **temblor**) is the result of a sudden release of energy in the Earth's crust that creates seismic waves. The **seismicity**, **seismism** or **seismic activity** of an area refers to the frequency, type and size of earthquakes experienced over a period of time. Earthquakes are measured using observations from seismometers. The moment magnitude is the most common scale on which earthquakes larger than approximately 5 are reported for the entire globe. The more numerous earthquakes smaller than magnitude 5 reported by national seismological observatories are measured mostly on the local magnitude scale, also referred to as the Richter scale. These two scales are numerically similar over their range of validity. Magnitude 3 or lower earthquakes are mostly almost imperceptible and magnitude 7 and over potentially cause serious damage over large areas, depending on their depth. The largest earthquakes in historic times have been of magnitude slightly over 9, although there is no limit to the possible magnitude. The most recent large earthquake of magnitude 9.0 or larger was a 9.0 magnitude earthquake in Japan in 2011 (as of March 2011), and it was the largest Japanese earthquake since records began. Intensity of shaking is measured on the modified Mercalli scale. The shallower an earthquake, the more damage to structures it causes, all else being equal.[1]

At the Earth's surface, earthquakes manifest themselves by shaking and sometimes displacement of the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity.

In its most general sense, the word *earthquake* is used to describe any seismic event — whether natural or caused by humans — that generates seismic waves. Earthquakes are caused mostly by rupture of geological faults, but also by other events such as volcanic activity, landslides, mine blasts, and nuclear tests. An earthquake's point of initial rupture is called its focus or hypocenter. The epicenter is the point at ground level directly above the hypocenter.

Measuring and locating earthquakes

Earthquakes can be recorded by seismometers up to great distances, because seismic waves travel through the whole Earth's interior. The absolute magnitude of a quake is conventionally reported by numbers on the Moment magnitude scale (formerly Richter scale, magnitude 7 causing serious damage

over large areas), whereas the felt magnitude is reported using the modified Mercalli intensity scale (intensity II–XII).
Every tremor produces different types of seismic waves, which travel through rock with different velocities:

- Longitudinal P-waves (shock- or pressure waves)
- Transverse S-waves (both body waves)
- Surface waves — (Rayleigh and Love waves)

Propagation velocity of the seismic waves ranges from approx. 3 km/s up to 13 km/s, depending on the density and elasticity of the medium. In the Earth's interior the shock- or P waves travel much faster than the S waves (approx. relation 1.7 : 1). The differences in travel time from the epicentre to the observatory are a measure of the distance and can be used to image both sources of quakes and structures within the Earth. Also the depth of the hypocenter can be computed roughly.
In solid rock P-waves travel at about 6 to 7 km per second; the velocity increases within the deep mantle to ~13 km/s. The velocity of S-waves ranges from 2–3 km/s in light sediments and 4–5 km/s in the Earth's crust up to 7 km/s in the deep mantle. As a consequence, the first waves of a distant earthquake arrive at an observatory via the Earth's mantle.

Rule of thumb: On the average, the kilometer distance to the earthquake is the number of seconds between the P and S wave **times 8**.[44] Slight deviations are caused by inhomogeneities of subsurface structure. By such analyses of seismograms the Earth's core was located in 1913 by Beno Gutenberg.
Earthquakes are not only categorized by their magnitude but also by the place where they occur. The world is divided into 754 Flinn-Engdahl regions (F-E regions), which are based on political and geographical boundaries as well as seismic activity. More active zones are divided into smaller F-E regions whereas less active zones belong to larger F-E regions.

Effects of earthquakes
1755 copper engraving depicting Lisbon in ruins and in flames after the 1755 Lisbon earthquake, which killed an estimated 60,000 people. A tsunami overwhelms the ships in the harbor.
The effects of earthquakes include, but are not limited to, the following:

Shaking and ground rupture
Damaged buildings in Port-au-Prince, Haiti, January 2010.
Shaking and ground rupture are the main effects created by earthquakes, principally resulting in more or less severe damage to buildings and other rigid structures. The severity of the local effects depends on the complex combination of the earthquake magnitude, the distance from the epicenter, and the local geological and geomorphological conditions, which may amplify or reduce wave propagation.[45]
The ground-shaking is measured by ground acceleration.
Specific local geological, geomorphological, and geostructural features can induce high levels of shaking on the ground surface even from low-intensity earthquakes. This effect is called site or local amplification. It is principally due to the transfer of the seismic motion from hard deep soils to soft superficial soils and to effects of seismic energy focalization owing to typical geometrical setting of the deposits.
Ground rupture is a visible breaking and displacement of the Earth's surface along the trace of the fault, which may be of the order of several metres in the case of major earthquakes. Ground rupture is a major risk for large engineering structures such as dams, bridges and nuclear power stations and requires careful mapping of existing faults to identify any which are likely to break the ground surface within the life of the structure.[46]
Landslides and avalanches
Earthquakes, along with severe storms, volcanic activity, coastal wave attack, and wildfires, can produce slope instability leading to landslides, a major geological hazard. Landslide danger may persist while emergency personnel are attempting rescue.[47]

Fires

Fires of the 1906 San Francisco earthquake

Earthquakes can cause fires by damaging electrical power or gas lines. In the event of water mains rupturing and a loss of pressure, it may also become difficult to stop the spread of a fire once it has started. For example, more deaths in the 1906 San Francisco earthquake were caused by fire than by the earthquake itself.[48]

Soil liquefaction

Main article: Soil liquefaction

Soil liquefaction occurs when, because of the shaking, water-saturated granular material (such as sand) temporarily loses its strength and transforms from a solid to a liquid. Soil liquefaction may cause rigid structures, like buildings and bridges, to tilt or sink into the liquefied deposits. This can be a devastating effect of earthquakes. For example, in the 1964 Alaska earthquake, soil liquefaction caused many buildings to sink into the ground, eventually collapsing upon themselves.[49]

Tsunami

The tsunami of the 2004 Indian Ocean earthquake

A large ferry boat rests inland amidst destroyed houses after a 9.0 earthquake and subsequent tsunami struck Japan in March 2011.

Main article: Tsunami

Tsunamis are long-wavelength, long-period sea waves produced by the sudden or abrupt movement of large volumes of water. In the open ocean the distance between wave crests can surpass 100 kilometers (62 mi), and the wave periods can vary from five minutes to one hour. Such tsunamis travel 600-800 kilometers per hour (373–497 miles per hour), depending on water depth. Large waves produced by an earthquake or a submarine landslide can overrun nearby coastal areas in a matter of minutes. Tsunamis can also travel thousands of kilometers across open ocean and wreak destruction on far shores hours after the earthquake that generated them.[50]

Ordinarily, subduction earthquakes under magnitude 7.5 on the Richter scale do not cause tsunamis, although some instances of this have been recorded. Most destructive tsunamis are caused by earthquakes of magnitude 7.5 or more.[50]

Floods

A flood is an overflow of any amount of water that reaches land.[51] Floods occur usually when the volume of water within a body of water, such as a river or lake, exceeds the total capacity of the formation, and as a result some of the water flows or sits outside of the normal perimeter of the body. However, floods may be secondary effects of earthquakes, if dams are damaged. Earthquakes may cause landslips to dam rivers, which collapse and cause floods.[52]

The terrain below the Sarez Lake in Tajikistan is in danger of catastrophic flood if the landslide dam formed by the earthquake, known as the Usoi Dam, were to fail during a future earthquake. Impact projections suggest the flood could affect roughly 5 million people.[53]

Human impacts

An earthquake may cause injury and loss of life, road and bridge damage, general property damage (which may or may not be covered by earthquake insurance), and collapse or destabilization (potentially leading to future collapse) of buildings. The aftermath may bring disease, lack of basic necessities, and higher insurance premiums.

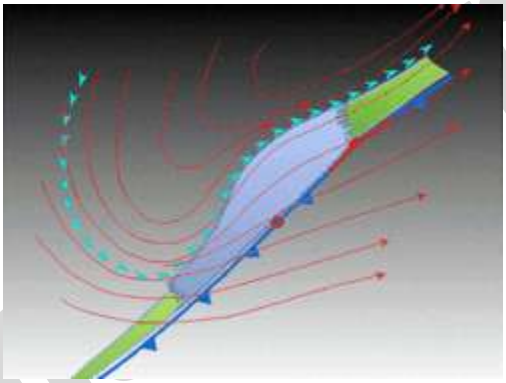
CYCLONE

In meteorology, a **cyclone** is an area of closed, circular fluid motion rotating in the same direction as the Earth.[1][2] This is usually characterized by inward spiraling winds that rotate counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere of the Earth. Most large-scale cyclonic circulations are centered on areas of low atmospheric pressure.[3][4] The largest low-pressure

systems are cold-core polar cyclones and extratropical cyclones which lie on the synoptic scale. According to NHC glossary, warm-core cyclones such as tropical cyclones and subtropical cyclones also lies within synoptic scale.[5] Mesocyclones, tornadoes and dust devils lie within the smaller mesoscale.[6] Upper level cyclones can exist without the presence of a surface low, and can pinch off from the base of the Tropical Upper Tropospheric Trough during the summer months in the Northern Hemisphere. Cyclones have also been seen on extraterrestrial planets, such as Mars and Neptune.[7][8] Cyclogenesis describes the process of cyclone formation and intensification.[9] Extratropical cyclones form as waves in large regions of enhanced mid-latitude temperature contrasts called baroclinic zones. These zones contract to form weather fronts as the cyclonic circulation closes and intensifies. Later in their life cycle, cyclones occlude as cold core systems. A cyclone's track is guided over the course of its 2 to 6 day life cycle by the steering flow of the cancer or subtropical jet stream.
Weather fronts separate two masses of air of different densities and are associated with the most prominent meteorological phenomena. Air masses separated by a front may differ in temperature or humidity. Strong cold fronts typically feature narrow bands of thunderstorms and severe weather, and may on occasion be preceded by squall lines or dry lines. They form west of the circulation center and generally move from west to east. Warm fronts form east of the cyclone center and are usually preceded by stratiform precipitation and fog. They move poleward ahead of the cyclone path. Occluded fronts form late in the cyclone life cycle near the center of the cyclone and often wrap around the storm center.

Structure
There are a number of structural characteristics common to all cyclones.The cyclones have high pressure outside and low pressure inside. A cyclone is a low pressure area.[13] A cyclone's center (often known in a mature tropical cyclone as the eye), is the area of lowest atmospheric pressure in the region.[13] Near the center, the pressure gradient force (from the pressure in the center of the cyclone compared to the pressure outside the cyclone) and the force from the Coriolis effect must be in an approximate balance, or the cyclone would collapse on itself as a result of the difference in pressure.[14] Because of the Coriolis effect, the wind flow around a large cyclone is counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere.[15] Cyclonic circulation is sometimes referred to as contra solem. In the Northern Hemisphere, the fastest winds relative to the surface of the Earth therefore occur on the eastern side of a northward-moving cyclone and on the northern side of a westward-moving one; the opposite occurs in the Southern Hemisphere.[16] (The wind flow around an anticyclone, on the other hand, is clockwise in the northern hemisphere, and counterclockwise in the southern hemisphere.)

Formation



The initial extratropical low pressure area forms at the location of the red dot on the image. It is usually perpendicular (at a right angle to) the leaf-like cloud formation seen on satellite during the early stage of cyclogenesis. The location of the axis of the upper level jet stream is in light blue.

Tropical cyclones form when the energy released by the condensation of moisture in rising air causes a positive feedback loop over warm ocean waters.[17]
Cyclogenesis is the development or strengthening of cyclonic circulation in the atmosphere (a low pressure area).[9] Cyclogenesis is an umbrella term for several different processes, all of which result in the development of some sort of cyclone. It can occur at various scales, from the microscale to the synoptic scale.
Extratropical cyclones form as waves along weather fronts before occluding later in their life cycle as cold core cyclones.
Tropical cyclones form due to latent heat driven by significant thunderstorm activity, and are warm core.
Mesocyclones form as warm core cyclones over land, and can lead to tornado formation.[11] Waterspouts can also form from mesocyclones, but more often develop from environments of high instability and low vertical wind shear.[12] Cyclogenesis is the opposite of cyclolysis, and has an anticyclonic (high pressure system) equivalent which deals with the formation of high pressure areas—Anticyclogenesis.
The surface low has a variety of ways of forming. Topography can force a surface low when dense low-level high pressure system ridges in east of a north-south mountain barrier. Mesoscale convective systems can spawn surface lows which are initially warm core.[The disturbance can grow into a wave-like formation along the front and the low will be positioned at the crest. Around the low, flow will become cyclonic, by definition. This rotational flow will push polar air equatorward west of the low via its trailing cold front, and warmer air with push poleward low via the warm front. Usually the cold front will move at a quicker pace than the warm front and "catch up" with it due to the slow erosion of higher density airmass located out ahead of the cyclone and the higher density airmass sweeping in behind the cyclone, usually resulting in a narrowing warm sector. At this point an occluded front forms where the warm air mass is pushed upwards into a trough of warm air aloft, which is also known as a trowal.
Tropical cyclogenesis is the technical term describing the development and strengthening of a tropical cyclone in the atmosphere. The mechanisms through which tropical cyclogenesis occurs are distinctly different from those through which mid-latitude cyclogenesis occurs. Tropical cyclogenesis involves the development of a warm-core cyclone, due to significant convection in a favorable atmospheric environment. There are six main requirements for tropical cyclogenesis: sufficiently warm sea surface temperatures, atmospheric instability, high humidity in the lower to middle levels of the troposphere, enough Coriolis force to develop a low pressure center, a preexisting low level focus or disturbance, and low vertical wind shear. An average of 86 tropical cyclones of tropical storm intensity form annually worldwide, with 47 reaching hurricane/typhoon strength, and 20 becoming intense tropical cyclones (at least Category 3 intensity on the Saffir–Simpson Hurricane Scale)

LANDSLIDES

A **landslide** or **landslip** is a geological phenomenon which includes a wide range of ground movement, such as rockfalls, deep failure of slopes and shallow debris flows, which can occur in offshore, coastal and onshore environments. Although the action of gravity is the primary driving force for a landslide to occur, there are other contributing factors affecting the original slope stability. Typically, pre-conditional factors build up specific sub-surface conditions that make the area/slope prone to failure, whereas the actual landslide often requires a trigger before being released.

Causes

The Mameyes Landslide, in the Mameyes neighborhood of barrio Portugués Urbano in Ponce, Puerto Rico, which buried more than 100 homes, was caused by extensive accumulation of rains and, according to some sources, lightning.
Landslides occur when the stability of a slope changes from a stable to an unstable condition. A change in the stability of a slope can be caused by a number of factors, acting together or alone. Natural causes of landslides include:

- groundwater (porewater) pressure acting to destabilize the slope
- Loss or absence of vertical vegetative structure, soil nutrients, and soil structure (e.g. after a wildfire)
- erosion of the toe of a slope by rivers or ocean waves
- weakening of a slope through saturation by snowmelt, glaciers melting, or heavy rains
- earthquakes adding loads to barely stable slope
- earthquake-caused liquefaction destabilizing slopes
- volcanic eruptions

Landslides are aggravated by human activities, Human causes include:

- deforestation, cultivation and construction, which destabilize the already fragile slopes
- vibrations from machinery or traffic
- blasting
- earthwork which alters the shape of a slope, or which imposes new loads on an existing slope
- in shallow soils, the removal of deep-rooted vegetation that binds colluvium to bedrock
- Construction, agricultural or forestry activities (logging) which change the amount of water which infiltrates the soil

UNIT III & IV
SUSTAINABLE DEVELOPMENT

Sustainable development is the process of maintaining human needs while preserving the environment for future generations. An example of this would be the entire green movement. This is utilizing the resources we have efficiently so that they will be available for many years to come.

"**Development** is defined … as: the modification of the biosphere and the application of human, financial, living and non-living resources to satisfy human needs and improve the quality of human life. For development to be sustainable it must take account of social and ecological factors, as well as economic ones; of the living and non-living resource base; and of the long term as well as short term advantages and disadvantages of alternative actions.

"Sustainability is a strategy for improving the quality of life while preserving the environmental potential for the future, of living off interest rather than consuming natural capital. Sustainable development mandates that the present generation must not narrow the choices of future generations but must strive to expand them by passing on an environment and an accumulation of resources that will allow its children to live at least as well as, and preferably better than, people today.

"The **possibility** that human and other forms of life will **flourish** on the Earth **forever**"

Sustainable development is the "process of meeting the needs of current and future generations without undermining the resilience of life-supporting properties or the integrity & cohesion of social systems".
Extending this definition further, we differentiate among four dimensions of sustainability:

1. Ecological configuration
2. Economic production & consumption
3. Governance & politics
4. Institution & Performance

Sustainability Development is:

a. Preserving natural resources for future generations
b. Preserving the option value of human and man-made capital for future generations
c. Improving quality of life for individuals
d. Ensuring a fair distribution of lifequality"

Sustainable development "is an obligation to conduct ourselves so that we leave to the future the option or the capacity to be as well off as we are"
"Economic growth that provides fairness and opportunity for all the world's people, not just the privileged few, without further destroying the world's finite natural resources and carrying capacity"

"**The main principle of sustainable development**

1. Is to limit the human scale to a level which, if not optimal, is at least within carrying capacity and therefore sustainable.
2. Technological progress for sustainable development should be efficiency-increasing rather than through put-increasing.
3. Renewable resources, in both their source and sink functions, should be exploited on a profit maximizing sustained yield basis and in general not driven to extinction (regardless of the dictates of present value maximization), since they will become ever more important as non-renewable run Out … Specifically this means that:
   - harvesting rates should not exceed regeneration rates; and
   - Waste emissions should not exceed the renewable assimilative capacity of the environment.
4. Non-renewable resources should be exploited, but at a rate equal to the creation of renewable

Substitutes.

Necessary Conditions for Global Sustainability:
"Ecological stability requires that:

- Consumption by the economy of the products and services of nature be compatible with rates of production by the ecosphere.
- The production of wastes by the economy remains within the assimilative capacity of the ecosphere.
- Economic activity protects the essential life-support functions of the ecosphere and preserves the biodiversity and resilience of Earth's ecological systems.
- Society satisfies basic standards of material equity and social justice.
- Governance mechanisms be in place to enable an informed citizenry to have an effective participatory role in decision-making.
- People share a positive sense of community cohesion (local and global) and a sense of collective responsibility for the future"

CHALLENGES

- The first challenge is the need to provide society with adequate and high quality goods and services - e.g., food, health care, transportation, security, etc.
- The second four challenges relate to four environmentally different concerns:
  1. Ecosystem integrity and the loss of biodiversity;
  2. Resource depletion;
  3. Toxic pollution; and
  4. Climate change.

The burden of these environmental problems is felt unequally within nations, between nations, and between generations, leading to concerns for international and intergenerational equity. These concerns for equity are often expressed under the heading of 'environmental justice.' The final two challenges relate to:

Economic and social concerns associated with employment, wages, and economic inequality.

ENERGY

Energy is a key input for meeting basic needs and for achieving socio-economic development goals that include, inter-alia, fuel for cooking, heating and lighting in households, power for industry, and petroleum products for transportation. The supply of and the demand for virtually every type of energy generates varying degrees of environmental externalities that affect human health, ecological stability, and economic development. These effects can occur at the local, regional, national or transnational level. Cities, with their high population densities, tend to concentrate environmental problems that elsewhere, are otherwise geographically dispersed. A classic example of this is air pollution in cities where both point (e.g. industrial emissions from smokestacks) and nonpoint (e.g., vehicle exhaust) sources are concentrated in a limited, densely populated geographic area. The degree of the problem varies with prevailing winds and thermal stratification patterns, urban geography, levels of industrialization and motorization, and the incidence of indoor as well as outdoor human exposure. It is important to note that the cause of many of these problems may be urban but the impact can be felt both inside and outside the city. In addition, ambient air pollution may affect the health of urban residents and damage the crops n of farmers in rural areas. Urban areas in developing countries typically generate up to fifty per cent, and often more, of the national gross domestic product. This involves the consumption and transformation of energy resources that are not found within the physical limits of the city.

Energy is the capacity to work. We use energy at various levels in different forms. It is used in the kitchen for cooking food to run machines at the factories. The motor vehicles, the train, the turbines and the aeroplanes are driven by the energy. The exploration of Antarctica or the arrival of man on the moon is only by harnessing energy rich fuels.

Energy provides the power to progress. Its uses at present life are manifold. We cannot grow without it. More d man is advancing towards modernity, more he is becoming dependent on energy, from the prehistoric period, when man first came to know about the use of fire, till date, it plays a key role in the economic and social developments of mankind.

A nation is considered rich not by amount of minerals or industrial resource it possesses, but by its technical ability is has acquired and scientific progress it is making, which depends ultimately on the supply and consumption of energy. The per capital daily consumption of energy of the developed countries is much higher in comparison to the developing countries like India.

Energy Resources –
Along with all other natural like air, water, land, forestry and fisheries, energy also occupies an important place. Our progress and prosperity depend solely upon it. Natural resources, energy and environment are intimate related. Distributed or anyone would definitely cause disturbances in other two.

Energy is required for beneficial use of natural resources and the resources, on the other hand, provide energy. The interaction of these two in the environment in safe and tolerable limit is called 'limit of tolerance.' When this is disturbed, great disaster occur.

Depending on the source and availability, energy resources are mainly of two types:

1. Non – Conventional or renewal energy
2. Conventional or non – renewal energy

Non – Conventional or renewable energy –
It is a type of non – replenish able or non – exhaustable form obtained from the continuous or repetitive currents of energy occurring in the natural environment. As the source of energy in unlimited, it is also called infinite or renewable energy. E.g. Biomass and Biogas, Solar, Wind, Tidal, Minihydel and Geothermal

Conventional Energy –
All the non – renewable types of energy come under this category. In this case, the raw materials that provide energy cannot be replaced. Once it is used, its stock is depleted forever. The common types are coal, Oil natural gas and recently the Nuclear energy.

The main factors contributing to increases in commercial energy consumption in LDCs are increased levels of motor vehicle use and urbanization. This increased fuel consumption is bound to exacerbate urban-based pollution. One consequence of this growth in demand for commercial fuels is that related environmental impacts will also increase if no mitigating measures are introduced. These effects will be increasingly felt all the way from the neighbourhood to the global level. At all levels (production, transformation, and consumption), urban energy use is a commercial activity, whether it is power generation for use by urban-based industries, refining of petroleum products, or neighbourhood sales of kerosene for household lighting. In cities, even these traditional types of fuel such as wood or charcoal, are bought and sold3. The implication for environmental management is that it is much easier to use economic policy instruments to influence energy consumption where there is a market, i.e., in the city.

Most of the commercial and noncommercial energy produced today is used in and for human settlements, and a substantial percentage of it is used by the household sector. Developing countries are at present faced with the need to increase their energy production to accelerate development and raise the living standards of their populations, while at the same time reducing energy production costs and energy-related pollution. Increasing the efficiency of energy use to reduce its polluting effects and to promote the use of renewable energies must be a priority in any action taken to protect the urban environment.

The structure of Urban Energy Use and its Environmental Implications

An energy balance i.e., share of different types of energy sources by sector, in total energy use,usually prepared for an entire country, presents data on the types of fuels being used by different sectors of the economy. Overall, electricity is the most important energy source; it is used extensively by households, industries, and commercial enterprises. Apart from focusing on the key fuels and sectors, an energy balance points out special features of each sector. For example, while charcoal accounts for only 8% of total gross energy consumption, it supplies 40% of the fuel used by industries in Delhi.

An important consequence of the dynamics of the energy ladder is the shift in fuels used in developing cities (and their related environmental problems) in recent years. The consumption of energy for lighting, cooking, and appliances by households and the service industry has changed significantly: growth in household incomes and urbanization has been accompanied by a change in the fuel mix to energies that can be used more efficiently. As incomes and urbanization continue, the share of traditional fuels used in cities will diminish while modem fuel consumption will increase.

Environmental impact of urban energy supply

The impact depends upon the types of energy supply. In the case of wood and charcoal, deforestation is the impact at the regional level while health and safety are affected during the conversion process of biomass into charcoal. The supply processes of petroleum products and natural gas cause land degradation and sulphur emissions at the local level and land/sea spills at the regional level. The conversion processes can lead to global warming through CO2 emissions.

The extraction and conversion processes of coal lead to water pollution, respiratory ailments and land degradation at the local level. Electricity generation from hydro affect river ecosystems at the regional level and displacement of populations, etc. at the local level. Nuclear energy generation leads to mine wastes at the local level and fuel cycle radiation at the regional level. Nuclear waste storage poses environmental threats that have local, regional and global connotations.

The impact of power plants located in urban areas, can be serious at the local level as a result of the emission of pollutants leading to deterioration of air quality and health hazards affecting concentrated population.

Despite the seemingly gloomy picture of deforestation, with economic growth, urban consumers usually make the transition from biofuels to commercial fuels, thus reducing fuel-related pressure on peri-urban forest resources. The change-over could be even more environmentally beneficial if power generation, industry and the transport sectors were to use natural gas.

WATER CONSERVATION

"Life Started From Water Nature Flourishes with Water Seasons Caused By Water Development Progresses with Water Energy Formed Of Water Health Depends On Water Religion Imbibes Water History Made Of Water Trade Rides On Water Bio-Diversity Needs Water Water Sustains Life It Brings Prosperity and Happiness "

A step to conserve water is the step to secure the future. The most essential among all the natural resources on earth is water. A drop of water is worth more than a sack of gold for the thirsty man. If each one of us make efforts to save water today , it will save us later. Water conservation is the most effective and environmentally sound method to fight global warming. Water conservation is what that can reduce the scarcity of water. It aims to improve the efficiency of use of water, and reduce losses and waste.

WATER IS A VERY IMPORTANT RESOURCE IN OUR LIFE . WATER IS BECOMING SCARCE DUE TO INCREASE IN POPULATION, INDUSTRIES AND AGRICULTURAL ACTIVITIES AND DUE TO POOR RAINFALL.

- Over the years rising populations, growing industrialization, and expanding agriculture have pushed up the demand for water.
- Efforts have been made to collect water by building dams, reservoirs and digging wells; some countries have also tried to recycle and desalinate sea water.
- Water conservation has become the need of the day.
- The method of recharging ground water by harvesting rainwater is gaining importance in many cities.
- In the forests, water seeps gently into the ground due to vegetation cover. This groundwater in turn feeds wells, lakes, and rivers. Protecting forests means protecting water 'catchments'. In ancient India, people worshipped Nature and one of them was Water.

Goals of Water Conservation

The goals of water conservation efforts include as follows:

Sustainability – To ensure availability for future generations, the withdrawal of fresh water from an ecosystem should not exceed its natural replacement rate.

Energy conservation – Water pumping, delivery, and wastewater treatment facilities consume significant amount of energy. In some regions of the world over 15% of total electricity consumption is devoted to water management.

Habitat conservation – Minimizing human water use helps top reserve fresh water habitats for local wildlife and migrating water flow, as well as reducing the need to build new dams and other water diversion infrastructure.

Water wastage

- People waste water in their homes without even realizing it. We have become so accustomed to have a 24 hour supply of water to meet all of our needs from cooking, to cleaning, to drinking, that we sometimes forget that we do not have an infinite supply of water. Besides using renewable energy in the home to cut back on the use of electricity, we must also learn how to save our water supply. Here are a few tips on how to do so.
- The first thing you should do is check for leaks in taps, pipes, and dishwasher hoses which can cause over 2,000 liters of water per month to be wasted. Repairing any leaks will save you a ton of money and you will also be saving the environment.
- In the same way that you can buy renewable energy, you can also buy water efficient taps that will make the most of your water and will ensure that you are not wasting any while the tap is running.
- To save both water and energy, if you're not already using green energy, then you should wait until your dishwasher is completely full before running it. On average, dishwashers use approximately 40 litres of water per load, but thanks to features that some dishwasher have, you can specify that it is a light load, or rinse only, or air dry. All of these features allow you to save both water and energy.

Water Saving Tips

Tips for Conserving Water Indoors

Verify your home is leak free. Repair dripping taps by replacing washers. Avoid flushing the toilet unnecessarily.

Use water efficient flushes, plumbing fixtures having sensors, low flow faucet aerators which require minimum water.

- Turn off water while brushing teeth.
- For shaving, use mug rather than using running water.
- Close faucets while soaping and rinsing clothes.
- Keep overflow valve in the over head tanks so as not to waste water.
- Use waste water of cloth cleaning to clean the floor.
- Use waste water in flush.
- Don't use running water for releasing ice from tray
- Don't use extra detergent in washing clothes.
- Don't use running water while hand-washing clothes.
- Operate automatic washing machine when it is fully loaded.
- Don't use shower/big bath tubs in bathrooms.
- While going outdoor, turn off the main valve for water.
- Develop habit of monitoring water meters.

Tips for Conserving Water Outdoors

Minimize grass lawns in your yard because less grass means water demand.

Don't over-water your lawns.

A good rain eliminates the need watering for more than a week.

Water the lawns during early morning hours when temperature and wind speeds are the lowest. This reduces losses from evaporation.

Try to use waste of dish washing/cloth cleaning for gardening and cleaning the floor.

Check leaks in hose, pipes etc. Use sprinkler/drip irrigation systems.

Don't allow water to flow into gutter.

Don't wash floors with a hose. Use a broom.

Avoid over fertilizing your lawn. The application of excess fertilizer increases the need of water.

Benefits to Conserve water -

- If you save water it can save your money bills.
- Reduction in interior water use cuts waste water flows, especially overflowing of gutters which contaminates the environment.
- Environment benefits include eco system and habitat protection.
- Water conservation helps in improving the quality of your drinking water
- **Technical methods to conserve water :**

Rainwater Harvesting:

Rainwater harvesting is the gathering and collection of water from the rooftop. The traditional method of rain water harvesting is the most effective and simple way to conserve the water. It means utilization of rain water for the domestic as well as agricultural purposes. There are three technical methods of rain water harvesting such as Catchment, Conveyance and storage.

Historical Water Bodies:

There are many traditional water bodies which have been in disuse for the longer time. These bodies can be reused as the recharging points.

Ponds:
Steps should be taken to avoid dumping of sewage into the village ponds. Efforts need to be made to deepen these ponds with the dragline machines. Garbage and other waste should not be dumped into the ponds.

- Implementation of water economy measures, reuse and recycle of wastes, and creation of surface water bodies like reservoirs Lakes, ponds etc.
- Development of efficient water transport and distribution systems.
- Control on waste discharge in water bodies and also on the land to avoid pollution and efficient treatment of wastewater for recycling of treated effluents.
- Recharge of ground water.

RAIN WATER PRESERVATION

1. Rainwater is absolutely pure. So it is safe to drink preserved rainwater even without boiling. But, if gas is available, it is best to first boil the water and then drink it.
2. During the first 15 minutes of rain, dust and sand particles, gas molecules and also germs are amassed by the rainwater and washed away. Therefore water should be collected after at least 15 minutes.
3. In heavily industrialized and densely populated areas, rainwater should be gathered after 30 minutes.
4. A clean pitcher or a jug can be used to collect rainwater. The pot should be placed in an open space so that water dripping from trees or rooftops does not spoil the pure water.
5. Rainwater can also be used to wash clothes or dishes. In fact, soaps and detergents work better in soft rainwater than in hard water containing metal ions.
6. Short and long-term measures should be taken from now on. Constructing rainwater-harvesting mechanism in all new buildings can be made obligatory by the government. Preserving rainwater on a mass scale can definitely lessen the present water crisis..

CONSERVATION OF NATURAL RESOURCES:

Natural resources occur naturally within environments that exist relatively undisturbed by mankind, in a natural form. A natural resource is often characterized by amounts of biodiversity and geodiversity existent in various ecosystems.

Natural resources are derived from the environment. Some of them are essential for our survival while most are used for satisfying our wants. Natural resources may be further classified in different ways.

Natural resources are materials and components (something that can be used) that can be found within the environment. Every man-made product is composed of natural resources (at its fundamental level). A natural resource may exist as a separate entity such as fresh water, and air, as well as a living organism such as a fish, or it may exist in an alternate form which must be processed to obtain the resource such as metal ores, oil, and most forms of energy.

There is much debate worldwide over natural resource allocations, this is partly due to increasing scarcity (depletion of resources) but also because the exportation of natural resources is the basis for many economies (particularly for developed nations such as Australia).

Some Natural resources can be found everywhere such as sunlight and air, when it is so the resource is known as an ubiquitous (existing or being everywhere) resource. However most resources are not ubiquitous. They only occur in small sporadic areas; these resources are referred to as localized resources. There are very few resources that are considered inexhaustible (will not run out in foreseeable future) – these are solar radiation, geothermal energy, and air (though access to clean air may not be). The vast majority of resources are however exhaustible, which means they have a finite quantity, and can be depleted if managed improperly. The natural resources are materials, which living

organisms can take from nature for sustaining their life or any components of the natural environment that can be utilized by man to promote his welfare is considered as natural resources

Classification

There are various methods of categorizing natural resources, these include source of origin, stage of development, and by their renewability, these classifications are described below. On the basis of origin, resources may be divided into:

- Biotic – Biotic resources are obtained from the biosphere (living and organic material), such as forests, animals, birds, and fish and the materials that can be obtained from them. Fossil fuels such as coal and petroleum are also included in this category because they are formed from decayed organic matter.
- Abiotic – Abiotic resources are those that come from non-living, non-organic material. Examples of abiotic resources include land, fresh water, airand heavy metals including ores such as gold, iron, copper, silver, etc.

Considering their stage of development, natural resources may be referred to in the following ways:

1. **Potential Resources** – Potential resources are those that exist in a region and may be used in the future. For example, petroleum may exist in many parts of India, having sedimentary rocks but until the time it is actually drilled out and put into use, it remains a potential resource.
2. **Actual Resources** – Actual resources are those that have been surveyed, their quantity and quality determined and are being used in present times. The development of an actual resource, such as wood processing depends upon the technology available and the cost involved.
3. **Reserve Resources** – The part of an actual resource which can be developed profitably in the future is called a reserve resource.
4. **Stock Resources** – Stock resources are those that have been surveyed but cannot be used by organisms due to lack of technology. For example:hydrogen.

Renewability is a very popular topic and many natural resources can be categorized as either renewable or non-renewable:

- Renewable resources are ones that can be replenished naturally. Some of these resources, like sunlight, air, wind, etc., are continuously available and their quantity is not noticeably affected by human consumption. Though many renewable resources do not have such a rapid recovery rate, these resources are susceptible to depletion by over-use. Resources from a human use perspective are classified as renewable only so long as the rate of replenishment/recovery exceeds that of the rate of consumption.
- Non-renewable resources are resources that form extremely slowly and those that do not naturally form in the environment. Minerals are the most common resource included in this category. By the human perspective, resources are non-renewable when their rate of consumption exceeds the rate of replenishment/recovery; a good example of this are fossil fuels, which are in this category because their rate of formation is extremely slow (potentially millions of years), meaning they are considered non-renewable. Some resources actually naturally deplete in amount without human interference, the most notable of these being radio-active elements such as uranium, which naturally decay into heavy metals. Of these, the metallic minerals can be re-used by recycling them, but coal and petroleum cannot be recycled.

FOOD RESOURCES:

means all commodities and products, simple, mixed, or compound, or complements to such commodities or products, that are capable of being ingested by either human beings or animals, irrespective of other uses to which such commodities or products may be put, at all stages of processing from the ...

Food sources
All food has its origin in plants. Some food is obtained directly from plants; but even animals that are used as food sources are raised by feeding them food derived from plants. Cereal grain is a staple food that provides more food energy worldwide than any other type of crop. Maize, wheat, and rice - in all of their varieties - account for 87% of all grain production worldwide.[2] Most of the grain that is produced worldwide is fed to livestock.

Other foods not from animal or plant sources include various edible fungi, especially mushrooms. Fungi and ambient bacteria are used in the preparation of fermented and pickled foods like leavened bread, alcoholic drinks, cheese, pickles, kombucha, and yogurt. Another example is blue-green algae such as Spirulina. Inorganic substances such as baking soda and cream of tartarare also used to chemically alter an ingredient.

There is a need to introduce production efficiency of crops and livestock because

- rapid increase in population
- No major scope of increasing area of land under cultivation.
- Success in efforts to meet food demand increase in food grain production
- Increase in Food Grain production - Green Revolution
- Increase in milk production – White Revolution

Effects of these 'revolutions' on Environment
Excessive use of natural resources thereby disturbing the ecological balance
Solution: Increase in food production without degrading our environment and disturbing the ecological balance i.e**. sustainable practices**

LAND ENVIRONMENT
Soil is an important resource of the lithosphere. All the nutrient elements essential for the web of life in the biosphere are derived from the soil which is component of land resources. Both primary as well as secondary consumers receive their nutrients from plant life. Soil is not only a resource but it is also an environmental medium. Land is a finite resource and therefore it is under heavy stress due to growing population. It has been observed that soil forms due to weathering of layer of Earth's crust, presence of living organisms and, their products of decay. Thus soil has been defined as uncemented aggregate of mineral grains and decayed organic matter with liquid and gas, occupying void spaces between the soil particles. It is a complex physic-biological system.

The total volume of soil contains about 45% solid mineral particles while, organic matter acquires about 5% of the volume. At optimum moisture levels essential for plant growth, the pore space has been considered to be divided roughly in two halves. 25% of the volume is considered to be occupied by water and 25% by air. The proportion of air and water however are subject to rapid fluctuations. Erosion of soil leads to environmental degradation. This has shown an increasing trend to deforestation and hence need urgent attention. Soil acts as filter for groundwater. Uncontrolled runoffs lead to formation of sediments in water bodies due to erosion of soil.

Elements of Land Management
In order to conserve the fertile soils and, to restrict the erosion of soil, land management efforts reserve most important place in the field of environmental management. Such management strategies consider the following basic objectives.

1. Protection of land surface from the impact of raindrops.
2. Increase in the infiltration of rainwater using hydro geological techniques.
3. Decrease in the volume and velocity of overland flow.
4. Reduction in the erodibility of soils.

These objectives can be achieved by soil conservation measures related to (i) crop management and (ii) mechanical protection (iii) conservation devices and practices.

Measures of crop management include:

1. Proper crop selection, as per the characteristics of the soil that may markedly reduce surface exposure to rainfall and bind soil particles together.
2. Sowing of crops in such a manner that no ground surface remains exposed to rainfall of high intensity for a long period.
3. Practice of intercropping and mixed cropping
4. Stubble mulching
5. Maintenance of soils at a high fertility level through supply of organic matter like manure, application of fertilizers and crop rotation.

Mechanical protection devices include:

1. Contour farming
2. Terracing on mountain slopes
3. Control of gully erosion

The above mentioned protection measures can be affected by the construction of series of check dams of Earthen material, plantation of vines, grasses, bushes and trees, and the development of pastures. Plugging off gully heads with stone-filled iron nets, debarring cultivation on land between two gullies, and plant bushes and trees to protect the remaining and from gully erosion may also be implemented.

Land use

Since the population is increasing, per capita land availability is decreasing. Therefore, more and more land is being exploited which will adversely affect the natural resources on the Earth. The common man-made uses of land are human habitat, agriculture, industry, artificial water bodies and facilities like communication systems, roads sports grounds, mining etc. owing to such uses of land which permanently cover the land surface, such land may get converted into wasteland.

Best example of the non-eco friendly activity for land use is mining. Falling of trees and making quarries, collection of non-fertile overburden dumps, subside areas, etc., are the most important damaging effect of the mining activity. These activities directly damage the previous use of the land area and result in long-term adverse impacts on land. Due to changes in land quality, it losses the water absorption capacity and result in loss of water. This culminates in loss of green cover on land resulting in more evaporation further continues, water from the water tables starts reaching the soil surface. This reduces the available water table. Such a process affects the plant life and also leads to erodibility of the soil. The combines effect of loss of soil moisture and erosion results in causing loss of soil particles and soil nutrients. Flow of this soil to water bodies in the runoff causes siltation and eutrophication of surface water bodies.

The impacts on land use pattern due to various activities such as agriculture, urbanization, development of communication systems, construction of dams and hydropower plants, industry and mining are the major factors to be considered in land resources management.

Soil Erosion

Erosion is the process by which soil particles are removed from the ecosystem, usually by wind or flowing water. Soil erosion leads to a decrease in the soil productivity due to a physical loss of the fertile topsoil, reduction in the rooting depth, and removal of plant nutrients and loss of water. Raindrops are reaching the Earth's surface with certain speed. These drops hit the soil surface and create an impact on the soil. The soil surface gets loosened due to this impact. During heavy rains an impact of raindrops loosens particles from the soil cover and moves them from their position in runoff.

These loosened partials from the soil are transported to longer distance, away from its original positions, by turbulent water. These particles get deposited in the riverbeds or in the oceans as silt. Thus the soil eroded and siltation occurs.

Soil erosion is one form of soil degradation along with soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinisation, and soil acidity problems. These other forms of soil degradation, serious in themselves, usually contribute to accelerated soil erosion. Soil erosion is a naturally occurring process on all land. The agents of soil erosion are water and wind, each contributing a significant amount of soil loss each year in Ontario. Soil erosion may be a slow process that continues relatively unnoticed, or it may occur at an alarming rate causing serious loss of topsoil. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks.

Erosivity is defined as the potential ability of process to cause erosion of soils in a certain set of environment conditions. It depends upon the drop size, velocity, distribution angle and direction, intensity, frequency and duration of rain and runoff (supply rate, flow depth, velocity, frequency, magnitude, duration and sediment content). Soil erosion is one form of soil degradation along with soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinisation, and soil acidity problems. These other forms of soil degradation, serious in themselves, usually contribute to accelerated soil erosion.

Importance of Soil to the Biosphere

Soil plays a vital role in determining the quality and composition of the biosphere which develops over it. Soil is an important section of the biosphere as it performs following functions related to maintenance of environmental balance:

i. Soil provides mechanical support to the plant.
ii. Owing to the porosity and water-holding capacity of soil, it serves as a reservoir of water and supplier water to the plants through roots even when the land surface is dry.
iii. The ion-exchange capacity of the soil ensures availability and supply of macro and macronutrients for the growth of plants, animals and microbes. It also helps in preventing excessive leaching of nutrient ions, while maintaining proper pH.
iv. The clay micelles and humus particles of soil (less than 0.002mm tightly adsorbs a number of nutrient loss and supply them evenly to the plants.
v. The biotic component of soil contains organotropic bacteria, nitrifying bacteria, Nitrogen-fixing bacteria, fungi, protozoans, and other microbes which help in decomposition and mineralization of organic matter and regeneration of nutrients.

Erosion by Water

The rate and magnitude of soil erosion by water is controlled by the following factors:

Rainfall Intensity and Runoff

Both rainfall and runoff factors must be considered in assessing a water erosion problem. The impact of raindrops on the soil surface can break down soil aggregates and disperse the aggregate material. Lighter aggregate materials such as very fine sand, silt, clay and organic matter can be easily removed by the raindrop splash and runoff water; greater raindrop energy or runoff amounts might be required to move the larger sand and gravel particles.

Soil Erodibility

Soil erodibility is an estimate of the ability of soils to resist erosion, based on the physical characteristics of each soil. Generally, soils with faster infiltration rates, higher levels of organic matter and improved soil structure have a greater resistance to erosion. Sand, sandy loam and loam textured soils tend to be less erodible than silt, very fine sand, and certain clay textured soils.Past erosion has an

effect on a soils' erodibility for a number of reasons. Many exposed subsurface soils on eroded sites tend to be more erodible than the original soils were, because of their poorer structure and lower organic matter. The lower nutrient levels often associated with subsoils contribute to lower crop yields and generally poorer crop cover, which in turn provides less crop protection for the soil.

Slope Gradient and Length

Naturally, the steeper the slope of a field, the greater the amount of soil loss from erosion by water. Soil erosion by water also increases as the slope length increases due to the greater accumulation of runoff. Consolidation of small fields into larger ones often results in longer slope lengths with increased erosion potential, due to increased velocity of water which permits a greater degree of scouring (carrying capacity for sediment).

Vegetation

Soil erosion potential is increased if the soil has no or very little vegetative cover of plants and/or crop residues. Plant and residue cover protects the soil from raindrop impact and splash, tends to slow down the movement of surface runoff and allows excess surface water to infiltrate.

The erosion-reducing effectiveness of plant and/or residue covers depends on the type, extent and quantity of cover. Vegetation and residue combinations that completely cover the soil, and which intercept all falling raindrops at and close to the surface and the most efficient in controlling soil (e.g. forests, permanent grasses). Partially incorporated residues and residual roots are also important as these provide channels that allow surface water to move into the soil. Soil erosion potential is affected by tillage operations, depending on the depth, direction and timing of plowing, the type of tillage equipment and the number of passes. Generally, the less the disturbance of vegetation or residue cover at or near the surface, the more effective the tillage practice in reducing erosion.

Conservation Measures

Certain conservation measures can reduce soil erosion by both water and wind. Tillage and cropping practices, as well a land management practices, directly affect the overall soil erosion problem and solutions on a farm. When crop rotations or changing tillage practices are not enough to control erosion on a field, a combination of approaches or more extreme measures might be necessary. For example, contour plowing, strip cropping, or terracing may be considered.

Effects

1. Sheet and Rill Erosion

Sheet erosion is soil movement from raindrop splash resulting in the breakdown of soil surface structure and surface runoff; it occurs rather uniformly over the slope and may go unnoticed until most of the productive topsoil has been lost. Rill erosion results when surface runoff concentrates forming small yet well-defined channels . These channels are called rills when they are small enough to not interfere with field machinery operations. The same eroded channels are known as gullies when they become a nuisance factor in normal tillage.

2. Gully Erosion

There are farms in Ontario that are losing large quantities of topsoil and subsoil each year due to fully erosion . Surface runoff, causing gull formation or the enlarging of existing gullies, is usually the result of improper outlet design for local surface and subsurface drainage systems. The soil instability of fully banks, usually associated with seepage of ground water, leads to sloughing and slumping (caving-in) of bank slopes. Such failures usually occur during spring months when the soil water conditions are most conducive to the problem.

3. Stream and Ditch Bank Erosion

Poor construction, or inadequate maintenance, of surface drainage systems, uncontrolled livestock access, and cropping too close to both stream banks has led to bank erosion problems. The direct damages from bank erosion include:

1. The loss of productive farmland.
2. The undermining of structures such as bridges.
3. The washing out of lanes, roads and fence rows.

Poorly constructed tile outlets may also contribute to stream and ditch bank erosion. Some do not function properly because they have no rigid outlet pipe, or have outlet pipes that have been damaged by erosion, machinery, inadequate or no splash pads, and bank cave-ins.

On-Site Effects: The implications of soil erosion extend beyond the removal of valuable topsoil. Crop emergence, growth and yield are directly affected through the loss of natural nutrients and applied fertilizers with the soil. Seeds and plants can be disturbed or completely removed from the eroded site. Organic matter from the soil, residues and any applied manure, is relatively light-weight and can be readily transported off the field, particularly during spring thaw conditions. Pesticides may also be carried off the site with the eroded soil.

Off-Site Effects: Off-site impacts of soil erosion are not always as apparent as the on-site effects. Eroded soil, deposited down slope can inhibit or delay the emergence of seeds, bury small seedling and necessitate replanting in the affected areas. Sediment can be deposited on down slope properties and can contribute to road damage.

Soil conservation: is fundamentally a matter of determining a correct form of land use and management. A correct form of land use and management is one that provides a higher level, or a different form of productivity from that available in the natural state. This new form of productivity must, however, be one that must be capable of being sustained indefinitely.

Soil conservation can be defined as the combination of the appropriate land use and management practices that promotes the productive and sustainable use of soils and, in the process, minimizes soil erosion and other forms of land degradation. Confronted with the problem of land degradation, over the centuries farmers have developed ingenious strategies and systems of land use and management to protect and rehabilitate their lands. Many of these have been very effective and the remains of some of them can still be seen in old terracing systems in several countries.

Methods of Soil Conservation

Soil conservation measures should aim at preventing or at least minimising the soils loss. In order to do this proper land utilisation coupled with agricul tural practices should be adopted.

Broadly categorizing there are two methods of soil conservation. These are biological and mechanical. The biological measures are again divided into Agronomic, Agrostilogical and Dry farming

1. **Agronomic practices:** Normally, the land will possess a vegetational cover so as to prevent erosion
2. **Contour farming:** Crops are cultivated along the contour of the land. The plough marks will be on level and can hold the rain. Even in heavy rain, the runoff is checked by the plants growing along the contour. Tillage: contour tilling will prevent the excess run of water.
3. **Mulching:** Interculturing operations will kill weeds and soil mulches help the plants to be rooted firmly in the soil.
4. **Crop rotations:** Alternatively growing a cereal and a legume in the same field will not only increase the yield, but also increase the fertility of the soil. They also help in checking soil erosion.

5. **Strip cropping:** This is an agricultural practice of growing plants in suitable strips in the field. This is of the following types.
6. **Contour strip cropping:** This is cultivation of soil protecting crops in strips alternating with erosion permitting crops. The strips should be across the slope.
7. **Field strip cropping:** Plants are cultivated in parallel strips across the slopes. Wind strip cropping: Crops are planted across the slopes to prevent soil loss. These may be legumes or grasses.
8. **Dry farming method:** This may be practised where rainfall is low, indefinite and variable. In dry farming methods only crops are grown that can sustain even a very low rain fall. The most important aspects of dry farming are conservation of soil mois ture and fertility.
9. **Mechanical -Measures:** The main aims of mechanical measures are to al low for the absorption of runoff, dividing the slope into short ones and protection against run off. A few of the mechanical measures are discussed below:
10. **Basin listing:** Small basins are formed along the contour with an implement called basin lister. These will hold water for some time.
11. **Sub soiling:** Soil is broken with a sub soiler into fine grains to increase their absorptive capacity.
12. **Contour terracing:** Along the contour, series of ridges or bunds of mud are formed to check the run off. This is of four types. In channel terrace a shallow channel is dug and the mud is deposited along the lower edge of the canal. In broad base ridge terrace a canal is formed on the contour by exavating the mud. The canal is wide. If it is narrow it is called narrow based ridge terrace. In bench terracing a series of platforms are formed along the contour across the general slope of the plant.
13. **Contour trenching:** Several 2 feet by one foot trenches are formed across the slopes at suitable intervals. Tree seedlings are to be planted above the trench.
14. **Terrace outlet:** Outlets are to be constructed for the safe disposal of runoff water.
15. **Gully control:** Suitable water conservation measures are to be taken so as to prevent the formation of gullies.
16. **Ponds:** Construction of small ponds at suitable places to store water is a good practice.
17. **Stream bank protection:** Banks of channels or rivers usually cave in during floods. To prevent this, construction of stone or concrete protective walls should be undertaken. In addition to this, planting some useful tree species will also prevent stream bank erosion.

Unit V
ENVIRONMENT CONSERVATION LAWS

1. **The Water (Prevention and control of pollution) Act 1974 –**
It is deeply felt in 60s only, that the water resources are being polluted and it is an urgent need to assure that domestic and industrial effluents must not be allowed to be discharged in the water resources **without adequate treatment**. The water (Prevention & control of pollution) Act was made in the same context. It received the consent of president of India on March 23, 1974. This act is related with prevention and control of water pollution. It also provides guidelines for maintaining and restoring water reservoirs. The establishment of Pollution Control Board at Central and state level is consequence of this act only. The Board consists of a chairman, secretary and 15 other nominated members. The Board advices central of state governments on issues related with prevention and control of water pollution.

According to section 63 of this act following two rules are made –
1) Water (Prevention and Control of Pollution) Rules, 1975.
2) The Central Board for the prevention and control of water pollution (Procedures for Transaction of Business) Rules 1975.

The act is twice amended is 1978 and 1988.

2. **The Air (Prevention & Control of Pollution) Act 1981 –**
This act is made on the basis of United Nations Conference on Human Environment held at Stock Holm from June 5-16, 1972. The main objectives of the act are –
- To prevent, control & abate air pollution.
- To establish central & state level boards to implement aforesaid purpose to empowerise the boards.
- To provide for conferring on such Boards, the powers and assigning to such Boards function related thereto and such other matters connected therewith.

The functioning and basic rules of this act are similar with the water (prevention & control) act 1974. The PCBs also suggest & advice the central and state governments regarding the air pollution & its prevention & control.

The act came into force on 16th may 1981. The act was once amended in 1987. The rules of this act are –
- The Air (Prevention & Control of Pollution) Rules 1982.
- The Air (Prevention & Control of Pollution) Union Territories Rule 1983.

3. **The Environment Protection Act 1986 –**
This act is a set of comprehensive legislation regulating activities which cause damage to the environment. This act came into force on November 19, 1986.
- Under section 3(1) the act provides sweeping powers to central government to take necessary actions against pollution
- The section 3(2) specifies the major concerns with respect of which the central government may institute necessary actions.
- As per section 6(1) and 6(2) the central government is empowered to make rules.

The rules made under this act may provide for the following concerns in particulars:
- The standards of quality of air, water or soil for various areas and purposes.
- The maximum allowable limits of concentration of various environmental pollutants, including noise, for different areas.

- The procedure and safeguards for the handling of hazardous substances in general and for different areas.
- The prohibition and restriction on the location of industries and carrying on the processes and operations in different areas.

4. Indian Forest Act (1927) –

This act was made in British India. It's major provisions were related with extraction of forest products for the benefit of British rulers.

5. The Wildlife Protection Act 1972 –

This act was signed by president on 9th September 1972 and was amended four times in 1982, 1986, 1991 & 1993.

It empowers central government to –

- Create machinery for wildlife conservation.
- Prohibit killing & hunting of specified animals.
- Protect specific flora & fauna.
- Constitute sanctuaries, national parks and zoo authorities.
- Restrict, regulate or prohibit trade & commerce of wild animals & their products.
- Prevent & detect offences against wild life.
- Frame rules & code of conduct.

Role of Information Technology in Protecting Environment & Health:

Environmental Issues for Human Health –

Environmental is the surrounding in which we all live but these days this environment is being polluted day by day. This is causing grave health problems to the human being Industrialization, use of modern technologies, westernized life style has spoiled the natural balance of the environment. Hence we have to environmental health problems. Here are some major points which deal with the environmental issues and are very necessary in present scenario –

- Saving powers – Wastage of electricity must be checked. The non-conventional energy resources & solar energy could be used.
- Environmental education – Every citizen from his childhood must be aware of the environmental issues.
- Check population – It is the need of the hour because increasing population demands for more energy supply.
- Stop wars & violence – Due to wars & violence, the environmental pollution increases. The danger of use of nuclear weapons also increase which the possibilities of war.
- Less use of vehicles – The urbanization caused a by-product i.e. increasing number of vehicles. These vehicles pollute the environment very badly.
- Deforestation – The plants absorb the environmental pollutants and cause raining. But excessive deforestation caused severe problems.
- Laws & legislations for industries – The industrialization is a consequence of development. But this also causes pollution to every level. Tough rules must be made against the pollution caused by the industry.
- Worldwide efforts – This is the need of the hour that the whole world must came along against pollution and to protect the environment.

7. Stockholm Declaration of human environment, 1972 –

The Stockholm Declaration was adopted by the United Nations conference on Human Environment held at Stockholm in 1972. It was the first declaration of the international protection of the environment. The important principles under this declaration:

(i) 5th June was declared as world environment day.

(ii) Principle 22 states that all the nations will co-operate to develop international laws against pollution & environmental damage
(iii) The natural resources will be protected.
(iv) Principle 8 says that social & economic development is necessary.
(v) The review & evaluation must be done through the earth watch
(vi) The right to live does not mean simply to live, and such right includes to live with healthy and hygienic condition.
(vii) Principles 7 states that the states shall take all precautionary and possible steps to prevent pollution of the seas by substances which are hazardous to human health, harm living resources and marine life, damage amenities interfere with other legitimate uses of the sea.

Rio Declaration –

The International Conference on Environment was held in Rio de Janeiro, capital of Brazil on 3rd June 1992. About 20,000 delegate form 178 nations attended it.

Important points of this declaration are as follows –

- 27 principles were adopted in this declaration.
- It works on the principle of sustainable development without any damage to environment.
- Environmental legislation is necessary.
- Major concerns of the declaration were Global Warming, Deforestation, Ozone layer Depletion.
- It stressed the importance to plan to eradicate the poverty. It also gave the importance to women, youth and indigenous peoples.
- The convention advised that the developed countries should take measures reducing their emission of Carbon dioxide and other green house gases.

Role of health education in environmental issues –

Health education deals with importing knowledge amongst people about the various practices, which will ensure a healthy community life and healthy and wealthy citizens. It creates awareness for health and hygiene. It also gives idea about proper diet. It also make people aware common diseases caused due to the pollutants and their treatment.

The contaminable diseases are caused and spread by the pollutants and changed life style. The international organizations like WHO, UNICEF etc. provide financial help to check such diseases and make people aware of them. Precaution is the only remedy for certain diseases even the governments are also running plans and programmes to check the diseases. Vaccination provides safety from various lethal diseases at the very childhood.

Science and technology activities in India

Science and Technology activities in India can be classified as follows:

(i) Central government
(ii) State Governments
(iii) Higher education sector
(iv) Public and private sector industry, and
(v) Non-Profit institution/association. Such institutions and their research laboratories are the main contributors toy research and development being carried out in the country. There are the council of scientific & Industrial Research (CSIR), Indian Council of Agricultural Research (ICAR), Indian Council of Medical Research (ICMR), besides departmental laboratories of various departments/ministries, viz. Dept. of Defense Research and development (DDRD), Department Ocean Development, department of Electronics, Ministry, of Environment and Forests, Ministry of Non-Conventional Energy Sources, and Ministry of Science and Technology.

Environmental Information System:

An Environmental information system (ENVIS) was set up by the Ministry of Environment and forests in 1982 as a decentralized information network for collection, storage, retrieval and dissemination of environmental information. Besides the Focal Point in the Ministry, ENVIS network presently consists of 25 subjects-oriented centres known as ENVIS Centres, set up in various institutions/organizations of the country in priority areas of environment such as environmentally sound and appropriate technology, bio-degradation of wastes, desertification, eastuary, mangroves, coral and lagoons, media and environment, environmental education solid wastes disposal, animal ecology, Himalayan ecology, etc. the Focal point brings out a quarterly abstracting journal, Paryavaran Abstracts, containing information about environmental research in the Indian Context.

International Cooperation:

The ministry of Environment and forests functions as a nodal agency for United Nations Environment Programme (UNEP), South Asia Cooperation Environment Programme (SACEP), and international Centre for Integrated Mountain and Development (ICIMOD), International Union of conservation of Nature and Natural Resources (IUCN) and various international agencies, regional bodies and multilateral institutions.

India is signatory to the following important international treaties/agreements in the field of environment:

(i) International Convention for the regulation of Whaling
(ii) International Plan Protection Convention
(iii) The Antarctic Treaty
(iv) Convention on Wetlands of International importance
(v) Convention on International trade in Endangered Species of Wild Flora and Fauna
(vi) Protocol of 1978 relating to the international convention for the prevention of pollution from ships
(vii) Vienna Convention for the protection of the Ozone Layer
(viii) Convention on Migratory Species;
(ix) Basal Convention of Trans-boundary movement of hazardous substances;
(x) Framework Convention on Climate Changes
(xi) Convention on Conservation of Bio-diversity
(xii) Montreal Protocol on the Substances on that deplete the ozone layer and
(xiii) International Convention for Combating Desertification