Semester – II

18AEC201 **ENVIRONMENTALSTUDIES** **(4H –4C)**

Instruction Hours / week: L: 4 T: 0P: 0 **Marks:** Internal: **40** External: **60** Total:**100**
End Semester Exam: 3Hours

COURSE OBJECTIVES

- Creating the awareness about environmental problems among people.Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and improvement.

COURSE OUTCOME

1. The study creates awareness among the students to know about various renewable and nonrenewable resources of the region, enables environmentally literate citizens (by knowing the environmental acts, rights, rules, legislation, etc.) to make appropriate judgments and decisions for the protection and improvement of theearth.

Unit I- Ecosystem

Environment Definition, scope and importance, components, Ecosystem Definition, Concept, Scope, importance, Structure and functions of ecosystem.Energy flow, Ecological succession Food chains and food webs.Classification of ecosystem.

Unit II- Natural Resources

Natural Resources - Renewable and Non-renewable Resources: Natural resources and associated problems. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources : Use and over-utilization, exploitation. Role of an individual in conservation of natural resources.Equitable use of resources for sustainable lifestyles.Ill-effects of fireworks.

Unit III- Biodiversity and Its Conservation

Biodiversity and Its Conservation: Introduction, definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels.India as a mega-diversity nation.Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

Unit IV- Environmental Pollution

Environmental Pollution - Definition, Causes, effects and control measures of Air pollution, Water pollution, Soil pollution , Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.Pollution case studies. Disaster management: Foods, earthquake, cyclone and landslides.

Unit V- Social Issues and the Environment

Social Issues and the Environment**:** From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland reclamation.Consumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health.Human rights.Value education.HIV/AIDS.Women and Child Welfare.Role of Information Technology in environment and human health.

SUGGESTED READINGS

1. Singh, M.P., Singh, B.S., and Dey, S.S., (2004). Conservation of Biodiversity and Natural Resources. Daya Publishing House,Delhi.

2. Botkin, D.B., and Keller, E.A., (1995). Environmental Science, John Wiley and Sons, Inc., New York.
3. Uberoi, N.K., (2005). Environmental Studies, Excel Books Publications, New Delhi,India.

4. Tripathy, S.N., and Panda, S., (2004). Fundamentals of Environmental Studies; 2nd Edition, Vrianda Publications Private Ltd., NewDelhi.
5. Kumar, A., (2004). A Textbook of Environmental Science; APH Publishing Corporation, New Delhi.
6. Verma, P.S., Agarwal, V.K., (2001). Environmental Biology (Principles of Ecology); S.Chandand Company Ltd., NewDelhi.
7. Kaushik, A., Kaushik, C.P., (2004). Perspectives in Environmental Studies, New Age International Pvt. Ltd. Publications, NewDelhi.

Ecosystem

An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. These biotic and abiotic components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one-another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present. By breaking down dead organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and other microbes.

Ecosystems are controlled by external and internal factors. External factors such as climate, the parent material which forms the soil and topography, control the overall structure of an ecosystem, but are not themselves influenced by the ecosystem.

Ecosystems are dynamic entities—they are subject to periodic disturbances and are in the process of recovering from some past disturbance. Ecosystems in similar environments that are located in different parts of the world can end up doing things very differently simply because they have different pools of species present. Internal factors not only control ecosystem processes but are also controlled by them and are often subject to feedback loops.

Resource inputs are generally controlled by external processes like climate and parent material. Resource availability within the ecosystem is controlled by internal factors like decomposition, root competition or shading. Although humans operate within ecosystems, their cumulative effects are large enough to influence external factors like climate.

Biodiversity affects ecosystem functioning, as do the processes of disturbance and succession. Ecosystems provide a variety of goods and services upon which people depend.

History

The term ecosystem was first used in 1935 in a publication by British ecologist Arthur Tansley. Tansley devised the concept to draw attention to the importance of transfers of materials between organisms and their environment.[8] He later refined the term, describing it as "The whole system, ... including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment".[9] Tansley regarded ecosystems not simply as

natural units, but as "mental isolates".[9] Tansley later defined the spatial extent of ecosystems using the term ecotope.[10]

G. Evelyn Hutchinson, a limnologist who was a contemporary of Tansley's, combined Charles Elton's ideas about trophic ecology with those of Russian geochemist Vladimir Vernadsky. As a result, he suggested that mineral nutrient availability in a lake limited algal production. This would, in turn, limit the abundance of animals that feed on algae. Raymond Lindeman took these ideas further to suggest that the flow of energy through a lake was the primary driver of the ecosystem. Hutchinson's students, brothers Howard T. Odum and Eugene P. Odum, further developed a "systems approach" to the study of ecosystems. This allowed them to study the flow of energy and material through ecological systems.[8]

Processes

Rainforest ecosystems are rich in biodiversity. This is the Gambia River in Senegal's Niokolo-Koba National Park.

Flora of Baja California Desert, Cataviña region, Mexico

Biomes of the world

Ecosystems are controlled both by external and internal factors. External factors, also called state factors, control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem. The most important of these is climate.[11] Climate determines the biome in which the ecosystem is embedded. Rainfall patterns and seasonal temperatures influence photosynthesis and thereby determine the amount of water and energy available to the ecosystem.[11]

Parent material determines the nature of the soil in an ecosystem, and influences the supply of mineral nutrients. Topography also controls ecosystem processes by affecting things like microclimate, soil development and the movement of water through a system. For example, ecosystems can be quite different if situated in a small depression on the landscape, versus one present on an adjacent steep hillside.[11]

Other external factors that play an important role in ecosystem functioning include time and potential biota. Similarly, the set of organisms that can potentially be present in an area can also significantly affect ecosystems. Ecosystems in similar environments that are located in different

parts of the world can end up doing things very differently simply because they have different pools of species present.[11] The introduction of non-native species can cause substantial shifts in ecosystem function.[12]

Unlike external factors, internal factors in ecosystems not only control ecosystem processes but are also controlled by them. Consequently, they are often subject to feedback loops.[11] While the resource inputs are generally controlled by external processes like climate and parent material, the availability of these resources within the ecosystem is controlled by internal factors like decomposition, root competition or shading.[11] Other factors like disturbance, succession or the types of species present are also internal factors.[citation needed]

Primary production

Global oceanic and terrestrial phototroph abundance, from September 1997 to August 2000. As an estimate of autotroph biomass, it is only a rough indicator of primary production potential and not an actual estimate of it.

Main article: Primary production

Primary production is the production of organic matter from inorganic carbon sources. This mainly occurs through photosynthesis. The energy incorporated through this process supports life on earth, while the carbon makes up much of the organic matter in living and dead biomass, soil carbon and fossil fuels. It also drives the carbon cycle, which influences global climate via the greenhouse effect.

Through the process of photosynthesis, plants capture energy from light and use it to combine carbon dioxide and water to produce carbohydrates and oxygen. The photosynthesis carried out by all the plants in an ecosystem is called the gross primary production (GPP).[13] About half of the GPP is consumed in plant respiration.[14] The remainder, that portion of GPP that is not used up by respiration, is known as the net primary production (NPP).[15] Total photosynthesis is limited by a range of environmental factors. These include the amount of light available, the amount of leaf area a plant has to capture light (shading by other plants is a major limitation of photosynthesis), rate at which carbon dioxide can be supplied to the chloroplasts to support photosynthesis, the availability of water, and the availability of suitable temperatures for carrying out photosynthesis.[13]

Energy flow

Main article: Energy flow (ecology)
See also: Food web and Trophic level
Energy and carbon enter ecosystems through photosynthesis, are incorporated into living tissue, transferred to other organisms that feed on the living and dead plant matter, and eventually released through respiration.[15]

The carbon and energy incorporated into plant tissues (net primary production) is either consumed by animals while the plant is alive, or it remains uneaten when the plant tissue dies and becomes detritus. In terrestrial ecosystems, roughly 90% of the net primary production ends up being broken down by decomposers. The remainder is either consumed by animals while still alive and enters the plant-based trophic system, or it is consumed after it has died, and enters the detritus-based trophic system.[citation needed]

In aquatic systems, the proportion of plant biomass that gets consumed by herbivores is much higher.[16] In trophic systems photosynthetic organisms are the primary producers. The organisms that consume their tissues are called primary consumers or secondary producers—herbivores. Organisms which feed on microbes (bacteria and fungi) are termed microbivores. Animals that feed on primary consumers—carnivores—are secondary consumers. Each of these constitutes a trophic level.[16]

The sequence of consumption—from plant to herbivore, to carnivore—forms a food chain. Real systems are much more complex than this—organisms will generally feed on more than one form of food, and may feed at more than one trophic level. Carnivores may capture some prey which are part of a plant-based trophic system and others that are part of a detritus-based trophic system (a bird that feeds both on herbivorous grasshoppers and earthworms, which consume detritus). Real systems, with all these complexities, form food webs rather than food chains.[16]

Decomposition
See also: Decomposition
The carbon and nutrients in dead organic matter are broken down by a group of processes known as decomposition. This releases nutrients that can then be re-used for plant and microbial production and returns carbon dioxide to the atmosphere (or water) where it can be used for photosynthesis. In the absence of decomposition, the dead organic matter would accumulate in an ecosystem, and nutrients and atmospheric carbon dioxide would be depleted.[17] Approximately 90% of terrestrial net primary production goes directly from plant to decomposer.[16]

Decomposition processes can be separated into three categories—leaching, fragmentation and chemical alteration of dead material. As water moves through dead organic matter, it dissolves and carries with it the water-soluble components. These are then taken up by organisms in the soil, react with mineral soil, or are transported beyond the confines of the ecosystem (and are considered lost to it).[17] Newly shed leaves and newly dead animals have high concentrations of water-soluble components and include sugars, amino acids and mineral nutrients. Leaching is more important in wet environments and much less important in dry ones.[17]

Fragmentation processes break organic material into smaller pieces, exposing new surfaces for colonization by microbes. Freshly shed leaf litter may be inaccessible due to an outer layer of cuticle or bark, and cell contents are protected by a cell wall. Newly dead animals may be covered by an exoskeleton. Fragmentation processes, which break through these protective layers, accelerate the rate of microbial decomposition.[17] Animals fragment detritus as they hunt for food, as does passage through the gut. Freeze-thaw cycles and cycles of wetting and drying also fragment dead material.[17]

The chemical alteration of the dead organic matter is primarily achieved through bacterial and fungal action. Fungal hyphae produce enzymes which can break through the tough outer structures surrounding dead plant material. They also produce enzymes which break down lignin, which allows them access to both cell contents and to the nitrogen in the lignin. Fungi can transfer carbon and nitrogen through their hyphal networks and thus, unlike bacteria, are not dependent solely on locally available resources.[17]

Decomposition rates vary among ecosystems.[18] The rate of decomposition is governed by three sets of factors—the physical environment (temperature, moisture, and soil properties), the quantity and quality of the dead material available to decomposers, and the nature of the microbial community itself.[19] Temperature controls the rate of microbial respiration; the higher the temperature, the faster microbial decomposition occurs. It also affects soil moisture, which slows microbial growth and reduces leaching. Freeze-thaw cycles also affect decomposition—freezing temperatures kill soil microorganisms, which allows leaching to play a more important role in moving nutrients around. This can be especially important as the soil thaws in the spring, creating a pulse of nutrients which become available.[19]

Decomposition rates are low under very wet or very dry conditions. Decomposition rates are highest in wet, moist conditions with adequate levels of oxygen. Wet soils tend to become

deficient in oxygen (this is especially true in wetlands), which slows microbial growth. In dry soils, decomposition slows as well, but bacteria continue to grow (albeit at a slower rate) even after soils become too dry to support plant growth.[19]

Further information: Decomposition § Rate of decomposition

Nutrient cycling

See also: Nutrient cycle, Biogeochemical cycle, and Nitrogen cycle

Biological nitrogen cycling

Ecosystems continually exchange energy and carbon with the wider environment. Mineral nutrients, on the other hand, are mostly cycled back and forth between plants, animals, microbes and the soil. Most nitrogen enters ecosystems through biological nitrogen fixation, is deposited through precipitation, dust, gases or is applied as fertilizer.[20]

Since most terrestrial ecosystems are nitrogen-limited, nitrogen cycling is an important control on ecosystem production.[20]

Until modern times, nitrogen fixation was the major source of nitrogen for ecosystems. Nitrogen-fixing bacteria either live symbiotically with plants or live freely in the soil. The energetic cost is high for plants which support nitrogen-fixing symbionts—as much as 25% of gross primary production when measured in controlled conditions. Many members of the legume plant family support nitrogen-fixing symbionts. Some cyanobacteria are also capable of nitrogen fixation. These are phototrophs, which carry out photosynthesis. Like other nitrogen-fixing bacteria, they can either be free-living or have symbiotic relationships with plants.[20] Other sources of nitrogen include acid deposition produced through the combustion of fossil fuels, ammonia gas which evaporates from agricultural fields which have had fertilizers applied to them, and dust.[20] Anthropogenic nitrogen inputs account for about 80% of all nitrogen fluxes in ecosystems.[20]

When plant tissues are shed or are eaten, the nitrogen in those tissues becomes available to animals and microbes. Microbial decomposition releases nitrogen compounds from dead organic matter in the soil, where plants, fungi, and bacteria compete for it. Some soil bacteria use organic nitrogen-containing compounds as a source of carbon, and release ammonium ions into the soil. This process is known as nitrogen mineralization. Others convert ammonium to nitrite and nitrate ions, a process known as nitrification. Nitric oxide and nitrous oxide are also produced during

nitrification.[20] Under nitrogen-rich and oxygen-poor conditions, nitrates and nitrites are converted to nitrogen gas, a process known as denitrification.[20]

Other important nutrients include phosphorus, sulfur, calcium, potassium, magnesium and manganese.[21][18] Phosphorus enters ecosystems through weathering. As ecosystems age this supply diminishes, making phosphorus-limitation more common in older landscapes (especially in the tropics).[21] Calcium and sulfur are also produced by weathering, but acid deposition is an important source of sulfur in many ecosystems. Although magnesium and manganese are produced by weathering, exchanges between soil organic matter and living cells account for a significant portion of ecosystem fluxes. Potassium is primarily cycled between living cells and soil organic matter.[21]

Function and biodiversity
Main article: Biodiversity
See also: Ecosystem diversity

Loch Lomond in Scotland forms a relatively isolated ecosystem. The fish community of this lake has remained stable over a long period until a number of introductions in the 1970s restructured it's food web.[22]

Spiny forest at Ifaty, Madagascar, featuring various Adansonia (baobab) species, Alluaudia procera (Madagascar ocotillo) and other vegetation.
Biodiversity plays an important role in ecosystem functioning.[23] The reason for this is that ecosystem processes are driven by the number of species in an ecosystem, the exact nature of each individual species, and the relative abundance organisms within these species.[24] Ecosystem processes are broad generalizations that actually take place through the actions of individual organisms. The nature of the organisms—the species, functional groups and trophic levels to which they belong—dictates the sorts of actions these individuals are capable of carrying out and the relative efficiency with which they do so.[citation needed]

Ecological theory suggests that in order to coexist, species must have some level of limiting similarity—they must be different from one another in some fundamental way, otherwise one species would competitively exclude the other.[25] Despite this, the cumulative effect of additional species in an ecosystem is not linear—additional species may enhance nitrogen retention, for example, but beyond some level of species richness, additional species may have little additive effect.[24]

The addition (or loss) of species which are ecologically similar to those already present in an ecosystem tends to only have a small effect on ecosystem function. Ecologically distinct species, on the other hand, have a much larger effect. Similarly, dominant species have a large effect on ecosystem function, while rare species tend to have a small effect. Keystone species tend to have an effect on ecosystem function that is disproportionate to their abundance in an ecosystem.[24] Similarly, an ecosystem engineer is any organism that creates, significantly modifies, maintains or destroys a habitat.[citation needed]

Dynamics

Ecosystems are dynamic entities. They are subject to periodic disturbances and are in the process of recovering from some past disturbance.[26] When a perturbation occurs, an ecosystem responds by moving away from its initial state. The tendency of an ecosystem to remain close to its equilibrium state, despite that disturbance, is termed its resistance. On the other hand, the speed with which it returns to its initial state after disturbance is called its resilience.[26] Time plays a role in the development of soil from bare rock and the recovery of a community from disturbance.[11]

From one year to another, ecosystems experience variation in their biotic and abiotic environments. A drought, an especially cold winter and a pest outbreak all constitute short-term variability in environmental conditions. Animal populations vary from year to year, building up during resource-rich periods and crashing as they overshoot their food supply. These changes play out in changes in net primary production decomposition rates, and other ecosystem processes.[26] Longer-term changes also shape ecosystem processes—the forests of eastern North America still show legacies of cultivation which ceased 200 years ago, while methane production in eastern Siberian lakes is controlled by organic matter which accumulated during the Pleistocene.[26]

Disturbance also plays an important role in ecological processes. F. Stuart Chapin and coauthors define disturbance as "a relatively discrete event in time and space that alters the structure of populations, communities, and ecosystems and causes changes in resources availability or the physical environment".[27] This can range from tree falls and insect outbreaks to hurricanes and wildfires to volcanic eruptions. Such disturbances can cause large changes in plant, animal and microbe populations, as well soil organic matter content.[26] Disturbance is followed by succession, a "directional change in ecosystem structure and functioning resulting from biotically driven changes in resources supply."[27]

The frequency and severity of disturbance determine the way it affects ecosystem function. A major disturbance like a volcanic eruption or glacial advance and retreat leave behind soils that lack plants, animals or organic matter. Ecosystems that experience such disturbances undergo primary succession. A less severe disturbance like forest fires, hurricanes or cultivation result in secondary succession and a faster recovery.[26] More severe disturbance and more frequent disturbance result in longer recovery times.[26]

A freshwater lake in Gran Canaria, an island of the Canary Islands. Clear boundaries make lakes convenient to study using an ecosystem approach.

Ecosystem ecology

Ecosystem ecology studies the processes and dynamics of ecosystems, and the way the flow of matter and energy through them structures natural systems. The study of ecosystems can cover 10 orders of magnitude, from the surface layers of rocks to the surface of the planet.[28]

There is no single definition of what constitutes an ecosystem.[29] German ecologist Ernst-Detlef Schulze and coauthors defined an ecosystem as an area which is "uniform regarding the biological turnover, and contains all the fluxes above and below the ground area under consideration." They explicitly reject Gene Likens' use of entire river catchments as "too wide a demarcation" to be a single ecosystem, given the level of heterogeneity within such an area.[30] Other authors have suggested that an ecosystem can encompass a much larger area, even the whole planet.[31] Schulze and coauthors also rejected the idea that a single rotting log could be studied as an ecosystem because the size of the flows between the log and its surroundings are too large, relative to the proportion cycles within the log.[30] Philosopher of science Mark Sagoff considers the failure to define "the kind of object it studies" to be an obstacle to the development of theory in ecosystem ecology.[29]

Ecosystems can be studied through a variety of approaches—theoretical studies, studies monitoring specific ecosystems over long periods of time, those that look at differences between ecosystems to elucidate how they work and direct manipulative experimentation.[32] Studies can be carried out at a variety of scales, ranging from whole-ecosystem studies to studying microcosms or mesocosms (simplified representations of ecosystems).[33] American ecologist Stephen R. Carpenter has argued that microcosm experiments can be "irrelevant and diversionary" if they are not carried out in conjunction with field studies done at the ecosystem scale. Microcosm experiments often fail to accurately predict ecosystem-level dynamics.[34]

The Hubbard Brook Ecosystem Study started in 1963 to study the White Mountains in New Hampshire. It was the first successful attempt to study an entire watershed as an ecosystem. The study used stream chemistry as a means of monitoring ecosystem properties, and developed a detailed biogeochemical model of the ecosystem.[35] Long-term research at the site led to the discovery of acid rain in North America in 1972. Researchers documented the depletion of soil cations (especially calcium) over the next several decades.[36]

Human activities

Human activities are important in almost all ecosystems. Although humans exist and operate within ecosystems, their cumulative effects are large enough to influence external factors like climate.[11]

Ecosystem goods and services

The High Peaks Wilderness Area in the 6,000,000-acre (2,400,000 ha) Adirondack Park is an example of a diverse ecosystem.

Main articles: Ecosystem services and Ecological goods and services

See also: Ecosystem valuation and Ecological yield

Ecosystems provide a variety of goods and services upon which people depend.[37] Ecosystem goods include the "tangible, material products" of ecosystem processes such as food, construction material, medicinal plants.[38] They also include less tangible items like tourism and recreation, and genes from wild plants and animals that can be used to improve domestic species.[37]

Ecosystem services, on the other hand, are generally "improvements in the condition or location of things of value".[38] These include things like the maintenance of hydrological cycles, cleaning air and water, the maintenance of oxygen in the atmosphere, crop pollination and even things like beauty, inspiration and opportunities for research.[37] While ecosystem goods have traditionally been recognized as being the basis for things of economic value, ecosystem services tend to be taken for granted.[38]

Ecosystem management

Main article: Ecosystem management

When natural resource management is applied to whole ecosystems, rather than single species, it is termed ecosystem management.[39] Although definitions of ecosystem management abound,

there is a common set of principles which underlie these definitions.[40] A fundamental principle is the long-term sustainability of the production of goods and services by the ecosystem;[40] "intergenerational sustainability [is] a precondition for management, not an afterthought".[37]

While ecosystem management can be used as part of a plan for wilderness conservation, it can also be used in intensively managed ecosystems[37] (see, for example, agroecosystem and close to nature forestry).

Threats caused by humans

As human population and per capita consumption grow, so do the resource demands imposed on ecosystems and the effects of the human ecological footprint. Natural resources are vulnerable and limited. The environmental impacts of anthropogenic actions are becoming more apparent. Problems for all ecosystems include: environmental pollution, climate change and biodiversity loss. For terrestrial ecosystems further threats include air pollution, soil degradation, and deforestation. For aquatic ecosystems threats include also unsustainable exploitation of marine resources (for example overfishing of certain species), marine pollution, microplastics pollution, water pollution, and building on coastal areas.[41]

Society is increasingly becoming aware that ecosystem services are not only limited but also that they are threatened by human activities. The need to better consider long-term ecosystem health and its role in enabling human habitation and economic activity is urgent. To help inform decision-makers, many ecosystem services are being assigned economic values, often based on the cost of replacement with anthropogenic alternatives. The ongoing challenge of prescribing economic value to nature, for example through biodiversity banking, is prompting transdisciplinary shifts in how we recognize and manage the environment, social responsibility, business opportunities, and our future as a species.

Food Chain and Food Web

Food chain is a linear sequence of organisms which starts from producer organisms and ends with decomposer species. Food web is a connection of multiple food chains. Food chain follows a single path whereas food web follows multiple paths. From the food chain, we get to know how organisms are connected with each other. Food chain and food web form an integral part of this ecosystem. Let us take a look at the food chain and a food web and the difference between them.

Food Chain

In scientific terms, a food chain is a chronological pathway or an order that shows the flow of energy from one organism to the other. In a community which has producers, consumers, and

decomposers, the energy flows in a specific pathway. Energy is not created or destroyed. But it flows from one level to the other, through different organisms.

A food chain shows a single pathway from the producers to the consumers and how the energy flows in this pathway. In the animal kingdom, food travels around different levels. To understand a food chain better, let us take a look at the terrestrial ecosystem.

Food chain in a Terrestrial Ecosystem

The sun is the source of energy, which is the initial energy source. This is used by the producers or plants to create their own food, through photosynthesis and grow. Next up, in this chain is another organism, which is the consumer that eats this food, taking in the energy.

The primary consumers are the organisms that consume the primary producers. In a terrestrial ecosystem, it could be a herbivore like a cow or a goat or it could even be a man. When a goat is consumed by man, he becomes the secondary consumer.

As the energy goes one level up, the food chain also moves up. Each level in the food chain is called a trophic level. The different trophic levels are Primary producers, primary consumers, secondary consumers, tertiary consumers and quaternary consumers.

Example of food chain

Grass (Producer) ——Goat (Primary Consumer) —— Man (Secondary consumer)

When dead organic matter becomes the starting of a food chain, then it is called the *detritus food chain* (DFC). The decomposers, which are the fungi and bacteria, feed on the organic matter to meet the energy requirements. The digestive enzymes secreted by the decomposers help in the breakdown of the organic matter into inorganic materials.

Food Web

Many interconnected food chains make up a food web. When you look at the larger picture, a food web shows a realistic representation of the energy flow through different organisms in an ecosystem.

Sometimes, a single organism gets eaten by many predators or it eats many other organisms. This is when a food chain doesn't represent the energy flow in a proper manner because there are many trophic levels that interconnect. This is where a food web comes into place. It shows the interactions between different organisms in an ecosystem.

The following diagram shows the energy flow between various organisms through a food web.

	UNIT - I	Option A	Option B	Option C	Option D	Answers
1	Which country has the maximum number of tube-wells in the world ?	America	Australia	China	India	India
2	Which of the following is not an air pollutant ?	Smoke	Carbon Dioxide	Nitrogen Gas	Sulphur Dioxide	Nitrogen Gas
3	Which part of plant evaporates water ?	Stomata	Fruit	Branch	Root	Stomata
4	Which energy is converted into electrical energy by a solar cell ?	Chemical Energy	Nuclear Energy	Solar Energy	Magnetic Energy	Solar Energy
5	Carrier of Dengue disease is	Aedes Mosquito	Culex Mosquito	Housefly	Anopheles Mosquito	Aedes Mosquito
6	Wildlife Week is celebrated on	1st October to 7th October	15th October to 2 1st October	1st June to 7th June	15th June to 21st June	1st October to 7th October
7	In which state of matter, the distance between the molecules is minimum ?	Solid	Liquid	Gas	Plasma	Solid
8	Maximum amount of gas found in air is	Oxygen	Carbon Dioxide	Hydrogen	Nitrogen	Nitrogen
9	Which state of India is known as 'Tiger State'?	Gujarat	West Bengal	Madhya Pradesh	Assam	Madhya Pradesh
10	Habitat of Dog Fish is	River	Pond	Lake	Sea	Sea
11	Which of the following has maximum speed ?	Air	Water Current	Sound	Light	Light
12	Tobacco addiction is caused due to	Cocaine	Caffeine	Nicotine	Histamine	Nicotine
13	Ozone layer is found in	Thermosphere	Stratosphere	Troposphere	Mesosphere	Stratosphere
14	Full form of CNG is	Common National Gas	Compressed Natural Gas	Common Natural Gas	Cirtified Natural Gas	Compressed Natural Gas
15	Renewable source of energy is	Coal	Petroleum	Plants	Uranium	Plants
16	Sugar is form of _____	Protein	Carbohydrate	Fat	Water	Carbohydrate
17	The mosquito repellent (coils, mats and liquids) that we generally use in our homes are:	Pesticides	Fertilizers	Sedatives	Insecticides	Insecticides
18	Which of the following plays an important	Evaporation	Condensation	Both	Filtration	Both

	role in the cause of rainfall			evaporation & condensation		evaporation & condensation
19	The process of solid changing into liquid upon the supply of heat is called:	Condensation	Evaporation	Melting	Boiling	Melting
20	During summer the earth is	Closer to the sun	Away from the sun	Closer to the moon	Away from the moon	Closer to the sun
21	During breathing which gas is most required by us?	Hydrogen	Oxygen	Carbondioxide	Nitrogen	Oxygen
22	Paper is mainly made up of:	Cellulose & starch	Polythene & cotton	Bamboo & grass	Sunflower & Maize	Bamboo & grass
23	Which one is non luminous	Moon	Sun	Star	Comet	Moon
24	When some sugar is dissolved in a glass of water, the water level:	Increases	Decreases	Remains the same	None of the above	Remains the same
25	Non-green plants like mushroom can't make their own food because:	They are too small	They lack chlorophyll	They lack photo-tropism	They lack roots to suck water	They lack chlorophyll
26	The nature of relationship between condensation & evaporation is:	They are the same	They are opposite	They are similar but not in all respects	None of the above	They are opposite
27	In which one of the following sound travels fast	Solid	Air	Water	Vacuum	Solid
28	What type of radiation is trapped on the earth's surface by the green house effect?	UV rays	? -rays	X-rays	IR rays	UV rays
29	Ame of extremely effective firs extinguishing agent is	helium	halons	halogens	argon	halons
30	Gas molecules that absorb thermal infrared radiation and are present in large quantity to change climate system are known as	alpha radiations	beta radiations	ozone gases	greenhouse gases	greenhouse gases
31	Chemical substance used in industry for cold cleaning, adhesives and vapor degreasing is	methyl chloroform	carbon tetrachloride	halons	hydrocarbons	methyl chloroform
32	Layer of atmosphere in which Ozone layer	Exosphere	Mesosphere	Troposphere	Stratosphere	Stratosphere

	lies is					
33	Greenhouse gases which is present in very high quantity is	Propane	Ethane	Carbon dioxide	Methane	Carbon dioxide
34	Exchange of outgoing and incoming radiations that keep Earth warm is known as	Greenhouse effect	Radiation effect	Infrared effect	Ozone layer depletion	Greenhouse effect
35	Wavelength of infrared radiations is	Zero	Finite	Shorter	Longer	Longer
36	Montreal protocol to reduce production of chlorofluorocarbons was assigned in	1977	1992	1987	1982	1987
37	Number of atoms in ozone molecules are	2	3	4	1	3
38	Layer which saves life from harmful effects of UV radiations is known as	Ozone layer	Alpha layer	Gamma layer	Infrared layer	Ozone layer
39	Higher energy level and shorter wavelengths are features of	Beta radiation	Alpha radiation	Ultraviolet radiation	Infrared radiation	Ultraviolet radiation
40	Chemical released by chlorofluorocarbons that causes depletion of ozone layer in atmosphere is	Nitrogen	Sulphuric aci	Chlorine	Sodium chloride	Chlorine
41	Methyl chloroform, carbon tetrachloride, hydro fluorocarbons and chlorofluorocarbons are mainly known as	Mesosphere building substances	Troposphere building substances	Ozone building substances	Ozone depleting substances	Ozone depleting substances
42	When chlorofluorocarbons are released in atmosphere, chlorine chemical destroys the	Beta molecules	Helium molecules	Argon molecules	Ozone molecules	Ozone molecules
43	Color of ozone molecule is	Blue	White	Pale yellow	Pale green	Blue
44	Wavelength of ultraviolet radiations is	Shorter	Longer	Zero	Finite	Shorter
45	Lower energy level and longer wavelengths are features of	Ultraviolet radiation	Infrared radiation	Beta radiation	Alpha radiation	Infrared radiation
46	Most serious group of chemicals emitted in British Columbia that causes depletion of ozone layer are	Noble gases	Halons	Halogens	Helium	Halons
47	Height of ozone above surface of Earth is	30 to 50 km	10 to 20 km	15 to 30 km	50 to 70 km	15 to 30 km
48	Name of protocol signed to reduce	UVB protocol	Montreal	UVA protocol	UVR protocol	Montreal

	production of chlorofluorocarbons is		Protocol			Protocol
49	One which is not considered as naturally occurring greenhouse gas is	Carbon dioxide	Methane	Nitrous oxide	Ethane	Ethane
50	Burning of fossil fuels	Decrease greenhouse gases	Increases greenhouse gases	Increased level of oxygen	Increased level of ethane	Increases greenhouse gases
51	Annual ozone hole is located on continent	Antarcti	South Ameri	North Ameri	Afri	Antarcti
52	Chemical group Halons are emitted in	Montreal	Icelan	British Columbi	Greenland	British Columbi
53	How much of the net irrigated well irrigation?	20%	60% (	45%	30%	30%
54	When an ant bites a person, which irritating chemical it (ant) injects into his (person) body?	Acetic acid	Citric acid	Tartaric acid	Formic acid	Formic acid
55	The soil of India's eastern and western coast is–	Alluvial	Black cotton	Red rocky	Laterite	Laterite
56	Nitrous oxide (commonly called laughing gas) has been a matter of concern to environmentalist recently because–	it is thought to cause cancer at low concentration	it produce photochemical smog	it is a green house gas	None of the above	it is a green house gas
57	Which one of the following is not a Biosphere Reserve?	Agasthy amalai	Nallambalai	Nilgiri	Panchmarhi	Nallambalai
58	The most harmful environmental pollution from nuclear reactor is–	radioactivity	particulate formation	thermal pollution	(noise pollution	thermal pollution
59	What unit of solar energy does the earth intercept?	2,200 millionth	2,000 millionth	2,100 millionth	2,300 millionth	2,000 millionth
60	Which of the following is used as a moderator in nuclear reactor?	Thorium	Graphite	Radium	Ordinary water	Graphite
61	Which of the following is not a primary pollutant?	SO2	Volcanic ash	O3	CO2	O3

Natural Resources

Natural resources are resources that exist without actions of humankind. This includes all valued characteristics such as magnetic, gravitational, electrical properties and forces etc. On earth it includes: sunlight, atmosphere, water, land(includes all minerals) along with all vegetation, crops and animal life that naturally subsists upon or within the heretofore identified characteristics and substances.[1][2][3][4]

Particular areas such as the rainforest in Fatu-Hiva are often characterized by the biodiversity and geodiversity existent in their ecosystems. 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, air, and as well as a living organism such as a fish, or it may exist in an alternate form that must be processed to obtain the resource such as metal ores, rare earth metals, petroleum, and most forms of energy.

There is much debate worldwide over natural resource allocations, this is particularly true during periods of increasing scarcity and shortages (depletion and overconsumption of resources).

Natural resources are resources that are not man made. They are materials or substances occurring in nature which can be exploited for economic gain.

Classification

There are various methods of categorizing natural resources, these include source of origin, stage of development, and by their renewability.

On the basis of origin, natural resources may be divided into two types:

- *Biotic* — Biotic resources are obtained from the biosphere (living and organic material), such as forests and animals, 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, air, rare earth metals and 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:

- *Potential resources* — Potential resources are those that may be used in the future—for example, petroleum in sedimentary rocks that, until drilled out and put to use remains a *potential* resource

- *Actual resources* — Those resources that have been surveyed, quantified and qualified and, are currently used—development, such as wood processing, depends on technology and cost
- *Reserve resources* — The part of an actual resource that can be developed profitably in the future
- *Stock resources* — Those that have been surveyed, but cannot be used due to lack of technology—for example, hydrogen

Many natural resources can be categorized as either renewable or non-renewable:

- *Renewable resources* — Renewable resources can be replenished naturally. Some of these resources, like sunlight, air, wind, water, 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 so long as the rate of replenishment/recovery exceeds that of the rate of consumption. They replenish easily compared to Non-renewable resources.
- *Non-renewable resources* – Non-renewable resources either form slowly or 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,[5] but coal and petroleum cannot be recycled.[6] Once they are completely used they take millions of years to replenish.

Extraction

Resource extraction involves any activity that withdraws resources from nature. This can range in scale from the traditional use of preindustrial societies, to global industry. Extractive industries are, along with agriculture, the basis of the primary sectorof the economy. Extraction produces raw material, which is then processed to add value. Examples of extractive industries are hunting, trapping, mining, oil and gas drilling, and forestry. Natural resources can add substantial amounts to a country's wealth,[7] however, a sudden inflow of money caused by a resource boom can create social problems including inflation harming other industries ("Dutch disease") and corruption, leading to inequality and underdevelopment, this is known as the "resource curse".

Extractive industries represent a large growing activity in many less-developed countries but the wealth generated does not always lead to sustainable and inclusive growth. People often accuse extractive industry businesses as acting only to maximize short-term value, implying that less-developed countries are vulnerable to powerful corporations. Alternatively, host governments are often assumed to be only maximizing immediate revenue. Researchers argue there are areas of common interest where development goals and business cross. These present opportunities for international governmental agencies to engage with the private sector and host governments through revenue management and expenditure accountability, infrastructure development, employment creation, skills and enterprise development and impacts on children, especially girls and women.[8] A strong civil society can play an important role in ensuring effective management of natural resources. Norway can serve as a role model in this regard as it has good institutions and open and dynamic public debate with strong civil society actors that provide an effective checks and balances system for government's management of extractive industries.

Depletion of resources

In recent years, the depletion of natural resources has become a major focus of governments and organizations such as the United Nations (UN). This is evident in the UN's Agenda 21 Section Two, which outlines the necessary steps for countries to take to sustain their natural resources.[10] The depletion of natural resources is considered a sustainable developmentissue.[11] The term sustainable development has many interpretations, most notably the Brundtland Commission's 'to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs',[12] however in broad terms it is balancing the needs of the planet's people and species now and in the future.[10] In regards to natural resources, depletion is of concern for sustainable development as it has the ability to degrade current environments[13] and potential to impact the needs of future generations Depletion of natural resources is associated with social inequity. Considering most biodiversity are located in developing countries,[15] depletion of this resource could result in losses of ecosystem services for these countries.[16] Some view this depletion as a major source of social unrest and conflicts in developing nations.[17]

At present, there is particular concern for rainforest regions that hold most of the Earth's biodiversity.[18] According to Nelson[19] deforestation and degradation affect 8.5% of the world's forests with 30% of the Earth's surface already cropped. If we consider that 80% of people rely on medicines obtained from plants and ¾ of the world's prescription medicines have ingredients taken from plants,[16] loss of the world's rainforests could result in a loss of finding more potential life saving medicines.[20]

The depletion of natural resources is caused by 'direct drivers of change'[19] such as Mining, petroleum extraction, fishing and forestry as well as 'indirect drivers of change' such as demography (e.g. population growth), economy, society, politics and technology.[19] The current practice of Agriculture is another factor causing depletion of natural resources. For example, the depletion of nutrients in the soil due to excessive use of nitrogen[19] and desertification.[10] The depletion of natural resources is a continuing concern for society. This is seen in the cited quote given by Theodore Roosevelt, a well-known conservationist and former United States president, who was opposed to unregulated natural resource extraction.

Protection

In 1982, the UN developed the World Charter for Nature, which recognized the need to protect nature from further depletion due to human activity. It states that measures must be taken at all societal levels, from international to individual, to protect nature. It outlines the need for sustainable use of natural resources and suggests that the protection of resources should be incorporated into national and international systems of law.[21] To look at the importance of protecting natural resources further, the World Ethic of Sustainability, developed by the IUCN, WWF and the UNEP in 1990,[22] set out eight values for sustainability, including the need to protect natural resources from depletion. Since the development of these documents, many measures have been taken to protect natural resources including establishment of the scientific field and practice of conservation biology and habitat conservation, respectively.

Conservation biology is the scientific study of the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction.[23][24] It is an interdisciplinary subject drawing on science, economics and the practice of natural resource management.[25][26][27][28] The term conservation biology was introduced as the title of a conference held at the University of California, San Diego, in La Jolla, California, in 1978, organized by biologists Bruce A. Wilcox and Michael E. Soulé.

Habitat conservation is a land management practice that seeks to conserve, protect and restore, habitat areas for wild plants and animals, especially conservation reliant species, and prevent their extinction, fragmentation or reduction in range.

Management

Natural resource management is a discipline in the management of natural resources such as land, water, soil, plants, and animals—with a particular focus on how management

affects quality of life for present and future generations. Hence, sustainable development is followed according to judicial use of resources to supply both the present generation and future generations.

Management of natural resources involves identifying who has the right to use the resources and who does not for defining the boundaries of the resource.[30] The resources are managed by the users according to the rules governing of when and how the resource is used depending on local condition.[31]

A "...successful management of natural resources depends on freedom of speech, a dynamic and wide-ranging public debate through multiple independent media channels and an active civil society engaged in natural resource issues...",[32] because of the nature of the shared resources the individuals who are affected by the rules can participate in setting or changing them.[30]The users have rights to devise their own management institutions and plans under the recognition by the government. The right to resources includes land, water, fisheries and pastoral rights.[31] The users or parties accountable to the users have to actively monitor and ensure the utilisation of the resource compliance with the rules and to impose penalty on those peoples who violates the rules.[30] These conflicts are resolved in a quick and low cost manner by the local institution according to the seriousness and context of the offence.[31] The global science-based platform to discuss natural resources management is the World Resources Forum, based in Switzerland.

	UNIT - II	Option A	Option B	Option C	Option D	Answers
1	Plants get their nitrogen from–	rain	the soil	the air	the bedrock	the soil
2	The lowest temperature of air is recorded at–	midnight		just after sunset	2 m	just before sunrise
3	Radioactivity is measured by–	Geiger-Muller counter	Polarimeter	Calorimeter	Colorimeter	Geiger-Muller counter
4	Gandhi Sagar Dam is a part of which one of the following?	Chambal Project	Kosi Project	Damodar Valley Project	Bhakra Nangal Project	Damodar Valley Project
5	Pollination by wind is called–	Autogamy	Entomophily	Anemophily	Ornithophily	Anemophily
6	Which state has the largest area under tank irrigation?	Tamil Nadu	Odisha	West Bengal	Karnataka	Tamil Nadu
7	Amongst the following Indian States which one has the minimum total forest cover?	Sikkim	Goa	Haryana	Kerala	Haryana
8	Of the total water on the Earth, fresh water reserves constitue approximately–	70%	27.00%	10%	89.00%	27.00%
9	Which state has the largest proportion of net irrigated area under canal irrigation?	Punjab	Uttar Pradesh	Maharashtra	Jammu and Kashmir	Jammu and Kashmir
10	Which of the following statement about Fjord is incorrect?	Most Fjords were formed due to raise in sea level after the melting of Pleistocene ice	It is an emergent coast that was originally submerged	It is a long narrow inlet of the sea bound by steep slopes	It is a glaciated valley that has been inundated by the sea	It is a glaciated valley that has been inundated by the sea
11	Residence time of water molecule in the ocean is:	35 years	35 million years	35 years	35000 years	35 years
12	Hyperplasia means	excessive motility of a muscle	Voracious eating	Abnormal increase in number of cells	An increase in size of a cell	Abnormal increase in number of cells
13	Carbon dioxide absorbs radiation in the range:	55 and 7 microns	Greater than 27 microns	8 to 13 microns	01 to 30 microns	55 and 7 microns
14	Sodium is usually estimated by which of the following analytical technique:	Flame Photometry	Coulometry	High pressure liquid chromotography	Visible spectrophotometry	Flame Photometry

15	Which combination of the following elements constitutes a major portion of earth crust:	Oxygen and Silicon	Oxygen and Iron	Silicon and Iron	Aluminium and Iron	Oxygen and Silicon
16	Assertion (: Chlorofluorocarbons deplete ozone Reason (R): These compounds contain Chlorine, Bromine and Fluorine	Both (and (R) are true and (R) is the correct explanation of (	Both (and (R) are true but (R) is not the correct explanation of (	(is true but (R) is false	(is false but (R) is true	(is true but (R) is false
17	Maximum Density of water is at:	4°C	0°C	100°C	272°C	4°C
18	The cause of lung cancer Mesothalemia is:	Asbestos	Arsenic	Mercury	Chromium	Arsenic
19	Which of the following pattern of evolution accounts for all the diversity present on earth today?	Microevolution	Megaevolution	Biodiversity	Speciation	Biodiversity
20	Group of individuals of the same species that share common attributes are called:	Community	Population	Ecotype	Society	Ecotype
21	Which one of the following is the correct food chain?	Algae -> Daphnia -> Dragon Fly Nymph -» Newt -» Grass Snake	Daphnia -» Dragon Fly Nymph -> Newt -» Algae -> Grass Snake	Grass Snake -> Newt -» Dragon Fly Nymph Daphnia Algae	Newt -» Grass Snake -» Dragon Fly Nymph -» Algae -> Daphnia	Algae -> Daphnia -> Dragon Fly Nymph -» Newt -» Grass Snake
22	Assertion (: Monsoonal rainfall is very high both on the west coast and northeast Indi Reason (R): The duration of monsoon over west coast and northeast India is longer than other parts of Indi	Both (and (R) are true and (R) is the correct explanation of (	Both (and (R) are true but (R) is not the correct explanation of (	(is true but (R) is false	(is false but (R) is true	Both (and (R) are true but (R) is not the correct explanation of (
23	Which one of the following statements regarding El-NINO is NOT true?	It is an extension of equatorial current towards the western coast of South Ameri	It is an occasional warm current leading to an increase of about 10°C in subsurface water temperature	It develops as temporary replacement of usual cold Peruvian Current	It causes an increase in plankton thriving in cold Peruvian current	It is an extension of equatorial current towards the western coast of South Ameri
24	The process of alluviation indicates	Removal of particles from the upper layer of soil	Removal of particles from lower layer of soil	Deposition of soil particles in sub-soil layer	Transportation of soil particles in the B-horizon	Deposition of soil particles in sub-soil layer

25	Which one of the following is the cleanest source of energy?	Hydropower	Fossil fuel	Nuclear power	Wind energy	Wind energy
26	The global warming efficiency of a CFC molecule in relation to a CO-, molecule is higher by a factor of:	125	25	20,000	1500	125
27	Arsenic problem in India is primarily due to:	Overexploitation of arsenopyrite in the hinterland	Overexploitation of coal in Bihar and Bengal	Overexploitation of ground water in the affected areas	Overexploitation of surface water in the affected areas	Overexploitation of ground water in the affected areas
28	Acid rain is caused by	CO and CO2 ,	SO 2 ,and 0 2	S0 2 and NO" 2	NO 2 and O 2	S0 2 and NO" 2
29	What will be the outcome of Eutrophication of surface waters?	Overproduction of biomass	Decrease in nitrogen concentration	Decrease in phosphorus concentration	Decrease in both nitrogen and phosphorus concentrations	Overproduction of biomass
30	Assertion (: Negatively charged soil particles attract positive ions like Ca++ and Mg ++ Reason (R): The attraction keeps the ions at soil level for ready availability	Both (and (R) are true and (R) is the correct explanation of (	Both (and (R) are true but (R) is not the correct explanation of (	(is true but (R) is false	(is false but (R) is true	Both (and (R) are true and (R) is the correct explanation of (
31	Cost Benefit analysis is required in case of proposals involving clearance of forest land:	Greater than 1Oha but less than 20ha	Greater than 20ha	Greater than 5ha but less than 1Oha	Greater than 40ha only	Greater than 1Oha but less than 20ha
32	Ecologically sensitive and important areas, breeding and spawning grounds of marine life et, are categorized in coastal Regulation Zone as:	CRZ - IV	CRZ - II	CRZ-III	CRZ-I	CRZ-I
33	A management tool comprising a systematic, periodic and objective evaluation of how well an environmental organization, management and equipment are performing is known as:	Raw material balance	Input - output analysis	Acturities at site	Environmental audit	Environmental audit
34	The least preferred technique in the disposal of municipal solid waste is	incineration	composting	land filling	Bricketting	Bricketting

35	Bacterial decomposition of biological material under aerobic condition is	Fermentation	Fertilization	Contamination	Composting	Fermentation
36	When you go for shopping, what are you expected to do to save environment?	Shop for products that have as little packaging as possible	In any store, use a bag even it is not neede	Do not reduce the frequency of shopping	Buy paper towels and napkins	Shop for products that have as little packaging as possible
37	In the analysis of 15 water samples, Ca and Mg gave a correlation of +095 It means:	Ca came from soil and Mg came from biota	Ca and Mg both came from the same type of water	Ca and Mg are both cogenetic	Ca and Mg came from different sources	Ca and Mg came from different sources
38	If a piece of metal weighs 102g in air, 86g in water and 78g in another liquid, then what will be the specific gravity of the liquid?	1	15	2	3	2
39	Climatic stress is caused by insufficient and/or excessive regime of	Temperature	Humidity	Solar radiation	All the above	All the above
40	The chemical that is used to ripen mangoes is	Calcium sulphide	Calcium carbide	Calcium carbonate	Calcium chloride	Calcium carbide
41	Organisms that generate energy using light are	oligotrophs	chaemorganotrophs	chaemolithotrophs	photoautotrophs	photoautotrophs
42	Land use pattern is usually studied by the following technique	Aerial photography	Satellite imaging	Satellite imaging and G I S	Satellite imaging, G I S and G P S	Satellite imaging
43	To conserve coral reefs the Govt, of India declared one of the following as Marine Park	Gulf of Kutch	Lakshadweep islands	Gulf of Mannar	Andaman Islands	Lakshadweep islands
44	Which one of the following does not contribute to conservation of water?	Waste water treatment	Waste land development	Water shed protection	Rain water harvesting	Waste land development
45	Particle size in soil can be classified as clay: 1-4 micron Silt: 4-62 micron Sand: 62-1000 micron; Boulder: >1000 micron It is hence correct to suggest that in nature particle size distribution follows	Binomial distribution	Lognormal distribution	Linear distribution	Normal distribution	Normal distribution

46	The phenomenon of occurrence of additional species found in the ecotone or transitional zone between adjoining ecosystems is known as ----------	Edge effect	Root effect	Raman effect		Edge effect
47	The complex network of interconnected food chains is called ----------	Trophic level	Food web	Ecological pyramid		Food web
48	Each organism in an ecosystem is at a specific feeding stage called as the ----	Climax level	Producer level	Trophic level		Trophic level
49	The area to which a species is biologically adapted to live is known as----------	Niche Habitat Succession	Habitat	Succession		Habitat
50	Official date of Earth Day is on ----------	April 22	March 21	May 22		April 22
51	All forms of water that comes down on Earth, including rain, show, hail et is known as----------	Calcification	Fixation	Precipitation		Precipitation
52	The forests in the Arctic are called ----------	Savanna	Tundra	Prairies		Tundra
53	The ocean cover ---------- percentage of Earth's surface	51%	61%	71 %		71 %
54	The salt-tolerant trees growing in shallow marine sediment or estuaries known as ----------	Mangroves	Xerophytes	Epiphytes		Mangroves
55	The largest brackish water lake situated in Asia is in Oriss Which is the lake ?	Chilka lake	Vembanad lake	Woolar lake		Chilka lake
56	Ramsar Convention refers to the conservation of ----------	Deserts	Wetlands	Agriculture lands		Wetlands
57	The World Wetlands Day is celebrated on ----------	February 02	February 28	June 05		February 02
58	National Maritime Day of India is celebrated on ----------	October 16	April 05	March 21		April 05
59	The animal which consumes decaying organic matter is ----------	Carnivore	Detrivore	Herbivore		Detrivore

60	Ganga Action Plan in India was launched in the year ----------	1988	1985	1980		1985
61	What is the name of the action plan for sustainable development in the twenty first century framed in the Rio Declaration on Environment & Development (1992) ?	Action 21	Agenda 21	Rio 21		Agenda 21

Biodiversity and Conservation Methods

The term biodiversity was coined as a contraction of biological diversity by E.O. Wilson in 1985. Biodiversity may be defined as the variety and variability of living organisms and the ecological complexes in which they exist. In other words, biodiversity is the occurrence of different types of ecosystems, different species of organisms with the whole range of their variants and genes adapted to different climates, environments along with their interactions and processes.

Biodiversity includes the genetic variability (for which different varieties of spices have appeared in the course of evolution) and diversity of life forms such as plants, animal microbes, etc. living in a wide range of ecosystems.

Contents:

1. Types of Biodiversity
2. Biodiversity of India
3. Importance of Biodiversity
4. Uses of Biodiversity
5. Threats to Biodiversity
6. Conservation of Biodiversity

The diversity may be interspecific (within species) and interspecific (in between the species) but these are well supported by ecosystem. It is seen that the diverse living forms of the ecosystem are modulated with the global environmental changes.

1. Types of Biodiversity:

There are three interrelated hierarchical levels of biodiversity namely, genetic diversity, species diversity and community or ecosystem diversity.

1. Genetic diversity:

It describes the variation in the number and types of genes as well as chromosomes present in different species. The magnitude of variation in genes of a species increases with increase in size and environmental parameters of the habitat.

The genetic variation arises by gene and chromosome mutation in individuals and in sexually reproducing organisms and it is spread in the population by recombination of genetic materials during cell division after sexual reproduction.

Genetic diversity has the following importance:

(i) It helps in speciation or evolution of new species;

(ii) It is useful in adaptation to changes in environmental conditions;

(iii) It is important for agricultural productivity and development.

2. Species diversity:

It describes the variety in the number and richness of the spices with in a region. The species richness may be defined as the number of species per unit area. The richness of a species tells about the extent of biodiversity of a site and provides a means for comparing different sites.

The species richness depends largely on climatic conditions. The number of individuals of different species with in a region represents species evenness or species equitability. The product species richness and species evenness give species diversity of a region. When a species is confined entirely to a particular area, it is termed as endemic species.

3. Ecosystem diversity:

It describes the assemblage and Interaction of spices living together and the physical environment a given area. It relates varieties of habitats, biotic communities ecological processes in biosphere. It also tells about the diversity within the ecosystem. It is referred as Land escape diversity because it includes placement and size of various ecosystems.

For example, the landscapes like grass lands, deserts, mountains etc. show ecosystem diversity. The ecosystem diversity is due to diversity of niches, trophic levels and ecological processes like nutrient cycling, food webs, energy flow, role of dominant species and various related biotic interactions. Such type of diversity can generate more productive and stable ecosystems or communities capable of tolerating various types of stresses e.g. drought, flood etc.

According to Whittaker (1965), the community diversities are of three types:

(i) α-Diversity:

It tells the species diversity in a given community.

It depends upon species richness and evenness.

(ii) β-Diversity:

It describes a range of communities due to replacement of species which arises due to the presence of different microhabitats, niches and environmental conditions.

(iii) γ -Diversity:

It describes diversity of habitat over a total land escape or geographical area.

2. Biodiversity of India:

As per available data, the varieties of species living on the earth are 1753739. Out of the above species, 134781 are residing in India although surface area of India is 2% of the earth's surface. Wild life Institute of India has divided it into ten biogeographical regions and twenty five biotic provinces.

Biogeographical regions are:

(i) Trans Himalayas,

(ii) Gangetic plain,
(iii) Desert,
(iv) Semiarid zone;
(v) Western Ghats;
(vi) Deccan peninsula,
(vii) North eastern zone,
(viii) Coastal lands
(ix) Himalayas,
(x) Islands.

India is one of the twelve mega diversity nations of the world due to the following reasons:

(i) It has 7.3% of the global fauna and 10.88% of global flora as per the data collected by Ministry of Environment and forest.
(ii) It has 350 different mammals, 1200 species of birds- 453 different reptiles, 182 amphibians and 45,000 plants spices.
(iii) It has 50,000 known species of insects which include 13,000 butterflies and moths.
(iv) It has 10 different biogeographical regions and 25 biotic provinces having varieties of lands and species.
(v) In addition to geographical distribution, geological events in the land mass provide high level of biological diversity.
(vi) Several crops arose in the country and spread throughout the world.
(vii) There is wide variety of domestic animals like cows, buffaloes, goats, sheep, pigs, horses etc.
(viii) The marine biota includes sea weeds, fishes, crustaceans, molluses, corals, reptiles etc.
(ix) There are a number of hot spots (namely Eastern Ghats, Western Ghats, North Eastern hills etc.).

3. Importance of Biodiversity:

The living organisms on earth are of great diversity, living in diverse habitats and possessing diverse qualities and are vital to human existence providing food, shelter, clothing's, medicines etc.

The biodiversity has the following importance's:

1. Productive values:

Biodiversity produces a number of products harvested from nature and sold in commercial markets. Indirectly it provides economic benefits to people which include water quality soil protection, equalisation of climate, environmental monitoring, scientific research, recreation etc.

2. Consumptive value:

The consumptive value can be assigned to goods such as fuel woods, leaves, forest products etc. which may be consumed locally and do not figure in national and international market.

3. Social value:

The loss of biodiversity directly influences the social life of the country possibly through influencing ecosystem functions (energy flow and biogeochemical cycle). This be easily understood by observing detrimental effects of global warming and acid rain which cause an unfavorable alteration in logical processes.

4. Aesthetic value:

Aesthetic values such as refreshing fragrance of the flowers, taste of berries, softness of mossed, melodious songs of birds, etc. compel the human beings to preserve them. The earth's natural beauty with its colour and hues, thick forest, and graceful beasts has inspired the human beings from their date of birth to take necessary steps for its maintenance. Similarly botanical and zoological gardens are the means of biodiversity conservation and are of aesthetic values.

5. Legal values:

Since earth is homeland of all living organisms, all have equal right to coexist on the surface of earth with all benefits. Unless some legal value is attached to biodiversity, it will not be possible to protect the rapid extinction of species.

6. Ethical value:

Biodiversity must be seen in the light of holding ethical value. Since man is the most intelligent amongst the living organisms, it should be prime responsibility and moral obligation of man to preserve and conserve other organisms which will directly or indirectly favour the existence of the man.

7. Ecological value:

Biodiversity holds great ecological value because it is indispensable to maintain the ecological balance. Any disturbance in the delicately fabricated ecological balance maintained by different organisms, will lead to severe problems, which may threaten the survival of human beings.

8. Economic value:

Biodiversity has great economic value because economic development depends upon efficient and economic management of biotic resources.

In the day to day life, human beings are maintaining their lifestyle at the sacrifice of surrounding species which come from diversity of plants and animals struggling for their existence.

So, it is highly essential for the human beings to take care of their surrounding species and make optimum use of their service, for better economic development. Thus, it is rightly told, survival of the man depends upon the survival of the biosphere.

4. Uses of Biodiversity:

Biodiversity has the following uses for the development humanity:

(i) It provides food of all types.

(ii) It provides fibers, sources for the preparation of clothes.

(iii) It provides different types of oil seeds for the preparation of oils.

(iv) It provides new varieties of rice, potato etc. through the process of hybridization.

(v) It provides different drugs and medicines which are based on different plant products.

(vi) It is very essential for natural pest control, maintenance of population of various species, pollination by insects and birds, nutrient cycling, conservation and purification of water, formation of soil etc. All these services together are valued 16.54 trillion dollars per year.

5. Threats to Biodiversity:

Biodiversity is considered as a reservoir of resources to be used for the manufacture of food, medicine, industrial products, etc. But with an increased demand of rapid population growth, biodiversity is gradually depleting. A number of plants" and animal species have already become extinct and many are endangered.

The different factors responsible for causing threat to biodiversity are as follows:

1. Habitat destruction:

The primary cause of loss of biodiversity is habitat loss or destruction which is resulted due to the large industrial and commercial activities associated with agriculture, irrigation, construction of dams, mining, fishing etc.

2. Habitat fragmentation:

With increased population, the habitats are fragmented into pieces by roads, fields, canals, power lines, towns etc. The isolated fragment of habitats restricts the potential of species for dispersal and colonization. In addition, the habitat fragmentation also brings about microclimatic changes in light, temperature, wind etc.

3. Pollution:

The most dreaded factor inducing loss of biodiversity is environmental pollution which include air pollution, Water pollution, industrial pollution, pollution due to chemical Pastes, pesticides radioactive materials etc.

4. Over exploitation:

The natural resources are over exploited to meet growing rural poverty, intensive technological growth and globalization of economy. All these factors together may be responsible for the extinction of a number of species.

5. Introduction of exotic species:

The introduction of exotic species are due to:

(i) horticulture

(ii) agriculture;

(iii) European colonisation and

(iv) accidental transport.

It is seen that some exotic species may kill or eat the native species thereby causing its extinction.

6. Diseases:

Since the animals are more vulnerable to infection, the anthropological activities may increase the incidence of diseases in wild species, leading to their extinction.

7. Shifting or Jhum cultivation:

The shifting or Jhum cultivation by poor tribal people greatly affects the forest structure which is a store house of biodiversity.

8. Poaching of wild life:

A number of wildlife species are becoming extinct due to poaching and hunting.

Table: Endangered and Endemic Species of India

Category	**Enlisted species**	**Highly endangered Species.**
1. Higher plants	15,000	135
2. Mammals	372	69
3. Reptiles and amphibians	580	22
4. Birds	1175	40
5. Fishes	1693	—

6. Conservation of Biodiversity:

Biodiversity is being depleted by the loss of habitat, fragmentation of habitat, over exploitation of resources, human sponsored ecosystems, climatic changes, pollution invasive exotic spices, diseases, shifting cultivation, poaching of wild life etc.

Since the human beings are enjoying all the benefits from biodiversity, they should take proper care for the preservation of biodiversity in all its form and good health for the future generation i.e., the human being should prevent the degradation and destruction of the habitats thereby maintaining the biodiversity at its optimum level.

Conservation of biodiversity is protection, upliftment and scientific management of biodiversity so as to maintain it at its threshold level and derive sustainable benefits for the present and future

generation. In other words, conservation of bio-diversity is the proper management of the biosphere by human beings in such a way that it gives maximum benefits for the present generation and also develops its potential so as to meet the needs of the future generations.

Mainly the conservation of biodiversity has three basic objectives:

(a) To maintain essential ecological processes and life supporting systems.

(b) To preserve the diversity of species.

(c) To make sustainable utilisation of species and ecosystems.

Strategies for Conservation of Biodiversity:

The following strategies should be undertaken in order to conserve biodiversity:

(1) All the possible varieties (old or new) of food, forage and timber plants, live stock, agriculture animals and microbes should be conserved.

(2) All the economically important organisms in protected areas should be identified and conserved.

(3) Critical habitats for each species should be identified and safeguarded.

(4) Priority should be given to preserve unique ecosystems.

(5) There should be sustainable utilisation of resources.

(6) International trade in wild life should be highly regulated.

(7) The poaching and hunting of wildlife should be prevented as far as practicable.

(8) Care should be taken for the development of reserves and protected areas.

(9) Efforts should be made to reduce the level of pollutants in the environment.

(10) Public awareness should be created regarding biodiversity and its importance for the living organisms.

(11) Priority should be given in wildlife conservation programme to endangered species over vulnerable species and to vulnerable species over rare species.

(12) The habitats of migratory birds should be protected by bilateral and multilateral agreement.

(13) The over exploitation of useful products of wild life should be prevented.

(14) The useful animals, plants and their wild relatives should be protected both in their natural habitat (in-situ) and in zoological botanical gardens (ex-situ)

(15) Efforts should be made for setting up of National parks and wild life sanctuaries to safeguard the genetic diversity and their continuing evolution.

(16) Environmental laws should be strictly followed.

Conservation Methods:

There are two types of conservation methods namely in-situ and ex-situ conservations. Let us discuss the different conservation methods along with their importance.

(a) In situ conservation:

The conservation of species in their natural habitat or natural ecosystem is known as in situ conservation. In the process, the natural surrounding or ecosystem is protected and maintained so that all the constituent species (known or unknown) are conserved and benefited. The factors which are detrimental to the existence of species concerned are eliminated by suitable mechanism.

The different advantages of in situ conservation are as follows:

(a) If is a cheap and convenient way of conserving biological diversity.

(b) It offers a way to preserve a large number of organisms simultaneously, known or unknown to us.

(c) The existence in natural ecosystem provides opportunity to the living organisms to adjust to differed' environmental conditions and to evolve in to a better life form.

The only disadvantage of in situ conservation is that it requires large space of earth which is often difficult because of growing demand for space. The protection and management of biodiversity through in situ conservation involve certain specific areas known as protected areas which include national parks, Sanctuaries and Biosphere reserves.

1. Protected areas:

The protected areas are biogeographical areas where biological diversity along with natural and cultural resources are protected, maintained and managed through legal and administrative measures. The demarcation of biodiversity in each area is determined on the basis of climatic and physiological conditions.

In these areas, hunting, firewood collection, timber harvesting etc. are prohibited so that the wild plants and animals can grow and multiply freely without any hindrance. Some protected areas are: Cold desert (Ladakh and Spiti), Hot desert (Thar), Saline Swampy area (Sunderban and Rann of Kutch), Tropical moist deciduous forest (Western Ghats and north East) etc. Protected areas include national parks, sanctuaries and biosphere reserves. There are 37,000 protected areas throughout the world. As per World Conservation Monitoring Centre, India has 581 protected areas, national parks and sanctuaries.

2. National parks:

These are the small reserves meant for the protection of wild life and their natural habitats. These are maintained by government. The area of national parks ranges between 0.04 to 3162 km. The boundaries are well demarcated and circumscribed. The activities like grazing forestry, cultivation and habitat manipulation are not permitted in these areas. There are about 89 national parks in India.

Some important national Parks of India are:

(i) Biological Park, Nandankanan, Orissa,

(ii) Corbett national Park Nainital, U.P. (First national Park)
(iii) Koziranga national Park, Jorhat, Assam
(iv) Tudula national Park, Maharashtra
(v) Hazaribagh national Park, Hazaribagh, Bihar
(vi) Band havgarh national park, M.P.
(vii) Bandipur national park, Karnataka.
(viii) Kanha National Park, M.P.
(ix) Reibul Lamjao National Park, Manipur
(x) Nawgaon National Park, Maharashtra

3. Sanctuaries:

These are the areas where only wild animals (fauna) are present. The activities like harvesting of timbers, collection of forest products, cultivation of lands etc. are permitted as long as these do not interfere with the project. That is, controlled biotic interference is permitted in sanctuaries, which allows visiting of tourists for recreation. The area under a sanctuary remains in between 0.61 to 7818 km.

Some important sanctuaries of Orissa are as follows:

(i) Nandankanan Zoological Park
(ii) Chandaka Elephant reserve
(iii) Simlipal Tiger Reserve
(iv) Bhitarkanika Wild life Sanctuary
(v) Gharial project at Tikarpada
(vi) Chilika (Nalaban) Sanctuary

4. Biosphere reserves:

Biosphere reserves or natural reserves are multipurpose protected areas with boundaries circumscribed by legislation. The main aim of biosphere reserve is to preserve genetic diversity in representative ecosystems by protecting wild animals, traditional life style of inhabitant and domesticated plant/ animal genetic resources. These are scientifically managed allowing only the tourists to visit.

Some importance of biosphere reserves are as follows:

(a) These help in the restoration of degraded ecosystem.
(b) The main role of these reserves is to preserve genetic resources, species, ecosystems, and habitats without disturbing the habitants.
(c) These maintain cultural, social and ecologically sustainable economic developments.
(d) These support education and research in various ecological aspects,

Some important biosphere reserves are:

Simlipal, (Orissa), Sunderban (West Bengal), Kanha (M.P Kaziranga (Assam) etc. The biosphere reserve net work was introduced by UNESCO 1971.

TABLE 5.2 : BIOSPHERE RESERVES OF INDIA

S. No.	Date notified	Name of the site	Area in sq.km.	Location (state)
1.	0.1.08.86	Nilgiri	5,520	Parts of Wynad, Nagarhole, bandipur and Mudumalai, Nilambur, Silent Valeey, and the Siruvani Hills (Tamil Nadu, Kerala and Karnataka)
2.	18.01.88	Nanda Devi	5,860.69	Parts o the Chamoli, Pithoragarh, and Almorae dis tricts Uttaranchal)
3.	01.09.88	Nokrerk	820	Part of Gora Hills (Meghalaya)
4.	14.03.89	Manas	2,837	Parts of the Kokrajhar, Bongaigaon, Parpeta, Nalbari, Kamprup, and Daarang districts (Assam)
5.	29.03.89	Sunderbans	9,630	Parts of the Brahamaputra and Ganga deltas (West Bengal)
6.	18.02.89	Gulf of Mannar	10,500	Indian part of Gulf of Mannar between India and Sri Lanka (Tamil Nadu)
7.	06.01.89	Great Nicobar	885	Southernmost islands of the Andaman and Nicobar islands.
8.	21.06.94	Similpal	4,374	Partof Mayurbhanj district (Orissa)
9.	29.07.97	Dibru-Saikhowa	765	Parts of the Dibrugarh and Tinsukia districts (Assam)
10.	02.09.98	Dehang Debang	5,112	Parts of Siang and Debang Valley (Arunachal Pradesh).
11.	03.03.99	Pachmarhi	4,926.28	Part of the Betul, Hoshangabad, and Chindwara dis tricts (Madhya Pradesh)
12.	07.02.00	Kanchanjanga	2,619.92	Part of Kanchanjanga Hills (Sikkim)

(b) Ex-situ conservation:

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation.

The stresses on living organisms due to competition for food, water, space etc. can be avoided by ex-situ conservation there by providing conditions necessary for a secure life and breeding.

Some important areas under these conservation are:

(i) Seed gene bank,

(ii) Field gene bank;

(iii) Botanical gardens;

(iv) Zoos.

The strategies for ex-situ conservations are:

(i) Identification of species to be conserved.

(ii) Adoption of Different ex-situ methods of conservation.

(i) Long-term captive breeding and propagation for the species which have lost their habitats permanently.

(ii) Short-term propagation and release of the animals in their natural habitat

(iii) Animal translocation
(iv) Animal reintroduction
(v) Advanced technology in the service of endangered species.

The different advantages of ex-situ conservation are:

(a) It gives longer life time and breeding activity to animals.
(b) Genetic techniques can be utilised in the process.
(c) Captivity breed species can again be reintroduced in the wild.

Some disadvantages of this method are:

(a) The favourable conditions may not be maintained always.
(b) Mew life forms cannot evolve.
(c) This technique involves only few species.

Hot Spots:

Hot spots are the areas with high density of biodiversity or mega diversity which are most threatened at present. There are 16 hot spots in world, out of which two are located in India namely North-East Himalayas and Western Ghats.

The hot spots are determined considering four factors:

(i) Degrees of endemism;
(ii) Degree of expectation
(iii) Degrees of threat to habitat due to its degradation and fragmentation and
(iv) Number of Species diversity.

The global hot spot and endemic species present within them are:

(1) North East Himalayas (3,500);
(ii) Western Ghats (1,600);
(iii) Cape region of South Africa (6,000);
(iv) Upland Western Amazonia (5,000);
(v) Madagascar (4,900);
(vi) Philippines (3,700)
(vii) Boreo (3, 500);
(viii) South West Australia (2,830);
(ix) Western Ecuador (2,500);
(x) Colombian Choco (2,500);
(xi) Peninsular Malaysia) (2, 400);
(xii) Californian Floristic Province (2,140);
(xiii) Central Chile (1,450);
(xiv) Eastern Arc. Mts (Tanzania) (535);
(xv) South West Srilanka (500);

(xvi) South west Tvorie (200).

Different mechanisms involved in the conservation of biodiversity is shown in Figure

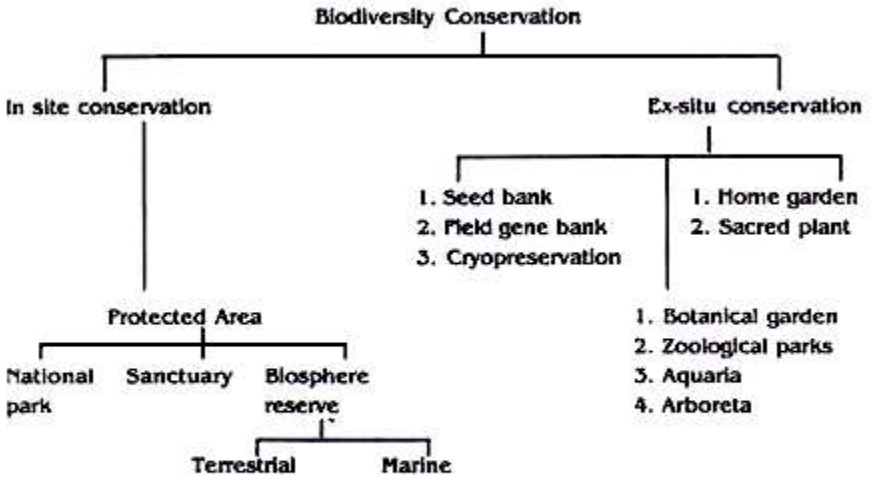

FIG. 5.1 : SCHEME SHOWING BIODIVERSITY CONSERVATION MANAGEMENT SYSTEMS.

	UNIT – III	Option A	Option B	Option C	Option D	Answers
1	The area where all the living organisms interact with each other and their environment is ----------	biosphere	exosphere	mesosphere		biosphere
2	An ecosystem gradually merges with an adjoining one through a transitional zone called the ----------	ecological niche	ecological footprint	ecotone		ecotone
3	Green revolution is associated with ----------	sericulture	agriculture	fish culture		agriculture
4	The first protected area in India is ----------	Silent valley	Corbett National Park	Bandipur sanctuary		Silent valley
5	The Indian Parliament passed the Biodiversity Bill in the year	2000	2005	2002		2002
6	World Water Day is celebrated on ----------	May 22	June 05	March 22		March 22
7	The components of LPG are ----------	Methane & Hexane	Propane & Butane	Ethane & Methane		Propane & Butane
8	Which chemical was responsible for Bhopal gas tragedy?	Methyl Iso Cyanate	Benzene Hexa Chloride	Tri Nitro Toluene		Methyl Iso Cyanate
9	Major consumer of wood from forest is ----------	Thermal Power Plant	Paper Industry	Chemistry Industry		Paper Industry
10	Green Revolution in India was initiated by ----------	MSSwaminathan	Sunderlal Bahugana	Kurien		MSSwaminathan
11	The Unit of measurement of intensity of sound is in ----------	decibels	lux	parsec		decibels
12	A combination of smoke, fog and chemical pollutants seen in industrialized cities is known as ----------	Sol	Smog	Fallout		Smog
13	Enrichment of water body by nutrients like phosphorus and nitrogen is called	Succession	Eutrophication	Stratification		Eutrophication
14	The violent tropical storms in the Indian Ocean are known as --------	Typhoon	Cyclones	Hurricane		Cyclones

15	The worst nuclear accident happened to date is occurred at ----------	Chernobyl in 1986	Three Mile Power Plant in 1979	Sellafield in 1957		Chernobyl in 1986
16	Major cause of Ozone depletion is due to which chemical ?	Chlorofluorocarbons	Polyphenols	Dioxins		Chlorofluorocarbons
17	The legally binding international agreement to reduce Greenhouse gases by 5% 2012 is ------	Vienna convention	Montreal Protocol	Kyoto Protocol		Kyoto Protocol
18	The portion of the earth and its environment which can support life is known as	Crust	Biosphere	Exosphere		Biosphere
19	Public awareness of environment creates ----------	Environment protection	Environment degradation	Environmental improvement	Environmental cultivation	Environment protection
20	Salim Ali centre for ornithology and history is located at ---------	Pune	Hyderabad	Kerala	Coimbatore	Coimbatore
21	Wild life protection act was formulated during the period of ----------	Mrs Indira Gandhi	Lal Bahadur Shasthri	Rajiv Gandhi	Morarji Desai	Mrs Indira Gandhi
22	What is troposphere?	Portion of air	Portion of water	Lowest layer of atmosphere where we survive	Portion of sky	Lowest layer of atmosphere where we survive
23	How is the atmosphere, hydrosphere and lithosphere connected ?	Hydrological cycle	Nitrogen cycle	Oxygen cycle	Carbon cycle	Carbon cycle
24	The main energy source for the environment is ----------	Solar energy	Chemical energy	Bioelectric energy	Electrical energy	Solar energy
25	What is the meaning of the word “endemic”	Rare and occur only in a few location	Rare and occur everywhere	Abundant and seen everywhere	Abundant and only in few locations	Rare and occur only in a few location
26	Which gas is likely to be reduced in the atmosphere by deforestation?	Carbon dioxide	Nitrogen	Oxygen		Oxygen
27	What are rodenticides ?	that kill fishes	that kill insects	that kill rats	that kill crocos	that kill rats
28	Which of the following enhances soil fertility ?	Crop rotation	Improved methods of agriculture	Using new seed verities	Irrigation	Crop rotation
29	Salinization is ----------	Accumulation of	Accumulation of	Accumulation of	Accumulation	Accumulation of

		salts in water	salts in food	salts in body animals	of salts in animals	salts in water
30	What is oil slick ?	Boiled oil	Cooled oil	Thin film of oil in sea water	Oil in deep sea	Oil in deep sea
31	Cigarette smoking exposes one to ----------	Sulphur dioxide	Carbon dioxide	Nitrogen peroxide	Carbon monoxide	Carbon monoxide
32	“Ozone Hole” is a ----------	Hole in the atmosphere	Destruction of ozone layer	Hole in hydrosphere		Destruction of ozone layer
33	Euro II standard refers to ----------	Lowering sulfur content in fuel	Increasing sulfur content in fuel	Lowering carbon content in fuel		Lowering sulfur content in fuel
34	Noise is ----------	Huge sound	Sound of vehicles	Undesirable and unwanted sound	Sound of crackers	Undesirable and unwanted sound
35	What is ‘temporary threshold shift’ ?	Hearing loss due to excessive noise	Noise that is untolerable	Tolerable noise		Hearing loss due to excessive noise
36	Acid is an example of ----------	Corrosive waste	Infectious waste	Radioactive waste	Ignitable waste	Corrosive waste
37	Vermi composting is a natural method of	Producing compost manure	Producing worms	Managing waste it creates	Destroying worms	Managing waste it creates
38	The intensity of earthquake is measured in ----------	Beaufort scale	Richter scale	Mohs scale		Richter scale
39	Which of the below is most responsible for world water crisis ?	Dams	Floods	Drought	Population growth	Population growth
40	Phagotropic mode of nutrition is found in ----------	Products	consumers	decomposers	all of these	consumers
41	Energy is returned to the atmosphere in the form of	potential energy	metabolic energy	heat	vapours	heat
42	The conversion of ammonia to nitrate is known as ----------	ammonification	nitrification	denitrification	all of these	nitrification
43	The study of individual organism is known as	syn ecology	population ecology	autecology	human ecology	autecology
44	The resources that can be replaced by natural ecological cycle is called	renewable	non-renewable	exhaustible	natural	renewable

45	Natural earthquakes are caused by ----------	earth's crust	deep seas	peak mountains	forests	earth's crust
46	Any unfavorable alteration of the environment may be called as	eutrophication	environment pollution	biomagnigication	bioaccumulation	environment pollution
47	The presence of solid, liquid or gaseous compounds, which may not be normally present, or in excess concentration in the atmosphere is called	air pollution	water pollution	soil pollution	radioactive pollution	air pollution
48	The place where the river meets the sea is called	estuaries	oceans	lake	wetlands	estuaries
49	The historical monument that is affected by acid rain is	Taj Mahal	Pyramid of Egypt	Pisa Tower	Golden Temple	Taj Mahal
50	The expansion on POLI is	physical quality of life index	population quotient of life in India	poor quality of life in India	poverty, quality of life in India	population quotient of life in India
51	The presence of which is necessary for photosynthesis	Chloroform	Chlorophyll	Phosphorus	Polymer	Chlorophyll
52	The Primary Consumers are also called as 6	Herbivores	Carnivores	Enzymes	None of these	Herbivores
53	Forest is an example of	Marine ecosystem	Limnic ecosystem	Artificial Ecosystem	Terrestial Ecosystem	Terrestial Ecosystem
54	The amount of solar radiation reaching the surface of the earth is called	Solar flux	reflected light	minerals	solvents	Solar flux
55	Snake is an example of	Primary Carnivores	Secondary Carnivores	Herbivores	None of these	Secondary Carnivores
56	The forests which occur in law rain fall area is	Evergreen forests `	deciduous forests	Coniferous forests	all the above	deciduous forests
57	All the genes of a population is called	gene poll	gene	ecosystem	population	gene poll
58	The destruction of habitat of plants and animals is called	endemism	endangered species	habitant loss	flood	habitant loss
59	Zoos are examples for	insitu conservation	in vivo conservation	exsitu conservation	exvivo conservation	exsitu conservation
60	Acid rain contains	Sulphuric acid	Hydrochloric acid	Oxalic acid	Acetic acid	Sulphuric acid

61	Organ affected by pneumonia	Liver	Kidney	Heart	Lungs	Lungs
62	Which year was declared as the 'Water Year' by Indian government	2010	2004	2007	2000	2007

Environmental Pollution

Pollution is the introduction of contaminants into the natural environment that cause adverse change.[1] 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. In 2015, pollution killed 9 million people in the world. Major forms of pollution include: Air pollution, light pollution, littering, noise pollution, plastic pollution, soil contamination, radioactive contamination, thermal pollution, visual pollution, water pollution.

History

Air pollution has always accompanied civilizations. Pollution started from prehistoric times, when man created the first fires. According to a 1983 article in the journal Science, "soot" found on ceilings of prehistoric caves provides ample evidence of the high levels of pollution that was associated with inadequate ventilation of open fires."[4] Metal forging appears to be a key turning point in the creation of significant air pollution levels outside the home. Core samples of glaciers in Greenland indicate increases in pollution associated with Greek, Roman, and Chinese metal production.

Urban pollution

The burning of coal and wood, and the presence of many horses in concentrated areas made the cities the primary sources of pollution. The Industrial Revolution brought an infusion of untreated chemicals and wastes into local streams that served as the water supply. King Edward I of England banned the burning of sea-coal by proclamation in London in 1272, after its smoke became a problem; the fuel was so common in England that this earliest of names for it was acquired because it could be carted away from some shores by the wheelbarrow.

It was the industrial revolution that gave birth to environmental pollution as we know it today. London also recorded one of the earlier extreme cases of water quality problems with the Great Stink on the Thames of 1858, which led to construction of the London sewerage system soon afterward. Pollution issues escalated as population growth far exceeded viability of neighborhoods to handle their waste problem. Reformers began to demand sewer systems and clean water.

In 1870, the sanitary conditions in Berlin were among the worst in Europe. August Bebel recalled conditions before a modern sewer system was built in the late 1870s:

"Waste-water from the houses collected in the gutters running alongside the curbs and emitted a truly fearsome smell. There were no public toilets in the streets or squares. Visitors, especially women, often became desperate when nature called. In the public buildings the sanitary facilities were unbelievably primitive....As a metropolis, Berlin did not emerge from a state of barbarism into civilization until after 1870."

The primitive conditions were intolerable for a world national capital, and the Imperial German government brought in its scientists, engineers, and urban planners to not only solve the deficiencies, but to forge Berlin as the world's model city. A British expert in 1906 concluded that Berlin represented "the most complete application of science, order and method of public life," adding "it is a marvel of civic administration, the most modern and most perfectly organized city that there is."

The emergence of great factories and consumption of immense quantities of coal gave rise to unprecedented air pollution and the large volume of industrial chemical discharges added to the growing load of untreated human waste. Chicago and Cincinnati were the first two American cities to enact laws ensuring cleaner air in 1881. Pollution became a major issue in the United States in the early twentieth century, as progressive reformers took issue with air pollution caused by coal burning, water pollution caused by bad sanitation, and street pollution caused by the 3 million horses who worked in American cities in 1900, generating large quantities of urine and manure. As historian Martin Melosi notes, The generation that first saw automobiles replacing the horses saw cars as "miracles of cleanliness.".[11] By the 1940s, however, automobile-caused smog was a major issue in Los Angeles.[12]

Other cities followed around the country until early in the 20th century, when the short lived Office of Air Pollution was created under the Department of the Interior. Extreme smog events were experienced by the cities of Los Angeles and Donora, Pennsylvania in the late 1940s, serving as another public reminder.

Air pollution would continue to be a problem in England, especially later during the industrial revolution, and extending into the recent past with the Great Smog of 1952. Awareness of atmospheric pollution spread widely after World War II, with fears triggered by reports of radioactive fallout from atomic warfare and testingThen a non-nuclear event – the Great Smog of 1952 in London – killed at least 4000 peopleThis prompted some of the first major modern environmental legislation: the Clean Air Act of 1956.

Pollution began to draw major public attention in the United States between the mid-1950s and early 1970s, when Congress passed the Noise Control Act, the Clean Air Act, the Clean Water Act, and the National Environmental Policy Act.

Smog Pollution in Taiwan

Severe incidents of pollution helped increase consciousness. PCB dumping in the Hudson River resulted in a ban by the EPA on consumption of its fish in 1974. National news stories in the late 1970s – especially the long-term dioxin contamination at Love Canal starting in 1947 and uncontrolled dumping in Valley of the Drums – led to the Superfund legislation of 1980.[17] The

pollution of industrial land gave rise to the name brownfield, a term now common in city planning.

The development of nuclear science introduced radioactive contamination, which can remain lethally radioactive for hundreds of thousands of years. Lake Karachay – named by the Worldwatch Institute as the "most polluted spot" on earth – served as a disposal site for the Soviet Union throughout the 1950s and 1960s. Chelyabinsk, Russia, is considered the "Most polluted place on the planet".[18]

Nuclear weapons continued to be tested in the Cold War, especially in the earlier stages of their development. The toll on the worst-affected populations and the growth since then in understanding about the critical threat to human health posed by radioactivity has also been a prohibitive complication associated with nuclear power. Though extreme care is practiced in that industry, the potential for disaster suggested by incidents such as those at Three Mile Island and Chernobyl pose a lingering specter of public mistrust. Worldwide publicity has been intense on those disasters.[19] Widespread support for test ban treaties has ended almost all nuclear testing in the atmosphere.[20]

International catastrophes such as the wreck of the Amoco Cadiz oil tanker off the coast of Brittany in 1978 and the Bhopal disaster in 1984 have demonstrated the universality of such events and the scale on which efforts to address them needed to engage. The borderless nature of atmosphere and oceans inevitably resulted in the implication of pollution on a planetary level with the issue of global warming. Most recently the term persistent organic pollutant (POP) has come to describe a group of chemicals such as PBDEs and PFCs among others. Though their effects remain somewhat less well understood owing to a lack of experimental data, they have been detected in various ecological habitats far removed from industrial activity such as the Arctic, demonstrating diffusion and bioaccumulation after only a relatively brief period of widespread use.

A much more recently discovered problem is the Great Pacific Garbage Patch, a huge concentration of plastics, chemical sludge and other debris which has been collected into a large area of the Pacific Ocean by the North Pacific Gyre. This is a less well known pollution problem than the others described above, but nonetheless has multiple and serious consequences such as increasing wildlife mortality, the spread of invasive species and human ingestion of toxic chemicals. Organizations such as 5 Gyres have researched the pollution and, along with artists like Marina DeBris, are working toward publicizing the issue.

Pollution introduced by light at night is becoming a global problem, more severe in urban centres, but nonetheless contaminating also large territories, far away from towns.[21]

Growing evidence of local and global pollution and an increasingly informed public over time have given rise to environmentalism and the environmental movement, which generally seek to limit human impact on the environment.

Forms of pollution

Air pollution: the release of chemicals and particulates into the atmosphere. Common gaseous pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight. Particulate matter, or fine dust is characterized by their micrometre size PM10 to PM2.5.

Light pollution: includes light trespass, over-illumination and astronomical interference.

Littering: the criminal throwing of inappropriate man-made objects, unremoved, onto public and private properties.

Noise pollution: which encompasses roadway noise, aircraft noise, industrial noise as well as high-intensity sonar.

Plastic pollution: involves the accumulation of plastic products and microplastics in the environment that adversely affects wildlife, wildlife habitat, or humans.

Soil contamination occurs when chemicals are released by spill or underground leakage. Among the most significant soil contaminants are hydrocarbons, heavy metals, MTBE,[22] herbicides, pesticides and chlorinated hydrocarbons.

Radioactive contamination, resulting from 20th century activities in atomic physics, such as nuclear power generation and nuclear weapons research, manufacture and deployment. (See alpha emitters and actinides in the environment.)

Thermal pollution, is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant.

Visual pollution, which can refer to the presence of overhead power lines, motorway billboards, scarred landforms (as from strip mining), open storage of trash, municipal solid waste or space debris.

Water pollution, by the discharge of wastewater from commercial and industrial waste (intentionally or through spills) into surface waters; discharges of untreated domestic sewage, and chemical contaminants, such as chlorine, from treated sewage; release of waste and contaminants into surface runoff flowing to surface waters (including urban runoff and agricultural runoff, which may contain chemical fertilizers and pesticides; also including human feces from open defecation – still a major problem in many developing countries); groundwater pollution from waste disposal and leaching into the ground, including from pit latrines and septic tanks; eutrophication and littering.

Pollutants

Pollutant

A pollutant is a waste material that pollutes air, water, or soil. Three factors determine the severity of a pollutant: its chemical nature, the concentration and the persistence.

Cost of pollution

Pollution has a cost. Manufacturing activities that cause air pollution impose health and clean-up costs on the whole of society, whereas the neighbors of an individual who chooses to fire-proof his home may benefit from a reduced risk of a fire spreading to their own homes. A manufacturing activity that causes air pollution is an example of a negative externality in production. A negative externality in production occurs "when a firm's production reduces the well-being of others who are not compensated by the firm."[26] For example, if a laundry firm exists near a polluting steel manufacturing firm, there will be increased costs for the laundry firm because of the dirt and smoke produced by the steel manufacturing firm.[27] If external costs exist, such as those created by pollution, the manufacturer will choose to produce more of the product than would be produced if the manufacturer were required to pay all associated environmental costs. Because responsibility or consequence for self-directed action lies partly outside the self, an element of externalization is involved. If there are external benefits, such as in public safety, less of the good may be produced than would be the case if the producer were to receive payment for the external benefits to others. However, goods and services that involve negative externalities in production, such as those that produce pollution, tend to be over-produced and underpriced since the externality is not being priced into the market.

Pollution can also create costs for the firms producing the pollution. Sometimes firms choose, or are forced by regulation, to reduce the amount of pollution that they are producing. The associated costs of doing this are called abatement costs, or marginal abatement costs if measured by each additional unit. In 2005 pollution abatement capital expenditures and operating costs in the US amounted to nearly $27 billion.

Socially optimal level of pollution

Society derives some indirect utility from pollution, otherwise there would be no incentive to pollute. This utility comes from the consumption of goods and services that create pollution. Therefore, it is important that policymakers attempt to balance these indirect benefits with the costs of pollution in order to achieve an efficient outcome.

It is possible to use environmental economics to determine which level of pollution is deemed the social optimum. For economists, pollution is an "external cost and occurs only when one or more individuals suffer a loss of welfare," however, there exists a socially optimal level of pollution at which welfare is maximized. This is because consumers derive utility from the good or service manufactured, which will outweigh the social cost of pollution until a certain point. At

this point the damage of one extra unit of pollution to society, the marginal cost of pollution, is exactly equal to the marginal benefit of consuming one more unit of the good or service.

In markets with pollution, or other negative externalities in production, the free market equilibrium will not account for the costs of pollution on society. If the social costs of pollution are higher than the private costs incurred by the firm, then the true supply curve will be higher. The point at which the social marginal cost and market demand intersect gives the socially optimal level of pollution. At this point, the quantity will be lower and the price will be higher in comparison to the free market equilibrium. Therefore, the free market outcome could be considered a market failure because it "does not maximize efficiency".

This model can be used as a basis to evaluate different methods of internalizing the externality. Some examples include tariffs, a carbon tax and cap and trade systems.

Sources and causes

Air pollution produced by ships may alter clouds, affecting global temperatures.

Air pollution comes from both natural and human-made (anthropogenic) sources. However, globally human-made pollutants from combustion, construction, mining, agriculture and warfare are increasingly significant in the air pollution equation.

Motor vehicle emissions are one of the leading causes of air pollution.[34][35][36] China, United States, Russia, India[37] Mexico, and Japan are the world leaders in air pollution emissions. Principal stationary pollution sources include chemical plants, coal-fired power plants, oil refineries,[38] petrochemical plants, nuclear waste disposal activity, incinerators, large livestock farms (dairy cows, pigs, poultry, etc.), PVC factories, metals production factories, plastics factories, and other heavy industry. Agricultural air pollution comes from contemporary practices which include clear felling and burning of natural vegetation as well as spraying of pesticides and herbicides.

About 400 million metric tons of hazardous wastes are generated each year. The United States alone produces about 250 million metric tons. Americans constitute less than 5% of the world's population, but produce roughly 25% of the world's CO_2, and generate approximately 30% of world's waste. In 2007, China has overtaken the United States as the world's biggest producer of CO_2, while still far behind based on per capita pollution – ranked 78th among the world's nations.

In February 2007, a report by the Intergovernmental Panel on Climate Change (IPCC), representing the work of 2,500 scientists, economists, and policymakers from more than 120 countries, said that humans have been the primary cause of global warming since 1950. Humans have ways to cut greenhouse gas emissions and avoid the consequences of global warming, a major climate report concluded. But to change the climate, the transition from fossil fuels like

coal and oil needs to occur within decades, according to the final report this year from the UN's Intergovernmental Panel on Climate Change (IPCC).[47]

Some of the more common soil contaminants are chlorinated hydrocarbons (CFH), heavy metals (such as chromium, cadmium – found in rechargeable batteries, and lead – found in lead paint, aviation fuel and still in some countries, gasoline), MTBE, zinc, arsenic and benzene. In 2001 a series of press reports culminating in a book called Fateful Harvest unveiled a widespread practice of recycling industrial byproducts into fertilizer, resulting in the contamination of the soil with various metals. Ordinary municipal landfills are the source of many chemical substances entering the soil environment (and often groundwater), emanating from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have been subject to little control in the U.S. or EU. There have also been some unusual releases of polychlorinated dibenzodioxins, commonly called dioxins for simplicity, such as TCDD.

Pollution can also be the consequence of a natural disaster. For example, hurricanes often involve water contamination from sewage, and petrochemical spills from ruptured boats or automobiles. Larger scale and environmental damage is not uncommon when coastal oil rigs or refineries are involved. Some sources of pollution, such as nuclear power plants or oil tankers, can produce widespread and potentially hazardous releases when accidents occur.

In the case of noise pollution the dominant source class is the motor vehicle, producing about ninety percent of all unwanted noise worldwide.

Effects

Human health

Further information: Soil pollution § Health effects, Toxic hotspots, and List of pollution-related diseases

Overview of main health effects on humans from some common types of pollution. Adverse air quality can kill many organisms including humans. Ozone pollution can cause respiratory disease, cardiovascular disease, throat inflammation, chest pain, and congestion. Water pollution causes approximately 14,000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries. An estimated 500 million Indians have no access to a proper toilet,[52][53] Over ten million people in India fell ill with waterborne illnesses in 2013, and 1,535 people died, most of them children.[54] Nearly 500 million Chinese lack access to safe drinking water.[55] A 2010 analysis estimated that 1.2 million people died prematurely each year in China because of air pollution.[56] The high smog levels China has been facing for a long time can do damage to civilians bodies and generate different diseases [57] The WHO estimated in 2007 that air pollution causes half a million deaths per year in India.[58] Studies have estimated that the number of people killed annually in the United States could be over 50,000.Oil

spills can cause skin irritations and rashes. Noise pollution induces hearing loss, high blood pressure, stress, and sleep disturbance. Mercury has been linked to developmental deficits in children and neurologic symptoms. Older people are majorly exposed to diseases induced by air pollution. Those with heart or lung disorders are at additional risk. Children and infants are also at serious risk. Lead and other heavy metals have been shown to cause neurological problems. Chemical and radioactive substances can cause cancer and as well as birth defects.

An October 2017 study by the Lancet Commission on Pollution and Health found that global pollution, specifically toxic air, water, soils and workplaces, kill nine million people annually, which is triple the number of deaths caused by AIDS, tuberculosis and malaria combined, and 15 times higher than deaths caused by wars and other forms of human violence.[60] The study concluded that "pollution is one of the great existential challenges of the Anthropocene era. Pollution endangers the stability of the Earth's support systems and threatens the continuing survival of human societies."

Environment

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

Biomagnification 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 biomolecules (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 fertilise 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 of tropospheric 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.

Organic pollution of watercourses can deplete oxygen levels and reduce species diversity.

Environmental health information

The Toxicology and Environmental Health Information Program (TEHIP)[61] at the United States National Library of Medicine (NLM) maintains a comprehensive toxicology and environmental health web site that includes access to resources produced by TEHIP and by other government agencies and organizations. This web site includes links to databases, bibliographies, tutorials, and other scientific and consumer-oriented resources. TEHIP also is responsible for the Toxicology Data Network (TOXNET)[62] an integrated system of toxicology and environmental health databases that are available free of charge on the web.

TOXMAP is a Geographic Information System (GIS) that is part of TOXNET. TOXMAP uses maps of the United States to help users visually explore data from the United States Environmental Protection Agency's (EPA) Toxics Release Inventory and Superfund Basic Research Programs.

Pollution control

A litter trap catches floating waste in the Yarra River, east-central Victoria, Australia

Air pollution control system, known as a Thermal oxidizer, decomposes hazard gases from industrial air streams at a factory in the United States of America.

A dust collector in Pristina, Kosovo

Gas nozzle with vapor recovery

Pollution control is a term used in environmental management. It means the control of emissions and effluents into air, water or soil. Without pollution control, the waste products from overconsumption, heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the environment. In the hierarchy of controls, pollution prevention and waste minimization are more desirable than pollution control. In the field of land development, low impact development is a similar technique for the prevention of urban runoff.

- Practices
- Recycling
- Reusing
- Waste minimisation
- Mitigating
- Preventing
- Compost
- Pollution control devices
- Air pollution control

- Thermal oxidizer
- Dust collection systems
- Baghouses
- Cyclones
- Electrostatic precipitators
- Scrubbers
- Baffle spray scrubber
- Cyclonic spray scrubber
- Ejector venturi scrubber
- Mechanically aided scrubber
- Spray tower
- Wet scrubber
- Sewage treatment
- Sedimentation (Primary treatment)
- Activated sludge biotreaters (Secondary treatment; also used for industrial wastewater)
- Aerated lagoons
- Constructed wetlands (also used for urban runoff)
- Industrial wastewater treatment
- API oil-water separators[38][68]
- Biofilters
- Dissolved air flotation (DAF)
- Powdered activated carbon treatment
- Ultrafiltration
- Vapor recovery systems
- Phytoremediation

Perspectives

The earliest precursor of pollution generated by life forms would have been a natural function of their existence. The attendant consequences on viability and population levels fell within the sphere of natural selection. These would have included the demise of a population locally or ultimately, species extinction. Processes that were untenable would have resulted in a new balance brought about by changes and adaptations. At the extremes, for any form of life, consideration of pollution is superseded by that of survival.

For humankind, the factor of technology is a distinguishing and critical consideration, both as an enabler and an additional source of byproducts. Short of survival, human concerns include the

range from quality of life to health hazards. Since science holds experimental demonstration to be definitive, modern treatment of toxicity or environmental harm involves defining a level at which an effect is observable. Common examples of fields where practical measurement is crucial include automobile emissions control, industrial exposure (e.g. Occupational Safety and Health Administration (OSHA) PELs), toxicology (e.g. LD50), and medicine (e.g. medication and radiation doses).

"The solution to pollution is dilution", is a dictum which summarizes a traditional approach to pollution management whereby sufficiently diluted pollution is not harmful.[69][70] It is well-suited to some other modern, locally scoped applications such as laboratory safety procedure and hazardous material release emergency management. But it assumes that the dilutant is in virtually unlimited supply for the application or that resulting dilutions are acceptable in all cases.

Such simple treatment for environmental pollution on a wider scale might have had greater merit in earlier centuries when physical survival was often the highest imperative, human population and densities were lower, technologies were simpler and their byproducts more benign. But these are often no longer the case. Furthermore, advances have enabled measurement of concentrations not possible before. The use of statistical methods in evaluating outcomes has given currency to the principle of probable harm in cases where assessment is warranted but resorting to deterministic models is impractical or infeasible. In addition, consideration of the environment beyond direct impact on human beings has gained prominence.

Yet in the absence of a superseding principle, this older approach predominates practices throughout the world. It is the basis by which to gauge concentrations of effluent for legal release, exceeding which penalties are assessed or restrictions applied. One such superseding principle is contained in modern hazardous waste laws in developed countries, as the process of diluting hazardous waste to make it non-hazardous is usually a regulated treatment process.[71] Migration from pollution dilution to elimination in many cases can be confronted by challenging economical and technological barriers.

Greenhouse gases and global warming

Carbon dioxide, while vital for photosynthesis, is sometimes referred to as pollution, because raised levels of the gas in the atmosphere are affecting the Earth's climate. Disruption of the environment can also highlight the connection between areas of pollution that would normally be classified separately, such as those of water and air. Recent studies have investigated the potential for long-term rising levels of atmospheric carbon dioxide to cause slight but critical increases in the acidity of ocean waters, and the possible effects of this on marine ecosystems.

Most polluting industries

The Pure Earth, an international non-for-profit organization dedicated to eliminating life-threatening pollution in the developing world, issues an annual list of some of the world's most polluting industries.[74]

- Lead-Acid Battery Recycling
- Industrial Mining and Ore Processing
- Lead Smelting
- Tannery Operations
- Artisanal Small-Scale Gold Mining
- Industrial/Municipal Dumpsites
- Industrial Estates
- Chemical Manufacturing
- Product Manufacturing
- Dye Industry

Solid Waste Management

Solid waste management is a term that is used to refer to the process of collecting and treating solid wastes. It also offers solutions for recycling itemsthat do not belong to garbage or trash. As long as people have been living in settlements and residential areas, garbage or solid waste has been an issue. Waste management is all about how solid waste can be changed and used as a valuable resource. Solid waste management should be embraced by each and every household including the business owners across the world. Industrialization has brought a lot of good things and bad things as well. One of the negative effects of industrialization is the creation of solid waste.

According to Britannica, *"Solid-waste management, the collecting, treating, and disposing of solid material that is discarded because it has served its purpose or is no longer useful. Improper disposal of municipal solid waste can create unsanitary conditions, and these conditions in turn can lead to pollution of the environment and to outbreaks of vector-borne disease—that is, diseases spread by rodents and insects."*

Various Sources of Solid Waste

Everyday, tonnes of solid waste is disposed off at various landfill sites. This waste comes from homes, offices, industries and various other agricultural related activities. These landfill sites produce foul smell if waste is not stored and treated properly. It can pollute the surrounding air and can seriously affect the health of humans, wildlife and our environment. The following are major sources of solid waste:

Residential

Residences and homes where people live are some of the major sources of solid waste. Garbage from these places include food wastes, plastics, paper, glass, leather, cardboard, metals, yard wastes, ashes and special wastes like bulky household items like electronics, tires, batteries, old mattresses and used oil. Most homes have garbage bins where they can throw away their solid wastes in and later the bin is emptied by a garbage collecting firm or person for treatment.

Industrial

Industries are known to be one of the biggest contributors of solid waste. They include light and heavy manufacturing industries, construction sites, fabrication plants, canning plants, power and chemical plants. These industries produce solid waste in form of housekeeping wastes, food wastes, packaging wastes, ashes, construction and demolition materials, special wastes, medical wastes as well as other hazardous wastes.

Commercial

Commercial facilities and buildings are yet another source of solid waste today. Commercial buildings and facilities in this case refer to hotels, markets, restaurants, go downs, stores and office buildings. Some of the solid wastes generated from these places include plastics, food wastes, metals, paper, glass, wood, cardboard materials, special wastes and other hazardous wastes.

Institutional

The institutional centers like schools, colleges, prisons, military barracks and other government centers also produce solid waste. Some of the common solid wastes obtained from these places include glass, rubber waste, plastics, food wastes, wood, paper, metals, cardboard materials, electronics as well as various hazardous wastes.

Construction and Demolition Areas

Construction sites and demolition sites also contribute to the solid waste problem. Construction sites include new construction sites for buildings and roads, road repair sites, building renovation sites and building demolition sites. Some of the solid wastes produced in these places include steel materials, concrete, wood, plastics, rubber, copper wires, dirt and glass.

Municipal services

The urban centers also contribute immensely to the solid waste crisis in most countries today. Some of the solid waste brought about by the municipal services include, street cleaning, wastes from parks and beaches, wastewater treatment plants, landscaping wastes and wastes from recreational areas including sludge.

Treatment Plants and Sites

Heavy and light manufacturing plants also produce solid waste. They include refineries, power plants, processing plants, mineral extraction plants and chemicals plants. Among the wastes

produced by these plants include, industrial process wastes, unwanted specification products, plastics, metal parts just to mention but a few.

Agriculture

Crop farms, orchards, dairies, vineyards and feedlots are also sources of solid wastes. Among the wastes they produce include agricultural wastes, spoiled food, pesticide containers and other hazardous materials.

Biomedical

This refers to hospitals and biomedical equipment and chemical manufacturing firms. In hospitals there are different types of solid wastes produced. Some of these solid wastes include syringes, bandages, used gloves, drugs, paper, plastics, food wastes and chemicals. All these require proper disposal or else they will cause a huge problem to the environment and the people in these facilities.

Effects of Poor Solid Waste Management

Due to improper waste disposal systems particularly by municipal waste management teams, wastes heap up and become a problem. People clean their homes and places of work and litter their surroundings which affects the environment and the community.

This type of dumping of waste materials forces biodegradable materials to rot and decompose under improper, unhygienic and uncontrolled conditions. After a few days of decomposition, a foul smell is produced and it becomes a **breeding ground for different types of disease** causing insects as well as infectious organisms. On top of that, it also spoils the aesthetic value of the area.

Solid wastes from industries are a source of toxic metals, hazardous wastes, and chemicals. When released to the environment, the solid wastes **can cause biological and physicochemical problems to the environment** and may affect or alter the productivity of the soils in that particular area.

Toxic materials and chemicals may seep into the soil and pollute the ground water. During the process of collecting solid waste, the hazardous wastes usually mix with ordinary garbage and other flammable wastes making the disposal process even harder and risky.

When hazardous wastes like pesticides, batteries containing lead, mercury or zinc, cleaning solvents, radioactive materials, e-waste and plastics are mixed up with paper and other scraps are burned they produce dioxins and gasses. These **toxic gases have a potential of causing various diseases including cancer**.

Methods of Solid Waste Management

There are different methods of solid waste management. The following are some of the recognized methods:

Sanitary Landfill

This is the most popular solid waste disposal method used today. Garbage is basically spread out in thin layers, compressed and covered with soil or plastic foam. Modern landfills are designed in such a way that the bottom of the landfill is covered with an impervious liner which is usually made of several layers of thick plastic and sand. This liner protects the ground water from being contaminated because of leaching or percolation. When the landfill is full, it is covered with layers of sand, clay, top soil and gravel to prevent seepage of water.

Incineration

This method involves burning of solid wastes at high temperatures until the wastes are turned into ashes. Incinerators are made in such a way that they do not give off extreme amounts of heat when burning solid wastes. This method of solid waste management can be done by individuals, municipalities and even institutions. The good thing about this method is the fact that it reduces the volume of waste up to 20 or 30% of the original volume.

Recovery and Recycling

Recycling or recovery of resources is the process of taking useful but discarded items for next use. Traditionally, these items are processed and cleaned before they are recycled. The process aims at reducing energy loss, consumption of new material and reduction of landfills.

Composting

Due to lack of adequate space for landfills, biodegradable yard waste is allowed to decompose in a medium designed for the purpose. Only biodegradable waste materials are used in composting. Good quality environmentally friendly manureis formed from the compost and can be used for agricultural purposes.

Pyrolysis

This is method of solid waste management whereby solid wastes are chemically decomposed by heat without presence of oxygen. This usually occurs under pressure and at temperatures of up to 430 degrees Celsius. The solid wastes are changed into gasses, solid residue and small quantities of liquid.

In summary, proper solid waste management is an integral part of environmental conservation that should be observed by individuals and companies globally. This will keep the environment clean and reduce health and settlement problems.

Disaster management

The United Nations defines a disaster as a serious disruption of the functioning of a community or a society. Disasters involve widespread human, material, economic or environmental impacts, which exceed the ability of the affected community or society to cope using its own resources.

The Red Cross and Red Crescent societies define disaster management as the organisation 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: including floods, hurricanes, earthquakes and volcano eruptions that have immediate impacts on human health and secondary impacts causing further death and suffering from (for example) floods, landslides, fires, tsunamis.
- Environmental emergencies: including technological or industrial accidents, usually involving the production, use or transportation of hazardous material, and occur where these materials are produced, used or transported, and forest fires caused by humans.
- Complex emergencies: involving a break-down of authority, looting and attacks on strategic installations, including conflict situations and war.
- Pandemic emergencies: involving a sudden onset of contagious disease that affects health, disrupts services and businesses, brings economic and social costs.

Any disaster can interrupt essential services, such as 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 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.

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 minimise 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. Health Volunteers Overseas publications address some of the common misunderstandings about disaster management.

	UNIT – IV	Option A	Option B	Option C	Option D	Answers
1	The area where all the living organisms interact with each other and their environment is ----------	biosphere	exosphere	mesosphere		biosphere
2	An ecosystem gradually merges with an adjoining one through a transitional zone called the ----------	ecological niche	ecological footprint	ecotone		ecotone
3	Green revolution is associated with ----------	sericulture	agriculture	fish culture		agriculture
4	The first protected area in India is ----------	Silent valley	Corbett National Park	Bandipur sanctuary		Silent valley
5	The Indian Parliament passed the Biodiversity Bill in the year	2000	2005	2002		2002
6	World Water Day is celebrated on ----------	May 22	June 05	March 22		March 22
7	The components of LPG are ----------	Methane & Hexane	Propane & Butane	Ethane & Methane		Propane & Butane
8	Which chemical was responsible for Bhopal gas tragedy?	Methyl Iso Cyanate	Benzene Hexa Chloride	Tri Nitro Toluene		Methyl Iso Cyanate
9	Major consumer of wood from forest is ----------	Thermal Power Plant	Paper Industry	Chemistry Industry		Paper Industry
10	Green Revolution in India was initiated by ----------	MSSwaminathan	Sunderlal Bahugana	Kurien		MSSwaminathan
11	The Unit of measurement of intensity of sound is in ----------	decibels	lux	parsec		decibels
12	A combination of smoke, fog and chemical pollutants seen in industrialized cities is known as ----------	Sol	Smog	Fallout		Smog
13	Enrichment of water body by nutrients like phosphorus and nitrogen is called	Succession	Eutrophication	Stratification		Eutrophication
14	The violent tropical storms in the Indian Ocean are known as --------	Typhoon	Cyclones	Hurricane		Cyclones

15	The worst nuclear accident happened to date is occurred at ----------	Chernobyl in 1986	Three Mile Power Plant in 1979	Sellafield in 1957		Chernobyl in 1986
16	Major cause of Ozone depletion is due to which chemical ?	Chlorofluorocarbons	Polyphenols	Dioxins		Chlorofluorocarbons
17	The legally binding international agreement to reduce Greenhouse gases by 5% 2012 is ------	Vienna convention	Montreal Protocol	Kyoto Protocol		Kyoto Protocol
18	The portion of the earth and its environment which can support life is known as	Crust	Biosphere	Exosphere		Biosphere
19	Public awareness of environment creates ----------	Environment protection	Environment degradation	Environmental improvement	Environmental cultivation	Environment protection
20	Salim Ali centre for ornithology and history is located at ---------	Pune	Hyderabad	Kerala	Coimbatore	Coimbatore
21	Wild life protection act was formulated during the period of ----------	Mrs Indira Gandhi	Lal Bahadur Shasthri	Rajiv Gandhi	Morarji Desai	Mrs Indira Gandhi
22	What is troposphere?	Portion of air	Portion of water	Lowest layer of atmosphere where we survive	Portion of sky	Lowest layer of atmosphere where we survive
23	How is the atmosphere, hydrosphere and lithosphere connected ?	Hydrological cycle	Nitrogen cycle	Oxygen cycle	Carbon cycle	Carbon cycle
24	The main energy source for the environment is ----------	Solar energy	Chemical energy	Bioelectric energy	Electrical energy	Solar energy
25	What is the meaning of the word “endemic”	Rare and occur only in a few location	Rare and occur everywhere	Abundant and seen everywhere	Abundant and only in few locations	Rare and occur only in a few location
26	Which gas is likely to be reduced in the atmosphere by deforestation?	Carbon dioxide	Nitrogen	Oxygen		Oxygen
27	What are rodenticides ?	that kill fishes	that kill insects	that kill rats	that kill crocos	that kill rats
28	Which of the following enhances soil fertility ?	Crop rotation	Improved methods of agriculture	Using new seed verities	Irrigation	Crop rotation
29	Salinization is ----------	Accumulation of	Accumulation of	Accumulation of	Accumulation	Accumulation of

		salts in water	salts in food	salts in body animals	of salts in animals	salts in water
30	What is oil slick ?	Boiled oil	Cooled oil	Thin film of oil in sea water	Oil in deep sea	Oil in deep sea
31	Cigarette smoking exposes one to ----------	Sulphur dioxide	Carbon dioxide	Nitrogen peroxide	Carbon monoxide	Carbon monoxide
32	“Ozone Hole” is a ----------	Hole in the atmosphere	Destruction of ozone layer	Hole in hydrosphere		Destruction of ozone layer
33	Euro II standard refers to ----------	Lowering sulfur content in fuel	Increasing sulfur content in fuel	Lowering carbon content in fuel		Lowering sulfur content in fuel
34	Noise is ----------	Huge sound	Sound of vehicles	Undesirable and unwanted sound	Sound of crackers	Undesirable and unwanted sound
35	What is ‘temporary threshold shift’ ?	Hearing loss due to excessive noise	Noise that is untolerable	Tolerable noise		Hearing loss due to excessive noise
36	Acid is an example of ----------	Corrosive waste	Infectious waste	Radioactive waste	Ignitable waste	Corrosive waste
37	Vermi composting is a natural method of	Producing compost manure	Producing worms	Managing waste it creates	Destroying worms	Managing waste it creates
38	The intensity of earthquake is measured in ----------	Beaufort scale	Richter scale	Mohs scale		Richter scale
39	Which of the below is most responsible for world water crisis ?	Dams	Floods	Drought	Population growth	Population growth
40	Phagotropic mode of nutrition is found in ----------	Products	consumers	decomposers	all of these	consumers
41	Energy is returned to the atmosphere in the form of	potential energy	metabolic energy	heat	vapours	heat
42	The conversion of ammonia to nitrate is known as ----------	ammonification	nitrification	denitrification	all of these	nitrification
43	The study of individual organism is known as	syn ecology	population ecology	autecology	human ecology	autecology
44	The resources that can be replaced by natural ecological cycle is called	renewable	non-renewable	exhaustible	natural	renewable

45	Natural earthquakes are caused by ----------	earth's crust	deep seas	peak mountains	forests	earth's crust
46	Any unfavorable alteration of the environment may be called as	eutrophication	environment pollution	biomagnigication	bioaccumulation	environment pollution
47	The presence of solid, liquid or gaseous compounds, which may not be normally present, or in excess concentration in the atmosphere is called	air pollution	water pollution	soil pollution	radioactive pollution	air pollution
48	The place where the river meets the sea is called	estuaries	oceans	lake	wetlands	estuaries
49	The historical monument that is affected by acid rain is	Taj Mahal	Pyramid of Egypt	Pisa Tower	Golden Temple	Taj Mahal
50	The expansion on POLI is	physical quality of life index	population quotient of life in India	poor quality of life in India	poverty, quality of life in India	population quotient of life in India
51	The presence of which is necessary for photosynthesis	Chloroform	Chlorophyll	Phosphorus	Polymer	Chlorophyll
52	The Primary Consumers are also called as 6	Herbivores	Carnivores	Enzymes	None of these	Herbivores
53	Forest is an example of	Marine ecosystem	Limnic ecosystem	Artificial Ecosystem	Terrestial Ecosystem	Terrestial Ecosystem
54	The amount of solar radiation reaching the surface of the earth is called	Solar flux	reflected light	minerals	solvents	Solar flux
55	Snake is an example of	Primary Carnivores	Secondary Carnivores	Herbivores	None of these	Secondary Carnivores
56	The forests which occur in law rain fall area is	Evergreen forests `	deciduous forests	Coniferous forests	all the above	deciduous forests
57	All the genes of a population is called	gene poll	gene	ecosystem	population	gene poll
58	The destruction of habitat of plants and animals is called	endemism	endangered species	habitant loss	flood	habitant loss
59	Zoos are examples for	insitu conservation	in vivo conservation	exsitu conservation	exvivo conservation	exsitu conservation
60	Acid rain contains	Sulphuric acid	Hydrochloric acid	Oxalic acid	Acetic acid	Sulphuric acid

61	Organ affected by pneumonia	Liver	Kidney	Heart	Lungs	Lungs
62	……is a marine tortoise which shows the unique phenomenon arribada	Olive Ridley	Star tortoise	Travancore tortoise		Olive Ridley
63	Largest reptile in the world	Dragon	Anaconda	Crocodile		Anaconda
64	Snow leopard is found in which National Park ?	Kaziranga	The Great Himalayan	Bharatpur		The Great Himalayan
65	Point Calimere sanctuary is situated in which state?	Tamilnadu	Kerala	Karnataka		Tamilnadu
66	The movement ‘ Beej Bachao Andolan’ was aimed for the conservation of -----	Trees	Shrubs	Crops		Crops
67	Who had stated in the Stockholm conference in 1972 that poverty was the greatest polluter?	Indira Gandhi	Mahatma Gandhi	Rajiv Gandhi		Indira Gandhi
68	The movement ‘Pani Panjayath’ was initiated to conserve waters in the drought prone areas of ……state	Tamilnadu	Rajasthan	Maharashtra		Rajasthan
69	Founder of ‘Shantinikethan’ a University that taught an environment based education	Mahathma Gandhi	Chandi Prasad Bhat	Rabindranatha Tagore		Chandi Prasad Bhat
70	Which state proposed a ban on all types of polythene packing for the first time in India?	Himachal Pradesh	Madhya Pradesh	Kerala		Kerala

Social Issues and the Environment
From Unstable to Sustainable Development

It is well recognised now that rich nations of the world consume resources, especially non-renewable natural resources like coal and oil at a break-neck pace. The consequence of this resource use is the promotion of unfettered consumption and greed which, in turn, has begun to create global energy shortages, pollution, global warming, among other myriad problems.

It is now recognised that this model of growth and development is unsustainable and must be addressed. The World Commission on Environment and Development defines Sustainable Development as *Development that meets the needs of the present generation without compromising the needs of the future generation to meet their needs.*

Sustainable development requires that for any activity that brings about economic growth, the corresponding environmental impact must be studied and negative aspects addressed. Especially major projects like large dams, mining industries and major highways should be restrained. This, in turn, requires that unfettered consumption by people be checked. Further, Environmental Impact Assessment (EIA) must be conducted on every major public and industrial or commercial project before proceeding.

Urban Problems Related to Energy

Mankind has designed cities as a marker of development, but by their very design the energy needs in urban agglomerations are typically very high. For example, in India, housing made out of traditional material like mud and straw can handle hot temperature better but such material are routinely discarded in favour of brick and mortar as soon as some development takes place.

In modern housing, the use of brick, concrete, aluminum and glass makes buildings hot and requires large number of fans or huge air–conditioning units. High-rise buildings also consume huge amount of electricity to operate lifts, pump water and for illumination.

Modern cooking is done with kerosene, natural gas, LPG or electricity. This consume large amount of fossil fuels. Urban transport requires that large number of cars to be on the road thereby creating, congestion, and waste of time, air pollution and respiratory diseases. Instead, efficient public transit systems like metros should be used so that transportation is fuel-efficient.

Water Conservation, Rain Water Harvesting and Watershed Management

It is often said nowadays that water will be the focus of the next global crisis. Clean, usable water has become a scarce item in the 21st century. There are several reasons for this. Modern agriculture based on HYV seeds require massive amount of irrigation water. This has, in turn, required the building of very large dams on important rivers and massive

water reservoirs. Dams and irrigation tamper with river courses leaving downstream areas nearly dry.

This has coupled with increasing deforestation. Deforestation increases surface run offs decreasing recharging of ground water. Agricultural needs have also caused much withdraw log ground water. Excessive use of ground water for irrigation and urban use causes the water table to drop.

Urban and industrial effluents have often not been cleaned up. Instead they have been discharged indiscriminately. These effluents pollute water bodies, lake and rivers. In addition, urban agglomerations generate massive amount of waste water from sewage, washing and other urban uses. All this is leading to a rising demand and falling supplies of usable water and massive water shortage.

The solution lies in conserving water, water recycling, harvesting of rain water and managing local watersheds more efficiently. For example, one can use drip irrigation to supply water directly to the root of plants so one needs less water to grow food.

Urban life wastes lots of water. Water wastage should be prevented. We all can do a little bit. The Pani Panchayet movement initiated by Vilasrao Salunkhe can be used to manage local watersheds better. Also, collecting rainwater in terraces and roofs and using them at source should be encouraged.

Resettlement and Rehabilitation of people: Its problems and Concerns

Large public and private projects like mines, highways or even the notification of a National Park will displace large number of people. It is expected that such people would be given good, arable land for resettlement. In an overpopulated country such as ours there is never enough arable land available.

Also, resettlements seldom take place in practice and may sometimes take decades. Often only wasteland is offered in place of arable land to the displaced people.

Large Dams have been one of the greatest causes behind the eviction of people. Tehri Dam, when finished will submerge Tehri town and 100 villages. The building of the dam has been opposed by the local people. Tribal people are often the most significant victims of eviction. Narmada Bachao Andolon is the greatest example of a battle by indigenous people over land for a large dam.

Environmental Ethics: Issues and Possible Solutions

Environmental ethics deal with rights of people and other living beings that are fundamental to their existence. We pose the question: Should there be huge disparity in the use of natural resources between rich nations and poor nations and between rich people and poor people? Many of us would like to answer “no”. Incomes and consumptions must be made more equitable through the sharing of Gross National Products. Tribal persons and women are particularly vulnerable when it comes to the control of natural resources

for individual use.

People with traditional life styles like fishermen and artisans have a right to live in the way they choose. Even when nature is "recreated" the poor are often excluded. All creatures big and small, living on land or in water animals, and plants have a right to exist and should not be slaughtered to serve human needs.

Climate Change and Global Warming

About seventy percent of solar energy reaching the earth's surface is absorbed. The rest is reflected back. This keeps the earth warm and fit for life. Green house Gases such as Carbon Dioxide traps heat. As we burn more fossil fuels like oil and coal to make electricity, the amount of carbon dioxide in air rises. This traps more heat and the temperature of the earth rises. This results in melting of polar caps and glaciers. Average sea level rises and low-lying land goes under water.

Sudden changes in climate may also happen. Hurricanes and typhoons may suddenly occur in regions where they are unexpected. This increases desertification, food shortage and vector-borne diseases. Human activities involving industrialisation and population growth has greatly increased energy demand in the last 100 years. This has resulted in massive increase in fossil fuel consumption, petroleum and coal.

Burning of fossil fuels result in Carbon Dioxide emissions. CO_2 and other Green House Gases have increased by 31% in this period. The only way this carbon dioxide can be sequestered in the forest, but with increasing deforestation, this CO_2 has nowhere to go. This is the main reason behind Global Warming and rise in earth's temperature.

Acid Rain

Burning of fossil fuels result in the release of Oxides of Sulphur (SO_X) and Nitrogen (NO_X). These react with water vapour in the air to form Sulphuric or Nitric Acid. They are carried up in the atmosphere and return to the earth in the form of Acid Rain. Acid rain dissolves and washes away nutrients in the soil. It also washes away the nutrients needed by plants. Acid rain affects rivers and wetlands, aquatic life disrupts food chains and destroys entire ecosystems.

Depletion of Ozone Layer

Ozone (O_3) is a poisonous gas and a dangerous pollutant at ground level. A layer of ozone (in a mixture with oxygen) exists in the stratosphere 20 to 50 km above earth's surface. Ozone molecules reflect the Ultraviolet rays (UV) coming from the sun and protects life on earth.

Chemical such as Chlorofluorocarbons (CFC) from refrigerators and aerosol propellants release chlorine that combines with ozone. Thus only oxygen is left in the ozone layer and there is nothing to stop the UV rays. This causes skin cancer, cataracts and other diseases.

Thinning of the ozone layer has been noticed over Antarctica and Australia. Mankind agreed at Montreal (1987) to ban CFC as a result of which the ozone layer is being regenerated.

Nuclear Accidents and Holocausts

Nuclear energy is a clean and cheap substitute to energy from fossil fuels. Though greatly beneficial to mankind this form of energy has many problems. When accidents happen at Nuclear power plants massive radioactivity is released. This can causes huge loss of human life, long term illness like cancer, thyroid disorders, tumours, etc.

Accidents at Three Mile Island (USA-1979) and Chernobyl (USSR-1986) are important examples. Disposal of Nuclear Waste also remains a major problem. Nuclear weapons used in war cause holocausts. Hiroshima and Nagasaki (Japan 1945) are examples.

Wasteland Reclamation

Loss of trees and vegetation cover causes soil to erode. Cultivable land can turn into wasteland in this way. Reclaiming wasteland for cultivation and other good uses remain a priority. Wasteland can be reclaimed by reducing the salt content. This can be done by leaching and flushing using Gypsum, Urea, Potash, and Compost. Agriculture can be mixed with forestry through an integrated system. Certain indigenous tree species that adopt to alkaline soil can be used to reclaim wasteland.

Consumerism & Waste Products:

Reduce, Reuse, Recycle

Current consumption patterns involving high degree of consumerism and this is very wasteful. Goods produced for one time use create massive amounts of solid waste. Packaging material for white goods are resource intensive, wasteful and contribute to solid waste. For example, two hundred billion plastic cups, cartons, cans and bottles are thrown away every year. Clearly, reduction or ban on certain types of plastic items can be a solution. Therefore, recycling as much as we can must be practiced. Reduction of gross consumerist life styles must be encouraged.

Environmental Laws

The Environmental (Protection) Act -1986

This Act was passed to give Government a comprehensive power to take action in environmental matters. It gave power to the Central Pollution Control Boards (CPCB) and State Pollution Control Boards (SPCBs) to set permissible limits for air pollution, water pollution and release of hazardous substances.

Other important laws in this area are Air (Prevention and control of pollution) Act 1981and the water (Prevention and control of pollution) Act 1974. The earliest law was the Wildlife (Protection) Act 1972. This act established National Park and Wildlife

Sanctuaries. This act launched Project Tiger and prevented trade in animal body parts. Forest (conservation Act) 1980/1988 is also important.

Enforcement of Environmental Legislation

All major Development projects- government or private – need an Environmental Impact Assessment by a competent organisation. It lists local flora, fauna, people and ecosystems that may be affected. Citizens actions and action groups can act as watch-dogs against willful environmental damage by resorting to prayers, petitions, media publicity, dharnas or Public Interest Litigation (PIL). Public awareness at the local level is extremely important. Events commemorating World Environment Day, Earth Day, Wet land Day contribute to this end.

Role of Information Technology in Environment and Human Health

When you talk about information technology, it has a significant hand in improving the status in the fields of environmental education and human health as compared to that of the other respective areas such as business, economics, and culture or politics. The emerging growth of the internet services and facilities, geographic information system or GIS, and the data that gets transmitted through satellites, etc. have generated a higher affluence of the updated information on several aspects of the environment as well as health. When you look for the variety of software in the market, you will come across a number of them that created for the health and environment studies in a better way. They are quite user-friendly and certainly help a learner to understand the respective subject with ease.

Database on the Environment System

Understanding the meaning of database is super easy and straightforward; it is a collection of connected data on some subjects. It comes in a computerized form, and you can retrieve the data at any hour of the day whenever needed. The information of database can easily extract in a computer. When it comes to comprehensive databases, things that include in it are wildlife database, forest cover database, and conservation database, etc. the databases are also available for some diseases which include malaria, fluorosis, HIV/AIDS, etc.

- National management information system (NMIS).
- Environmental information system (ENVIS).
- Remote sensing and geographical information system (GIS).
- Geographical information system (GIS).
- The World Wide Web (WWW).

National Management Information System (Nmis)

According to NMIS of the department of science and technology, it can understand that it has a database compilation that base on research and development projects, as well as

information that is related to research scientists and personnel, are included.

Environmental Information System (Envis)

According to the ministry of environment and forests, the government of India has developed an information system known as ecological information system or ENVIS. It has its headquarters based in Delhi and has its branches all over India. ENVIS established back in 1982, and since then, its main aim is to provide environmental information to all the decision makers, engineers, scientists, and policy planners that reside in all over the country. The centers of ENVIS implement the work hours in generating a new network for databases in areas such as clean technologies, pollution control, biodiversity, wildlife, environmental management, remote sensing, and renewable energy.

Remote Sensing And Geographical Information System (Gis)

The process of remote sensing that accesses through satellites can be used to get through the ongoing alterations in the environment as well as to predict the natural hazards before time such as floods, droughts, volcanic eruptions, starvation, etc. It is one of the most useful techniques in exploring the availability of mineral deposits, crude oil, and locating other geothermal powerhouses.

Geographical Information System (GIS)

GIS or geographic information system consider as one of the most effective tools in the entire environmental management topic. It is a process of superimposing different thematic maps with the help of digital data on a large scale of interconnected aspects. The different thematic maps that contain digital information and database on various elements such as forest land, water resources, soil type, cropland, industrial growth, human settlement, and industrial growth, etc. are placed in a layered prospectus in the computer with the help of software.

GIS also helps in identifying some deadly and chronic diseases that come from the infested areas which are very much prone to vector-borne diseases such as schistosomiasis, malaria, etc. based on the geographical map of that area. There are some distribution information centers (DICs) in India that are interrelated with each other and with the central information network getting its access to the international database.

They are also capable of availing information and facts about the atmospheric phenomena such as the upcoming monsoon, inversion phenomena, the depletion of the ozone layer, smog, etc. It is the reason why remote sensing and GIS play a significant role in resource mapping, management, planning, environmental conservation, and environmental impact assessment as well.

The World Wide Web (WWW)

With the availability of resources on every aspect, things like classroom activities, digital files of photos, web-exercises, animations, PowerPoint lecture presentations, and quiz

competitions have proved to be more helpful for both the students as well as the teachers who pursue environmental studies.

Features of Online Learning Centre Websites

Student-Friendly Aspects:

It includes tips how to study smartly, detailed information and hyperlinks on every important topic, practice quiz, web exercises, case studies, key-terms, career information, current affairs, an interactive encyclopedia, environmental maps, current articles, and tips to contact your elected officials.

Teacher-Friendly Aspects:

It includes additional case studies, solutions to critical thinking, questions, answers to web exercises, editing facility to imply or delete the items and make multiple versions of the same test, etc.

Seeking Online Help for Information on Health

The online portals provide a wide range of information on various subjects such as human health and environment. You can access help from the national institute of occupational health as it avails electronic information on the professional and fundamental health of people who work in hazardous working conditions such as industries, etc. and provide safety measures as well.

Conclusion

The field of information technology has been increasing rapidly with an explosion of some applications and new avenues that are opening along with an active role in the field of education, planning, and management of health and environment. Information technology has been playing a significant role in the areas of biometrics, genome sequencing, gene engineering, online medical transcription, maintaining the DTA database for the betterment of human health, biotechnology, etc. The field also helps in identifying some deadly and chronic diseases that come from the infested areas which are very much prone to vector-borne diseases such as schistosomiasis, malaria, etc. based on the geographical map of that area.

	UNIT – V	Option A	Option B	Option C	Option D	Answers
1	The Expansion of SPCA	Society for the protection of Common Animals	Society for the Prevention of Cruelty to Animals	Society for the Prohibition of Cruelty to Animals		Society for the Prevention of Cruelty to Animals
2	The projects that already exist but require expansion must also apply for clearance is called……	Green-field projects	brown-field projects	blue-field projects		brown-field projects
3	Expansion of PCB	Pollution Control Board	Population Control Board	Protection and Conservation of Biodiversity		Pollution Control Board
4	In which year Silent Valley was declared as National Park ?	1988	1982	1984		1984
5	One of the most commonly used pesticide	Lacto Bacillus	Bacillus Thuringiensis	Rhizobium		Bacillus Thuringiensis
6	'Smog' is a mixture of	Smoke and Fog	Snow and Fog	Snow and Dust Sulpher Dioxide and Fog		Smoke and Fog
7	The Anthrax disease is caused by	Virus	Bacteria	Protozoa Helminthes		Bacteria
8	A Hawk that eats a frog is a	Producer	Primary Consumer	Secondary consumer	Tertiary consumer	Tertiary consumer
9	Moisture in the air is known as	Water	Fog	Snow	Humidity	Humidity
10	Zoological Survey of India is at	Delhi	Mumbai	Calcutta		Calcutta
11	World Forest day is celebrated on	21st March	(5th June	(Ist Dec	(7th June	21st March
12	An example of lotic water	Pond	River	Lake	Reservoir	River
13	Superbugs are	Synthetic bug	Bacteria	Radio nucleotide	Industries	Bacteria
14	Torrey Cannon is famous for	Gulf of War	Industries	Electric Potential	Oil Spillage	Oil Spillage
15	Red Sea is named after	Red algae	Blue green algae	Oil spillage	Brown Algae	Red algae
16	Aquatic life is damaged by	Sound pollution Air Pollution		Thermal Pollution	All of these	Thermal Pollution

17	Minamata disease is caused by	Air Pollution Water Pollution		Marine pollution	All of these	Marine pollution
18	Complex interlinked food chains are called	Food Web	Food net work	Trophic levels	Food pyramid	Food Web
19	…… is an evergreen forest of Kerala	Silent Valley	Muthanga	Wayanad	Muthumala	Silent Valley
20	Acid rain mainly result from	Sulpher dioxide	Carbon dioxide	Carbon monoxide	Amonia	Sulpher dioxide
21	Ozone depletion is caused by	Co2	CCL	CFCs	CO	CFCs
22	Which among the following is an example for ex-situ conservation	Zoological parks	Wild life sanctuaries	National Parks	Reserve Forests	Zoological parks
23	The World Biophilia was coined by	Dr Hackel	Dr Johanssen	Dr Benjamine	Dr Earnest Wilson,(answer, Edward O Wilson)	Dr Earnest Wilson,(answer, Edward O Wilson)
24	The book silent spring was written by	Madhav Gandgil	Anil Agarwal	Racihel Carson	EO Wilson	Racihel Carson
25	The Chipko movement is started by	Engler	Sunderlal Bahuguna	Medha Padkar	None of these	Sunderlal Bahuguna
26	World Ozone day is	March 16	June 5	September 16	November 16	September 16
27	Which of the following is a part of the Carbon Cycle	Animal respiration	Plant respiration	Production of sugars in plants	Production of proteins in animals	
28	Abiotic is a	Living component	Non living component	Both living and non living	None of these components	Non living component
29	Biome refers to	Flora of an area	Fauna of an area	Large community of Plants	None of these & animals	Large community of Plants
30	BOD of a river water is found very high This means water	is clear	is highly polluted	contain Algae	contain many dissolved minerals	is highly polluted
31	Lotic eco system refers to	static water system	Ecosystem of flowing water	Ecosystem of estuaries	Deep marine water system	Ecosystem of flowing water
32	The Red Data book which lists endangered species is maintained by	UNO	WHO	ICUN	WWF	ICUN
33	Which of the following is a	Western Ghats	Nandadevi	Eastern Ghats	Aravalli	Western Ghats

	biodiversity hot sport in India ?					
34	Global warming is caused by	GHGs	CFCs	CH4	No2	CFCs
35	The Salim Ali Bird Sanctuary is located at	Pondicherry	Thattakad	Anakkatti	Kalakkad	Thattakad
36	First Biosphere reserve in India	Nilgiri	Agastyamala	Eravikulam	Chinnar	Nilgiri
37	Flag ship species of Choolannur sanctuary	Tiger	Peacock	Elephant	Rhino	Peacock
38	Utilisation of natural resources in moderate manner remaining something for the next generation is termed as	Resettlement	Sustainable development	Rehabilitation	Mutual development	Sustainable development
39	Autotrophs are……	Consumers	Herbivores	Saprophytes	Producers	Producers
40	Organisms which depend on Producers are called	Autotrophs	Saprophytes	Consumers	Xerophytes	Consumers
41	The source of atmospheric oxygen is	Nitrogen cycle	Photosynthesizing from Green Plants	Water	Carbon Cycle	Photosynthesizing from Green Plants
42	Plants which grow in shade are called	Sciophytes	Heliophytes	Oxylophytes	Epiphytes	Sciophytes
43	Who coined the slogan of ‘Chipko Movement’ Ecology is permanent economy”	Jawaharlal	Salim Ali	Sunderlal Bahuguna	Rachel Carson	Sunderlal Bahuguna
44	Herpetology is a branch of Science which deals with	Aves	Mammals	Reptiles	Fishes	Reptiles
45	“ Silent Spring” is a well known book written by	John Miller	Charles Darwin	Rachel Carson	Aldoleopold	Rachel Carson
46	The build up of Co2 is known as	Global warming	Green House effect	Fossil fuels	Ozone	Global warming
47	Bears are usually hunted and killed for their	Teeth	Skin	Gall bladder	Nails	Gall bladder
48	The capacity to do work is termed as	Power	Force	Strength	Energy	Energy

49	Coral reefs is India can be seen in	Himalayan region	Andaman and Nicobar Islands	Uttarpradesh	Maharashtra	Andaman and Nicobar Islands
50	The 'Marble Cancer' shown by Taj Mahal was due to	Global Warming	Exposure to carbon dioxide	Marble degradation	Fungal growth	Marble degradation
51	The darkening of the skin due to arsenic poisoning is called	Black syndrome	Diffiuse melanosis	Skin scaling	None of these	Diffiuse melanosis
52	Boron, Zinc and Manganese are usually referred to as	Micro materials	Macro materials 20	Soil Vitamins	MBZ nutrients	Micro materials
53	The noise pollution is measured in terms of	decibel	Dobson units	Hertz	Candela	decibel
54	Incineration of Municipal waster involves	Oxidation	Deduction	Redox action	disintegration	Deduction
55	The word Tsunami is derived from two Japanese words	tsu(big) and nami(flow)	tsu(harbour) and nami(wave)	Tsu (big wave) and nami(wave)	None of the above	tsu(harbour) and nami(wave)
56	The 3 R principle in waste management involves	Reduce, Regain, Reuse	Reduce, Reuse, Recycle	Reduce, Reform, Reset	Reduce, Retain, Regain	Reduce, Reuse, Recycle
57	Which of the following is an extinct species	Tiger	Lion	Dodo	Ostrich	Dodo
58	'Project Tiger' was launched in the year	1973	1972	1991	1992	1972
59	The famous Minamata disease in Japan is due to the accumulation of in fishes	Cadmium	Mercury	Zinc	Lead	Mercury
60	The term 'Ecology' was coined by	G Tansley	Earnest Hackel	Aristotle	Linnaeus	Earnest Hackel
61	Nitrogen gas returns to the atmosphere by the action of	Nitrogen fixing bacteria	Denitrifying bacteria	Nitrifying bacteria	Nitrate fertilizers 21	Denitrifying bacteria
62	Photosynthesis is found in	Producers	Decomposers	Consumers	None of these	Producers
63	Phytoplankton is	Producers of forest	Producers of lakes	Consumers of Ocean	Omnivores	Producers of lakes
64	The only ape found in India	Gorilla	Chimpanzee	Haddock gibbon	Oranguttan,(answer Hoolok Gibbon)	Oranguttan,(answer Hoolok Gibbon)

65	Soil pollution is caused by	Aerosol	Ozone	Acid rain	PAN	Acid rain