Thakur Educational Trust's (Regd.)

Thakur Shyamnarayan College of Education & Research

Environmental Education

Compiled By

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ELECTIVE COURSE 3 (EC 3)

ENVIRONMENTAL EDUCATION

Total Credits: 6

Total Marks: 100

Goals:

1. To gain knowledge about the principles, necessity, and concept of environmental education.

2. To gain knowledge of the ideas of ecology and the environment.

3. To gain knowledge about entropic pollution and ecological energy dynamics.

4. To raise awareness of important environmental concerns

5. To investigate and value the environmental ideals portrayed in classical religious philosophy.

6. To gain knowledge of the different methods used in environmental education.

7. To raise awareness of government and public efforts to conserve and protect the environment.

8. To gain knowledge about the idea and necessity of sustainable development.

9. To cultivate an optimistic outlook on environmental preservation and protection.

10. To develop skills of observation, participation and assessment through environmental projects.

11. To comprehend how environmental education is currently incorporated into the curriculum

12. To understand the curriculum and methods in environmental education.

13. To acquire knowledge about the different methods of teaching in environmental education

14. To acquire knowledge of the tools and techniques for the evaluation of environmental education

MODULE-I: FUNDAMENTALS OF ENVIRONMENTAL EDUCATION (2 Credits)

Unit 1: Environmental, Ecological, and Ecological Concepts

a) Environment: Meaning, Components (Biotic and Abiotic),

b) Concept of Ecosystems and Their Types

c) The food web, ecological pyramids (numbers, mass, and energy), and the concept of ecology & Ecological Energy Dynamics

Unit 2: Key Environmental Concerns: Significance, Origins, Impacts, and Solutions

a) Climate Change & Loss of Biodiversity.

b) Bio magnification and Eutrophication

c) Genetic Engineering & Urban Sprawl

Unit 3: Development of Environmental Education

(a)The Stockholm Conference (1972), the Intergovernmental Conference (1977), the Kyoto Protocol (2005), and Tbilisi + 30 (2007) are examples of historical developments.

b) Environmental Education: Meaning, Objectives, Principles & Significance

(c) A variety of interdisciplinary and multidisciplinary methods for teaching environmental education

MODULE II: ENVIRONMENTAL EDUCATION FOR SUSTAINABLE DEVELOPMENT

(2 Credits)

Unit 4: Initiatives for Environment Assessment

a) Environmental Impact Assessment: (Meaning, Steps & Significance)

b) Protection and Management of the Environment The necessity of environmental management, as well as its features and functions

c) Environmental Audit: (Definition; Features and types of environmental auditing)

Unit 5: Sustainable Environmental Management

a) Sustainable Development: Meaning, Need, Guiding Principles.

b) Rainwater harvesting, mangrove management, and solid waste management (meaning, procedure, and importance of each) are examples of sustainable environmental practices.

c) Native Technical Knowledge as an Ecological Approach

Unit 6: Environmental Initiatives, Projects and Laws

a) Active participants include Narmada Bachao Andolan, Tarun Bharat Sangh,

b) Projects: Tiger Project, Ganga Action Plan,

c) Laws of Conservation & Protectiion: Wild-lifeProtection Act-1972, Environment

Protection Act, 1986 and Noise Pollution Act-2000.

MODULE 3: INTERNAL ASSESSMENT

(2 Credits)

Sr.No	**Particulars**	**Marks**
1	**Task/Assignment for each module held in the semester (2X10)**	**20**
2	**During the specified semester, there was one periodic class test**.	**15**
3	**One Essay held in the given semester**	**05**
	Total	**40**

Any two of the following tasks:

a) Presenting a case study/statistical study of a city/region from local, national or global

level pertaining to a specific environmental issue.

b) Field visit and a report/ Case study of conservation efforts at individual/ institutional level.

c) Awareness activity in the community/school regarding various environmental issues through an exhibition or display.

d) Using storytelling in the classroom to raise understanding of environmental values as they are portrayed in ancient religious systems.

e) Creating an instructional plan to teach environmental education and practice lessons for curricular and extracurricular activities in the classroom.

f) Carrying out a single college-level project, like terrace gardening, paper recycling, vermi-composting, etc.

g) Organizing any one co-curricular activity to impart environmental education in school or college and writing a report.

h) Creating a report on an environmental audit for a specific procedure.

i) Holding a seminar on any government program aimed at protecting the environment or any group that works to do so, such the Chipko Movement, Narmada Bachao Andolan, Green Peace, etc.

j) Conducting an activity based on Indigenous Technical Knowledge (ITK) Practices and submit a report

MODULE-I: FUNDAMENTALS OF ENVIRONMENTAL EDUCATION

UNIT 1: CONCEPT OF ENVIRONMENT & ITS ISSUES

a) Environment: Meaning, Components (Biotic and Abiotic), concept of Eco System, Ecological Pyramids (Numbers, Mass, Energy), Food Web.

b) Major Environmental Issues: Meaning, Causes, Effects and Remedies – Climate Change, Loss of Biodiversity.

c) The concept of entropic pollution and ecological energy dynamics. (The idea of pollution in relation to energy loss due to different types of pollution)

Sub-unit a)

Environment – Meaning:

- An organism's surroundings, which comprise both living and non living elements, are referred to as its environment.
- Derived from a French word *'Environ'* means to 'Encircle' or 'Surround'.
- The environment is made up of the air, water, and land as well as the interactions between these elements and with people, plants, animals, and other living things.
- Environment thus includes all physical and biological surroundings and their interactions.

Sub-unit a)

Concept of Eco System:

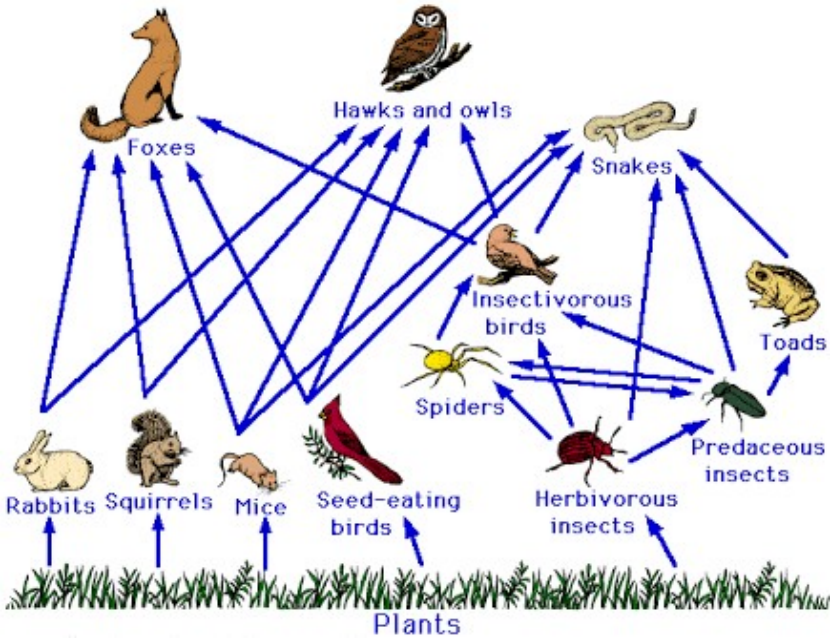
- ""An ecosystem is a specific class of physical systems that includes organisms and inorganic elements in a reasonably stable equilibrium, open, and varying in size and type." – *Sir Arthur. G Tansley (1935)*
- ""The ecosystem entails the movement, conversion, and build-up of matter and energy via living things and their activities."– *Evans (1956)*
- The word ecosystem is not a synonym of habitat, community or some other similar descriptive terms. Rather, it is a technical term in ecology and refers to *"a system of living and non-living components interacting as a whole."*

Sub-unit a)

Food Web:

- Energy moves throughout the biosphere from producers to primary consumers, then from primary consumers to secondary consumers, then to tertiary consumers, and finally to decomposers. The "food chain" is the movement of energy from producers to consumers and ultimately to decomposers.
- Nevertheless, an ecosystem's food chain is not always straightforward and linear; occasionally, it becomes complex due to multiple interconnected, overlapping food chains. This occurs when more species consume a wider variety of prey. The term "food web" refers to the intricate food chain that forms a network-like structure.

FOOD WEB



Sub-unit a)

Ecological Pyramids (Numbers, Mass, Energy):

- Producers (autotrophs), primary consumers (herbivores), secondary consumers (primary carnivores), and tertiary consumers (top consumers or top carnivores) are the different trophic levels that make up an ecosystem.

- Food energy moves from one trophic level to another, and throughout this process, a large portion of its energy is lost as heat. As a result, each trophic level gets less energy than the one before it. As a result, the food chain's energy level eventually tapers to resemble a pyramid.

- The graphic representation of relationship between the various trophic levels of a food chain is called as **Ecological Pyramid**.

Ecological Pyramid of Numbers:

- In this, the number of organisms of each trophic level is counted and accordingly respective volumes to each trophic level in the pyramid is allotted.

- A pyramid of numbers represents the total number of persons (population) at each trophic level.

- In 1972, Elton John made the phrase "pyramid of numbers" widely known.

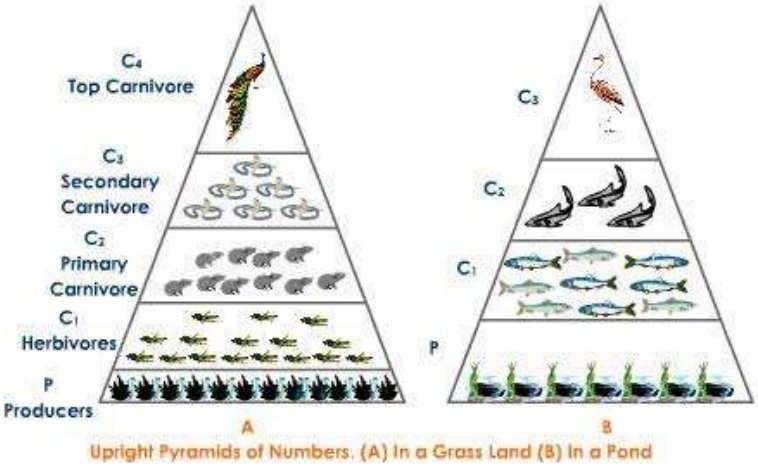
- This pyramid is incredibly effective in counting the number of organisms.

- Counting is a simple method that may be used to track changes in an ecosystem over time. But some organisms are hard to count, especially young forms.
- The number pyramid is classified as either upright or inverted based on the quantity of organisms.

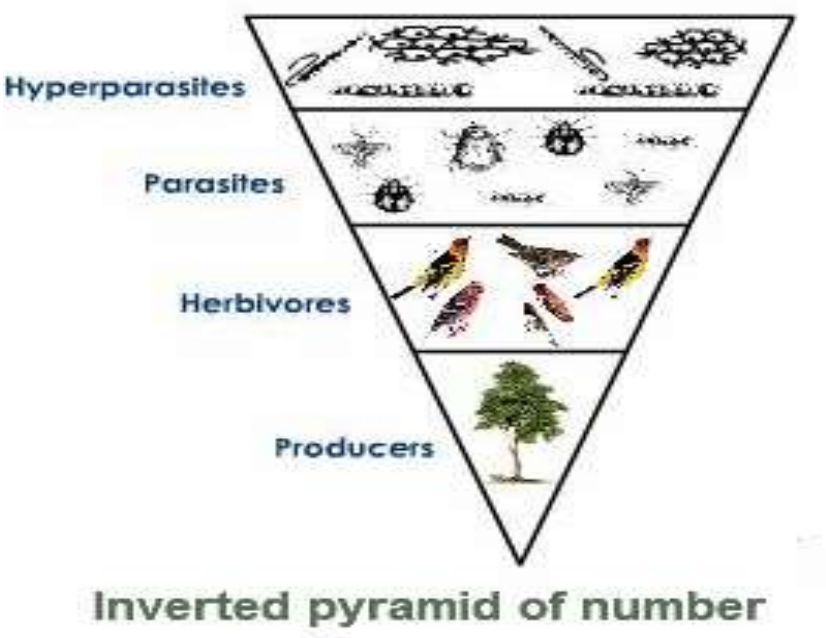
  Eg: Grassland ecosystem (upright),

  Pond ecosystem (upright),

  Tree ecosystem (inverted).



Upright Pyramids of Numbers. (A) In a Grass Land (B) In a Pond



Inverted pyramid of number

Ecological Pyramid of Mass:

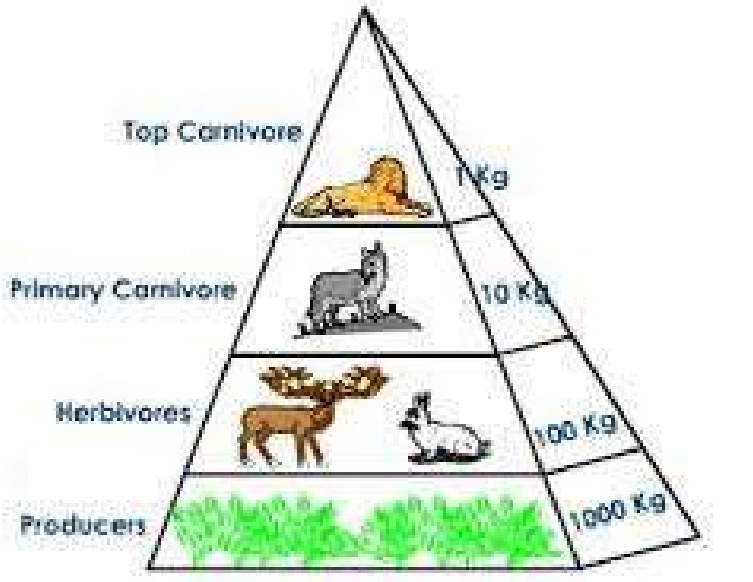
- Biomass is the total weight of dry matter (dry weight) present in the eco system at any one time. Ecological pyramid of mass shows the total biomass of organisms at each trophic level and provides a rough picture of the overall effect of the food chain relationships for the ecological group as a whole

- The amount of living material in an individual or group of individuals per unit area product is known as biomass at a particular trophic level.
- The amount of biomass found in each trophic level is represented by each level of this type of ecological pyramid.
- The law of thermodynamics serves as the foundation for the biomass pyramid's portrayal.
- This law states that energy can be changed from one condition to another but cannot be created or destroyed.
- In particular, energy is transformed into biomass after being transferred from producers to consumers and so forth.
- The quantity of biomass available due to species at different trophic levels can be calculated using a biomass pyramid.

- Eg: Grassland ecosystem (upright),

  Forest ecosystem (upright),

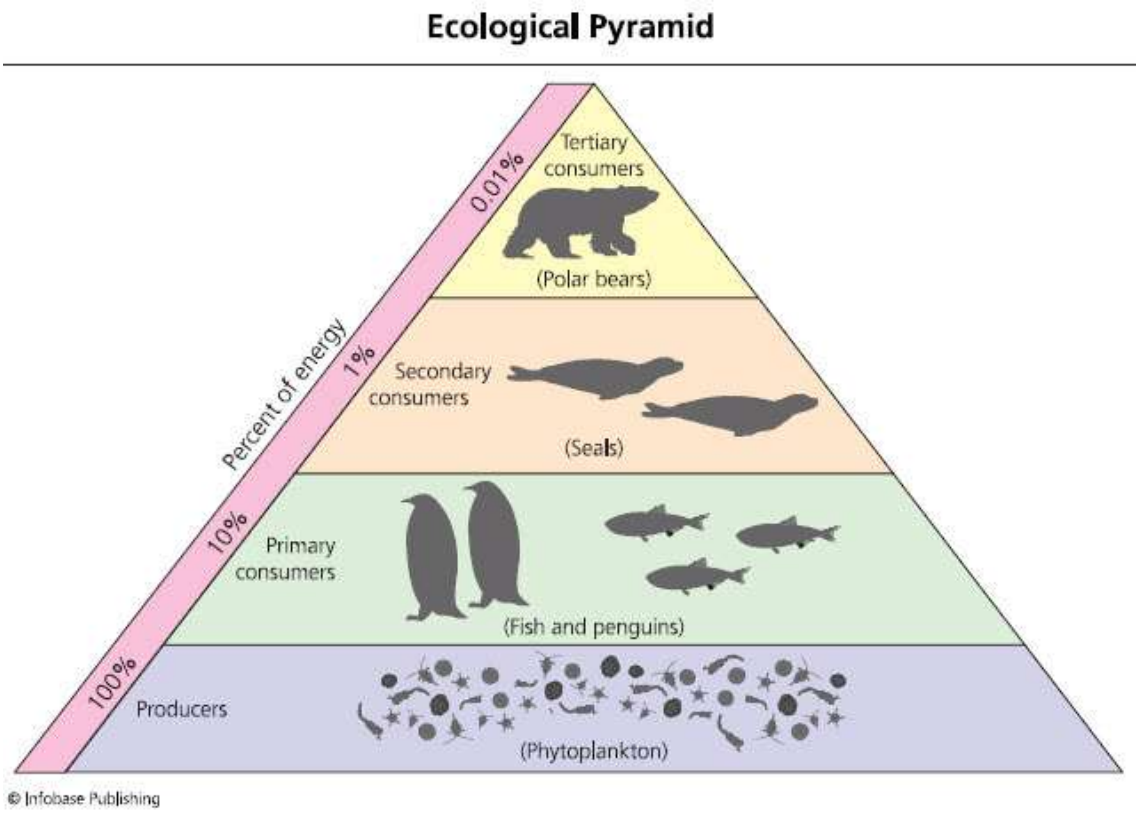
  Pond ecosystem (inverted).



Upright Pyramid of biomass in a Terrestrial Ecosystem

Ecological Pyramid of Energy:

- At every trophic level organisms use the energy from the previous trophic level for its own growth and metabolism while some amount of energy is lost to the environment in the form of heat. Thus the energy transfer is never 100%.
- Eventually, the amount of energy and matter transferred through food to successive higher trophic levels become less and less which forms the energy pyramid. (and hence it is always upright)



Sub-unit b)

Major Environmental Issues – Climate Change:

Meaning:

- Any substantial, long-term shift in the "average weather" that a particular area experiences is referred to as climate change.
- Average weather may include average temperature, precipitation and wind patterns.
- It involves changes in the average state of the atmosphere over durations ranging from decades to millions of years.

Major Environmental Issues – Climate Change:

Causes – Natural:

- Volcanic eruptions
- Earth's tilt
- Continental drift
- Greenhouse gases

Causes – Human:

- A rise in greenhouse gas emissions brought on by human activity:

  - Carbon dioxide: deforestation, land clearing, agriculture and other activities
  - Methane: domesticated animals (cud-chewing process), rice and paddy fields (flooded during sowing and maturity periods), coal mining, oil drilling, leaking gas pipelines, etc.
  - Nitrous oxide: fertilizer application

- Humans are also directly responsible for climate change.

Effects:

- Increase in temperature due to rising CO_2 concentrations.
- Sea levels increase as a result of glacier melting.
- The frequency and destructiveness of strong hurricanes are increasing.
- Precipitation is causing some rivers to overflow, while evaporation is emptying others.
- Disruptive patterns of rainfall – some areas heavy rainfall and some will see low rainfall.
- Effects on human health – heat stroke, spread of diseases like malaria and dengue, deaths and injuries due to calamities like: droughts, storms and flooding, etc.
- Effects on water resources – drought, rivers drying up, flooding, water-borne diseases, etc.
- Effects on agriculture: decline in crop productivity due to increased temperatures and drought. This may lead to food shortage with further social implications.

- Declining biodiversity.

Remedies:

- Reduce vehicular use and advocate fuel efficient vehicles
- Make greater use of unconventional energy sources, such as solar power.
- Decrease deforestation and promote afforestation.
- Reduce your carbon footprint
- International initiatives such as – Kyoto Protocol (Emission restrictions on industrialized countries.)

Individual actions –

- ✔ Turn off your appliances when not in use
- ✔ Switch to energy efficient CFL bulbs
- ✔ Buy products made locally and with less packaging
- ✔ Use as little paper as possible (use both sides of paper)
- ✔ Use public transport/ car pool service/ ride a cycle/ walk

Sub-unit b

Major Environmental Issues – Loss of Biodiversity:

Meaning:

- Biodiversity can be described as the variety of all living things, including plants and animals (species) and the places they live (ecosystems).
- Biodiversity includes the rich diversity of forms right from molecular unit to the individual organism, to population, community, habitat, ecosystem, landscape and biosphere levels.

Currently there is much concern over the increasing impact of human actions on biodiversity leading to decline or loss of biological diversity.

Major Environmental Issues – Loss of Biodiversity:

Causes:

Human influence on the world's ecosystem is the main cause of biodiversity loss:

- Habitat destruction – deforestation and over-grazing of forests by cattle

- Rapid growth includes townships, roads, industry, mining, agricultural, and river valley projects.
- Poaching – for animal parts used in medicines or other reasons.
- Introduction of exotic species – causing damage to the local ecosystem .
- Pollution – putting birds and other wildlife at risk.
- Climate change – species that are unable to adapt are facing extinction.

Major Environmental Issues – Loss of Biodiversity:

Effects:

- The loss of even one species can ruin an entire ecosystem of plants and animals.
- The loss of plant species with their ecological and economic value.
- Reduced benefits to a human being in terms of health and medicine due to biodiversity loss.
- Effect on food supply
- Effect on industrial production that draws raw material from nature – Eg: rubber, turpentine, gums and resins, paper, dyes, fiber, etc.

Major Environmental Issues – Loss of Biodiversity:

Remedies:

- Making policies that constantly monitor dangers to biodiversity and take corrective measures when required.
- Restricting commercial development in ecologically sensitive areas.
- Protecting existent biosphere reserves.
- Documenting traditional knowledge before it is lost and use it to save resources that are been eroded.
- Reintroduce, relocate, and rehabilitate, threatened species through captive breeding.
- Create wildlife protected areas with strict penalties for violations.
- Train and involve village communities in forest and wildlife management.

Sub-unit c)

Ecological Energy Dynamics and Entropic Pollution

- Environmental Pollution
- Laws of Thermodynamics governing Ecological Energy Dynamics
- Concept of Entropy and its relation to Pollution

Environmental Pollution:

- Pollution is an undesirable change in the physical, chemical, or biological characteristics of our atmosphere; land and water that harmfully affect human life or that of desirable species.
- Pollution is a detrimental change in the environment that affects our living conditions, cultural assets, industrial processes, that may waste or deteriorate our raw material resources and in fact everything that supports human existence.
- Etymologically, the term '*Pollution*' owe its origin to a Latin word '*Pollutionem*' which means '*Contaminate*' or '*Spoil*'.
- So the literal meaning of the term 'Environmental Pollution' can be 'a process that contaminates or spoils the environment'.
- Pollutants are residue of the things we make, use and throw away.

Laws of Thermodynamics

- First law of thermodynamics:

  "Energy is neither created nor destroyed, but it can change forms."

Second law of thermodynamics:

"Unless energy is degraded from a concentrated to a dispersed form, no process involving an energy transformation will happen spontaneously."

(In other words, transformation of energy is not 100% efficient.)

- It thus indicates presence of two kinds of energy in our ecological system:

  a) *'Unavailable Energy'* – degraded energy not available for work

  b) *'Available Energy'* – energy available to do work

Ecological energy dynamics:

- When an ecological system is young, the major flow of energy is directed towards its **'Productivity'**. But as the complexity of the system rises, the greater proportion of the **'Available Energy'** in the system, instead of directing towards its productivity is shifted more towards maintaining the complex structure that has been created.
- Eventually such a complex and matured system is seen to be associated with a tremendous **'Loss of Energy'**.
- In brief, more complex system is associated with a limited 'Available Energy' that will delimit or restrict its further development.
- Another factor associated with environmental energy-dynamics is the progressive loss of energy due to transfer of energy.
- More the phases of energy-transfer, energy-loss associated is also seen to be more.
- High energy-loss in more complex systems is therefore attributed to this factor also.
- The same principle is seen in ecological food-chains too. As we move higher from lower trophic levels to higher trophic levels, the proportion of 'Usable' energy goes on decreasing.

Progressive Loss of Energy in Food Chain

'Unavailable Energy' or 'Entropy' is 'Pollution':

- According to thermodynamics, there are basic rules for the conversion of energy and matter from one form in to another.

- According to these thermodynamic principles, whenever any mechanical work is done, it increases the 'disorder' of the system.
- This increased disorder is an indication of the 'loss of available energy' in the system which is termed as Entropy.
- As per the thermodynamics definition, 'Entropy' is the 'Unavailable Energy' with the system and it is the measure of 'Disorder' of the system.

- 'Pollution' is an undesirable or adverse change in the environment. It is also indicative of the increasing disorder of the system. So that we can say, 'Pollution' is nothing but 'Entropy' or 'Unavailable Energy' in the universal system.
- Thermodynamics indicates that 'economic growth' is responsible for the 'increasing disorder' of our ecological system contributing to Entropic Pollution.
- More specifically, increasing the flow of energy and matter through society, as happens in the process of on going industrialization, -there is progressive loss & depletion of energy & matter, or otherwise stated, generating a state of increased "entropy" (disorder).
- Excessive entropy production is reflected in in natural disorders such as greenhouse effect, depletion of ozone layer, environmental pollution, etc.

Polluted Environment-A running down clock

- Another important fact is that earth is a closed system in relation to the universe. It exchanges energy but not matter with its surroundings, and the amount of energy in the universe is constant.
- These two laws mean that the matter that makes up the earth is continuously dissipating. This means that the earth and the universe is like a clock which is running down, whose entropy (disorder) is increasing continually.
- This kind of loss, wastage or penalty is called entropy or unavailable energy which is pollution.

Entropic Pollution (w.r.t. pollution types):

1. During vehicular combustion of fuel to run an automobile engine, incomplete combustion of fossil fuel leads to gaseous exhausts. These vehicular exhausts are harmful gaseous pollutants which is also a form of entropic unavailable energy.
2. When a locomotive metallic wheel moves on a railway track, there is a friction producing heat and sound which adds to loss of thermal energy and also producing sound/noise pollution.

3. Radio-chemical processes dissipate nuclear energy in the form of nuclear waste and harmful radiations leading to radioactive pollution.
4. Industrial processes are associated with dissipation of enormous heat energy leading to thermal pollution.
5. Water is often used as a coolant in many industries. Hot water thrown out from these industries as an effluent damages the surrounding eco-system and contaminates outside water bodies. This hot water is a result of unused heat energy from factories which is also a form of entropic unavailable energy permanently lost to the system that causes pollution.

References:

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  -Dr. R. A. Sharma
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- Sandharaniya Paryavaran Vyavasthapan

- S. Rajpurkar

UNIT 2: DEVELOPMENT OF ENVIRONMENTAL EDUCATION (5 Lectures)

a) **Historical Developments:**

- Stockholm conference (1972),
- Intergovernmental conference (1977),
- Kyoto Protocol (2005),
- Tbilisi + 30 (2007).

b) Environmental Education: Meaning, Objectives, Principles, Significance.

c)Approaches of teaching Environmental Education

(Multidisciplinary and Interdisciplinary)

Task / Assignment:

Conduct an activity based on Indigenous Technical Knowledge (ITK)

Practices and submit a report

a) Historical Developments: Stockholm conference (1972): Sweden first proposed the idea of holding a UN conference to focus on human interactions with the environment to ECOSOC in 1968The United Nations Conference on the Human Environment, which took place in Stockholm from June 5–16, 1972, looked at the necessity of a common viewpoint and set of guidelines to inspire and direct the peoples of the world in protecting and enhancing the environment for humans. Resolution 1346, which supported the notion, was passed by ECOSOC. In 1969, the General Assembly passed Resolution 2398, which called for a conference in 1972 and required the UN secretary-general to submit a series of reports proposing that the conference's main objective be "stimulating and providing guidelines for action by national government and international organizations" in the face of environmental challenges.

Intergovernmental conference (1977)

From October 14–26, 1977, the United Nations Education, Scientific, and Cultural Organization (UNESCO) and the U.N. Environment Programme (UNEP) held the world's first intergovernmental conference on environmental education in Tbilisi, Georgia (USSR).Participating were representatives from 66 member nations as well as observers from two non-member states. Participants included representatives and observers from eight U.N. programs and agencies.

Twenty international nonprofit organizations and three additional intergovernmental

organizations were also present.
There were 265 attendees, 65 delegates, and 65 observers at the meeting. The worldwide gathering ended with a resounding embrace of the Tbilisi Declaration.

According to the declaration, everyone agreed that environmental education is crucial to both the sustainable and healthy development of global communities and the preservation and enhancement of the environment.

Kyoto Protocol (2005):

Background and provisions

Adopted as the first amendment to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol obligated members to create national plans to cut their greenhouse gas emissions. Perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulfur hexafluoride (SF6), carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and other greenhouse gases alter the energy balance of the global atmosphere in ways that are predicted to raise the average global temperature, a phenomenon known as global warming (see also greenhouse effect).
The Intergovernmental Panel on Climate Change, which was created in 1988 by the World Meteorological Organization and the United Nations Environment Programme, predicted that the long-term effects of global warming would include melting glaciers, sea ice, and Arctic permafrost; an increase in the frequency of extreme climate-related events, such as floods and droughts, and changes in their distribution; a general rise in sea level worldwide, which would inundate low-lying coastal areas and possibly lead to the disappearance of some island states; and an increased risk of extinction for 20 to 30% of all species of plants and animals.

The Kyoto Protocol obligated the majority of Annex I signatories to the UNFCCC (which included several nations with "economies in transition" and members of the Organization for Economic Co-operation and Development) to mandatory emission-reduction targets that differed based on each nation's particular situation. The UNFCCC and the convention did not oblige other members, primarily developing nations, to limit their emissions. Ninety days after being approved by at least 55 Annex I signatories, who collectively contributed at least 55% of 1990's total carbon dioxide emissions, the agreement came into effect in February 2005.

The protocol gave nations a number of ways to accomplish their goals. Utilizing "sinks," or natural processes, that extract greenhouse gases from the atmosphere, was one strategy. One example would be planting trees, which absorb carbon dioxide from the atmosphere. Another strategy was the Clean Development Mechanism (CDM), an international initiative that urged wealthy nations to invest in infrastructure and technology in developing nations where there were frequently substantial chances to cut emissions.
The investing nation could use the successful emission reduction as a credit toward fulfilling its responsibilities under the CDM. An investment in a clean-burning natural gas power plant to replace a projected coal-fired facility would be one example. Emissions trading was a third

strategy that gave greenhouse gas emissions an economic value by enabling participating nations to purchase and sell emissions rights. An emissions-trading system was established by European nations as a way to meeting their commitments under the Kyoto Protocol. In addition to being barred from participating in emissions trading until they were deemed to be in compliance with the protocol, countries that did not meet their emissions targets would have must compensate for the discrepancy between their intended and actual emissions, along with a 30% penalty, during the subsequent commitment period, which begins in 2012. Protocols in the future that aim to establish emission goals for commitment periods after 2012.

Introduction

The Kyoto Protocol was negotiated by numerous countries in December 1997, and it became operative on February 16, 2005, when Russia ratified it. The Kyoto Protocol's requirements that at least 55 parties ratify the agreement and that the combined emissions of those parties equal at least 55% of the world's greenhouse gas production were the cause of the protracted period between the agreement's terms being decided upon and the protocol being engaged.

The United Nations Framework Convention on Climate Change, or UNFCCC, served as the framework for the protocol's development. In addition to reducing carbon dioxide emissions, participating nations that have ratified the Kyoto Protocol have also pledged to reduce emissions of other greenhouse gases, such as methane (CH4), Hydro fluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrous oxide (N2O).

Participating nations must engage in emissions trading, which entails purchasing "credits" from other nations that are able to surpass their reduction targets in order to make up for any emissions that continue to exceed the targets. By 2012, Kyoto's participants were expected to have collectively reduced greenhouse gas emissions by 5.2% below 1990 levels. Although the 5.2% percentage is a total, different nations were given different goals, and some were allowed to raise their percentages. For instance, a 7% reduction in emissions was anticipated in the USA. You can see from this chart why different nations were given distinct goals:

Difficulties

The Kyoto Protocol was a historic diplomatic achievement, but its success was far from guaranteed. In fact, the majority of countries would not meet their emission objectives, according to reports released in the first two years following the treaty's implementation. However, some critics argue that even if the targets were met, the ultimate environmental benefit would be negligible because the United States, the second-largest emitter of greenhouse gases, and China, the world's largest emitter, were not bound by the protocol (the United States because it had not ratified the protocol, and China because it was a developing country). Even if the protocol's emission reductions were completely implemented with U.S. involvement, other critics said that they were too small to have a discernible impact on world temperatures in the ensuing decades. In the meantime, some developing nations contended that enhancing climate variability and change adaptability was equally as crucial as cutting

greenhouse gas emissions.
Tbilisi + 30 (2007): Held at Ahemedabad, the fourth International Conference on EE

In the context of the UN DESD, India in 2007 represents 30 years following Tiblisi.

The opinions and viewpoints of more than 1,500 attendees from 97 nations at the Ahmedabad Conference are reflected in this publication. In addition to a conference deliberation and recommendations on over 30 subjects covered by conference working groups, it focuses on common themes brought up throughout the conference.
The conference also suggests adjustments in a number of areas of practice and thought.

• Modify the way you think about learning and education:

• Modify leadership and partnership formation patterns:

• Modify our perspective on environmental issues:

• Modify our understanding of and approach to the link between environment and development:

• Modify our communication methods and the way we perceive knowledge:

• Modify learning environments and patterns and practices of participation:

On November 28, 2007, at the Center for Environment Education in Ahmedabad, India, the delegates at the 4th International Conference on Environmental Education endorsed these proposals.

Highlights of the Meeting
The 18th International Conference on High-Energy Physics, part of the 'Rochester' Conference series, took place in Georgia's capital city of Tbilisi from July 15–21, 1976. The great poet C. Roustaveli, whose famous poem "The Prince in the Lion's Skin" dates back to the 12th century, and Joseph Stalin are two examples of men from Georgia, one of the 15 Soviet republics, that had quite different personalities. The rich plains that have provided a privileged life to a series of conquerors over the last three millennia stand in stark contrast to the range of Caucasus mountains that encircle and cross this area. Numerous monuments that beautifully demonstrate the diverse and extremely sophisticated manifestations of the architectural and decorative arts bear witness to the early Christian stronghold that was established in this nation. When choosing the "highlights" of the conference, I wanted to talk about only the topics that had the biggest impact on our core ideas during the last year, rather than listing all of the many fascinating findings that were presented in Tbilisi. According to general agreement, some of the issues seemed resolved, while others were still hotly contested and held out the possibility of exciting outcomes soon.

b) **Teaching about the environment:**

Meaning: E. E. is a comprehensive process that addresses how humans interact with their natural and artificial surroundings, including how population increase, pollution, resource allocation and deflection, conservation, technology, and urban and rural planning relate to the overall human environment.

E. E. is a study of the factors affecting ecosystems, population pressures, deteriorating cities, mental and physical health, and leaving and working conditions.

E. E. is the process of recognizing values and clarifying concepts related to environment and its problems in order to develop skills and attitudes necessary to understand the environment.

E. E. also involves self-improvement in decision-making and the development of a code of conduct on environmental quality issues.

Objectives:

- Awareness: to assist people and social groups in being sensitive to and conscious of the environment as a whole and the issues that surround it.

- Knowledge: to assist people and social groups in gaining a fundamental awareness of the environment as a whole, the issues that surround it, and humanity's vitally important role and presence within it.

- Attitude: to encourage people and social groups to develop strong environmental concerns, social values, and the drive to actively contribute to its preservation and enhancement.

- Skills: to assist people and social groups in developing the abilities necessary to address environmental issues.

- The ability to assess environmental policies and educational initiatives in terms of ecological, political, economic, social, aesthetic, and educational aspects is a useful skill for people and social organizations.

- • Participation: to ensure that the right actions are taken to address environmental issues by assisting people and social groups in developing a feeling of urgency and responsibility.

Environmental Education Principles: The following are the principles that advocate for the inclusion of environmental education in the curriculum:

• The reciprocal impact and reliance principle states that each element depends on and

influences the others, either directly or indirectly. Key words are interaction and interdependence.

• The principle of balance states that there is ecological equilibrium and that the ecosystem stays relatively stable as a result of this dependency and interaction.

• The principle of unity states that all constituents are composed of the same structural and functional units, namely cells, and the same basic units, namely amino acids. This isn't true for synthetic materials.

- The diversification principle states that different creatures have different morphological traits. The environment is stable because of this diversity.

• The active tendency principle states that organisms can become resistant to substances that are created by humans.

• The principle of continuous production states that while an organism's normal loss is replaced, nature maintains the majority of its population within certain bounds. Any excess is harmful.

Environmental education's importance:

• E. E. is crucial for social development and self-fulfillment in both children and adults.

• It supports self-preservation, life and health maintenance, and the

• the preservation of humanity.

• It facilitates comprehension of the many food chains and natural ecological equilibrium.

• It is beneficial to comprehend and value the ways in which the environment supports a material culture and is utilized to earn a living.

It facilitates the enjoyment and appreciation of society and the natural world.

• It systematically raises long-term concerns about the changing environment.

• as well as humankind's present well-being.

• It draws attention to the issues of population growth, depletion of

• environmental contamination and natural resources and provides insight into solutions.

• E. E. facilitates the progression of learning experiences from basic to sophisticated.

• E. E. facilitates the transition from vague to specific concepts.

• E. E. facilitates the transition from the concrete to the abstract.

Learning experiences are arranged from the empirical to the logical with the aid of E. E.

• Raising public awareness is the first step in environmental conservation so that it becomes part of people's life style. The key to achieving this goals and objectives lies in environmental education and its related programmes.

c) Diverse and interdisciplinary methods of teaching environmental education

Multidisciplinary strategy:

where elements from two or more academic fields are combined and used to focus on a single issue at the same time.

Multidisciplinary approach:

Where components are drawn from two or more academic disciplines and focused SEQUENTIALLY on a single topic.

Meaning, importance, and the institution's role in interdisciplinary and multidisciplinary teaching and learning

Interdisciplinary and multidisciplinary approaches make educational experiences authentic. Students find greater relevance in curricula that are grounded in real-world experiences. Pupils can recognize logical and organic links between different subject areas. The conventional method of instruction divides the material into sections according to the boundaries of the subject matter. Questions, ideas, issues, and initiatives are at the center of content in interdisciplinary and multidisciplinary approaches.

Meaning of Interdisciplinary teaching and learning

According to Heidi Jacobs, interdisciplinary learning is "a curricular approach and knowledge view that intentionally uses methods and vocabulary from multiple disciplines to address a central subject, issue, problem, topic, or experience" Keith Barton and Lynn Smith suggest that interdisciplinary learning is especially important in the early grades so as to "provide authentic experiences in more than one content area, offer a range of learning experiences for students, and give students choices in the projects they pursue and the ways they demonstrate their learning."

According to Barton and Smith, interdisciplinary units give students the chance to see the connections across subject areas and participate in real-world activities while also allowing teachers to make better use of class time and cover material in greater detail.

Academic fields are excellent venues for knowledge generation and transmission. However, in order to handle complicated problems and comprehend concerns, interdisciplinary learning is necessary because one subject may not be able to adequately address or resolve a situation.

In a nutshell, interdisciplinary learning is the process of using the insights from various disciplines to answer a question, solve a problem, or address a topic that is too broad or complex to be adequately handled by a single discipline. The ultimate goal is to create a more comprehensive understanding.

There can be two distinct approaches to interdisciplinary:

i. The integrationist approach, which examines a process that links, synthesizes, or blends concepts, data, techniques, and tools from two or more disciplines.

ii. The generalist approach, in which two or more disciplines interact or converse with one another without being merged into a single field. This method is regarded as multidisciplinary by some specialists.

Qualities of multidisciplinary education

1. Multiple disciplines are incorporated into interdisciplinary learning. Multidisciplinary learning is influenced by a variety of fields. The student can comprehend different viewpoints on the problem under investigation thanks to the content derived from each subject. For instance, when studying "War," we might consult the following sources: History (to learn about actual wars), Economics (to learn about the economic causes and consequences of war), Geography (to learn which areas have been affected by war), Literature (to see how poets and writers depict war-related events), and Political Science (to see how political affairs determine war-related events).

2. A clear goal that transcends the boundaries of a single field is essential for interdisciplinary learning. The scope of interdisciplinary learning is so broad that it cannot be fully understood by one field alone. For instance, the subject of "health" is not solely associated with science. Geographical and economic viewpoints will be included because climate may have an impact on health and because certain diseases are linked to socioeconomic standing.

3. Because interdisciplinary learning takes a pragmatic approach, it ought to encourage fresh perspectives or innovative solutions about the problem under investigation. Students who learn through interdisciplinary approaches cultivate a problem-solving mindset.

4. The dialectical process of interdisciplinary learning necessitates collaboration between individuals from multiple disciplines. Concepts and viewpoints from several disciplines are logically discussed. It may be necessary to consult with experts in different fields in order to grasp a problem from a variety of viewpoints. This aids in the development of more rational and impartial findings regarding the problem under investigation.

5. Multidisciplinary education promotes integration. Discipline views are purposefully and effectively integrated by instructors and students. components of various fields of study (knowledge) to meet the needs of the students.

- Instructors must select subjects that allow for opportunities to engage in multidisciplinary and interdisciplinary learning. Teachers of a given class should search for common subjects that can be addressed through interdisciplinary or multidisciplinary techniques when they are making plans for the year.

  • Multidisciplinary learning can be facilitated by combining different teaching methods and strategies. Project-based learning is now incorporated into the majority of curricula. This is an excellent time to make plans for multidisciplinary education. Offer a variety of educational experiences that demonstrate an interdisciplinary and discipline-based approach. It is necessary to pursue interdisciplinary studies after gaining a fundamental foundation in subjects.

- A teacher might increase their knowledge of various fields by participating in seminars and workshops. Thinking outside of one's primary field of expertise will be aided by this.

- The instructor will be able to think across disciplines if they conduct multidisciplinary and interdisciplinary study. This will assist in giving pupils more direction as they strive for multidisciplinary and interdisciplinary learning.

  • It is insufficient to merely plan for multidisciplinary and interdisciplinary learning. Students need to be asked epistemological questions like "What is knowledge?" by their teachers. "What are we aware of?" as well as "How can we connect knowledge with practical application?" In transdisciplinary learning, a constructivist approach—where students investigate and take ownership of their education—will work well.

- Instructors might ask professionals outside of the academic community to offer their perspectives on the subject under investigation. For instance, while discussing the topic of "pollution," professionals like Pollution Control Board officers, physicians, and environmentalists can be asked to engage with the students.

Students' roles in heterogeneous and interdisciplinary learning

• Pupils ought to cultivate a positive outlook on every subject. It is detrimental to view one field as superior to another since it only provides an incomplete understanding of a subject.

• One surefire method to support interdisciplinary and multidisciplinary learning is to read and reflect. Meaningful interdisciplinary learning can be achieved by reading papers from several fields and, more crucially, by considering what each field has to contribute.

• Extended learning locations that support multidisciplinary learning include historical museums, monuments, libraries, labs, and science centers. It is not appropriate to characterize these visits as leisure. Instead, they ought to be seen as chances for integrated learning.

• Students should, if at all possible, participate in the creation of interdisciplinary units. In higher education, where pupils are more mature and capable of critical thought, this might be feasible.

• As a result, curriculum designers, the institution's director, instructors, and students all share responsibilities for assuring interdisciplinary and multidisciplinary learning. To make this endeavor successful, others, such as scholars and community experts, may also contribute their own ideas.

 Strategies to Promote Interdisciplinary Learning

Team Teaching for Interdisciplinary Learning
An approach to faculty organization known as interdisciplinary team organization places a group of professors in the same group as students and assigns them the task of developing, instructing, and assessing the curriculum and instruction in many academic fields. (Alexander and George, 1993). In team teaching, several teachers collaborate to organize, carry out, and assess the learning activities for the same class of pupils. Teams are typically made up of staff members who may have varying specialties but who work with the same students and have a shared planning period to get ready to teach.

James Beane, who has written extensively about interdisciplinary teaching methods, supports curriculum integration, or curriculum that is created cooperatively around significant topics. Experience integration, social integration, knowledge integration, and curriculum design integration are its four main constituents. It is distinct from other forms of interdisciplinary instruction in that, regardless of academic boundaries, it starts with a fundamental theme that arises from students' queries or social issues (Beane, 1997).

Characteristics of Interdisciplinary Team Teaching
 The team of teachers should represent varied disciplines.
 Learning must centre around a topic that cuts across different disciplines.
 All team members pool in their expertise and resources to help the learners understand the concept as an integrated whole

 Each teacher gets appropriate space and time. No subject is considered superior to the other in interdisciplinary team teaching.

 In team teaching, the group of teachers has to consider the needs of their pupils and they should teach jointly to satisfy their needs and remove the difficulties of their students.

Organization of Interdisciplinary Team Teaching

Successful team teaching that cuts across different disciplines depends upon effective planning, organization, execution and evaluation.

(1) **Planning**: Planning is a crucial stage in Interdisciplinary Team Teaching. This will involve

i. Planning the team: Once the main theme is decided, then the team should be carefully selected. Teachers from other disciplines could be the only members of the team. It could even consider inviting experts or professionals who can contribute from their fields. The team should be of optimal size. Assign duties to the team members.

ii. Planning the content: Content may ideally be chosen to include what is in the curricula of different subjects. Additions may be made keeping in mind the needs, interests, maturity of the learners and other aspects like time and resources. All team members must contribute towards planning for content. While planning consider a series of essential questions that can be addressed by examining the issue through different disciplines.

iii. Planning the learning experiences: A blend of learning experiences must be planned. These should be suitable to the age of the learners and resources available. Knowledge of students' background prior to the programme will help to plan in an effective manner. Adequate provision must be made to include the element of interdisciplinarity. This can be done by including experiences as writing reflective logs, discussion and making presentations.

iv. Planning with respect to resources: Bear in mind space available, resources in form of books and experts so that students get to learn from variety of resources. Information technology must be optimally used to provide resources in form of interviews, videos, news reports and statistical data. Provision in the timetable must be made.

(2) **Executing**: Begin by making students aware of the theme and the objectives of the interdisciplinary team teaching programme. It is beneficial to let students know what they are expected to do, what kind of learning experiences they will participate in and what sort of output they will be required to supply at the program's conclusion. Introduce the team members to the students. Generally a lead lecture is delivered to give an overview of the theme. During the lead lecture, other teachers note down aspects that they could link to their own inputs. This lecture can be followed by subsequent lectures or learning activities to

integrate experiences from individual disciplines. Efforts should be made to integrate with other disciplines as and when possible through questions, activities and discussions.

(3) **Evaluating**: To ensure meaningful integration of disciplines, it is advisable to have evaluation exercises that draw from different disciplines. Avoid questions that seek responses that lean on one discipline. Think in terms of variety of evaluation procedures such as presentations, exhibitions, problem solving exercises, group discussions or even through role play.

Example of Interdisciplinary Team Teaching

Theme for Interdisciplinary Team Teaching: The Olympics
Level: Class Eight

Team Members: Teachers teaching English, History, Science, Mathematics, Physical Education. An ex Olympian can be invited as an expert. Special assistance will be provided by the librarian.

Main content identified: Origin of Olympics, Features of Olympics, Significance of Olympics to present world, specific issues associated with Olympics

Material Resources: exhibition material, videos, news reports, books,

Time: total six hours spread over one week.

Activities planned to transact the content:

 Lead lecture by Physical Education teacher about sports and games

 Visit to an exhibition featuring the various aspects of Olympic Games

 Viewing of documentaries about Olympics

 Students interview an ex Olympian and write a report

 Science teacher will discuss about diet and sports, sports related injuries. The students will learn how science has impacted Olympics eg: accuracy in recording timings of athletes.

 Mathematics teacher helps students analyse statistical data about Olympics. Students try to see relationships between countries and performance in Olympics. Students use Venn diagrams to compare two events for their similarities and differences.

 The language teacher takes a unit on famous Olympians. Students dramatise events from lives of sportsmen.

 The music teacher can encourage students to play the Olympic anthem

 Students research into changes that the Olympics have undergone from the time of their origin. They also look at issues of racial discrimination in sports, effect of world war on the Olympics. They study contribution of Greek culture. The History teacher provides assistance in this respect.

 Students discuss essential questions like ‘Are sports helping build bridges between cultures?’ ‘How has the nature of Olympics changed during the last century?’ ‘How is science and technology influencing sports?’ ‘Number of Indian athletes getting medals at Olympics is rather limited. How can this situation be improved?’

Evaluation: Report on interview with ex Olympian, Reflective essay ‘What ails Indian sports?’ , an exhibition covering various aspects like origin of Olympics, modern day Olympics, stories of those who achieved at the Olympics, special Olympics, Olympics and politics. understanding and skills) are established a constructive relationship with one another, and the connections that are formed enable pupils to get a greater, more profound, and more comprehensive comprehension of the subject matter being studied.

Four cognitive skills are promoted by interdisciplinary learning, according to Allen Repko, Director of Interdisciplinary Programs at the University of Texas.
a) Perspective Taking Techniques: The capacity to understand multiple viewpoints on a given topic is improved. Pupils gain an understanding of how disciplines differ from one another, particularly in terms of how they tackle problems.

b) Development of structural knowledge: Declarative and procedural knowledge are necessary for problem solving. Declarative knowledge is factual information related to the problem and procedural knowledge is information about the process involved. Both these are enhanced due to use of interdisciplinary learning

c) Integration of conflicting insights: Variety of ideas from different disciplines are incorporated due to interdisciplinary approach. Rather than use approaches from a single discipline, students are encouraged to look out for alternatives from different disciplines and hence insights are enriched.

d) As interdisciplinary knowledge grows, holistic thinking happens. It promotes higher order thinking skills such as creativity, critical and systems thinking, synthesis, evaluation and analysis

Interdisciplinary Learning and contemporary education

There is much emphasis on interdisciplinary learning in the 21st century. Interdisciplinary learning is incorporated into the International Baccalaureate Middle Years Programme (MYP) to help students comprehend bodies of information from two or more topic areas or disciplines in order to integrate them and create new understanding. When students combine ideas, approaches, or communication styles from two or more disciplines or recognized fields of expertise, they exhibit interdisciplinary understanding. This allows them to explain a phenomenon, solve a problem, produce a product, or pose a new question in ways that would not have been possible with just one discipline.

Five guiding principles for curriculum development are proposed by the National Curriculum Framework 2005: (i) relating knowledge to life outside of school; (ii) making sure that learning moves away from rote methods; (iii) enriching the curriculum to go beyond textbooks; (iv) making examinations more flexible and integrating them with classroom life; and (v) fostering an overriding identity informed by caring concerns within our nation's democratic polity. The fundamentals of transdisciplinary learning are based on these ideas. "The NCF recommends the softening of subject boundaries so that children can get a taste of integrated knowledge and the joy of understanding," the executive summary of this historic statement stated unequivocally. Upon close examination, the document facilitates multidisciplinary learning.

Statements such as "Some themes that facilitate interdisciplinary thinking need to be incorporated into an enabling curriculum" are encountered..

<table>
<tr><td colspan="2">This is an illustration of interdisciplinary learning for the "Migration" issue under investigation. Migration</td><td>Secondary Level: Class IX or X</td></tr>
<tr><td colspan="3">Disciplinary Understandings</td></tr>
<tr><td>History</td><td>Geography</td><td>Economics</td></tr>
<tr><td>Students investigate the patterns of migration in various countries and historical periods.</td><td>Students investigate the types of migration, their causes, and trends of migration (both domestic and international).</td><td>Students research the effects of migration on population and livelihoods. They research how migration affects the nations where migrants settle.</td></tr>
<tr><td>Science</td><td>Literature</td><td>Political Science</td></tr>
<tr><td>Students gain knowledge about animal migration. They research migratory trends. Students consider the parallels and discrepancies between human and animal migration.</td><td>Students can see how local and immigrant languages have changed as a result of migration. For instance, the effect of migration on Parsi language. By examining diasporic literature, students will explore the ways in which migrations have</td><td>Students investigate the relationship between migration and politics. They discover answers to issues such as which countries have seen high rates of exodus? What tenable explanations exist for the same? What</td></tr>
</table>

	impacted language and literature.	treatment do migrants receive in the new country?

Integrative Understandings

Through this unit, students will

• Recognize the social, political, and economic factors that influence migration.

• Recognize how migration affects both individuals and society.

• Recognize how migration affects language, art, and science.

• Establish links between topics such as business and migration, economic development and migration, and war and migration.

• Recognize how migration affects a country's political, social, and economic conditions.

• Recognize the differences between animal and human migration.

Assessment of Learning

A variety of evaluation techniques, such as reflective diaries, group discussions, poster presentations, and examination of migration-influenced literature and art forms, might be employed.

To provide a thorough understanding of the causes and effects of migration, emphasis must be placed on the capacity to analyze and synthesize inputs from diverse disciplines and to integrate information from multiple sources.

Some guiding questions to ensure interdisciplinary learning

 Is the unit conducive for interdisciplinary learning?

 Are the disciplinary understandings robust and adequate?

Bio magnification

Bio magnification

• **Bio magnification**, also known as
Bio amplification or **biological magnification**,
is the rise in a substance's concentration,
like the pesticide DDT, which is found in food
chain as a consequence of:

• Persistence

• Food chain energetics

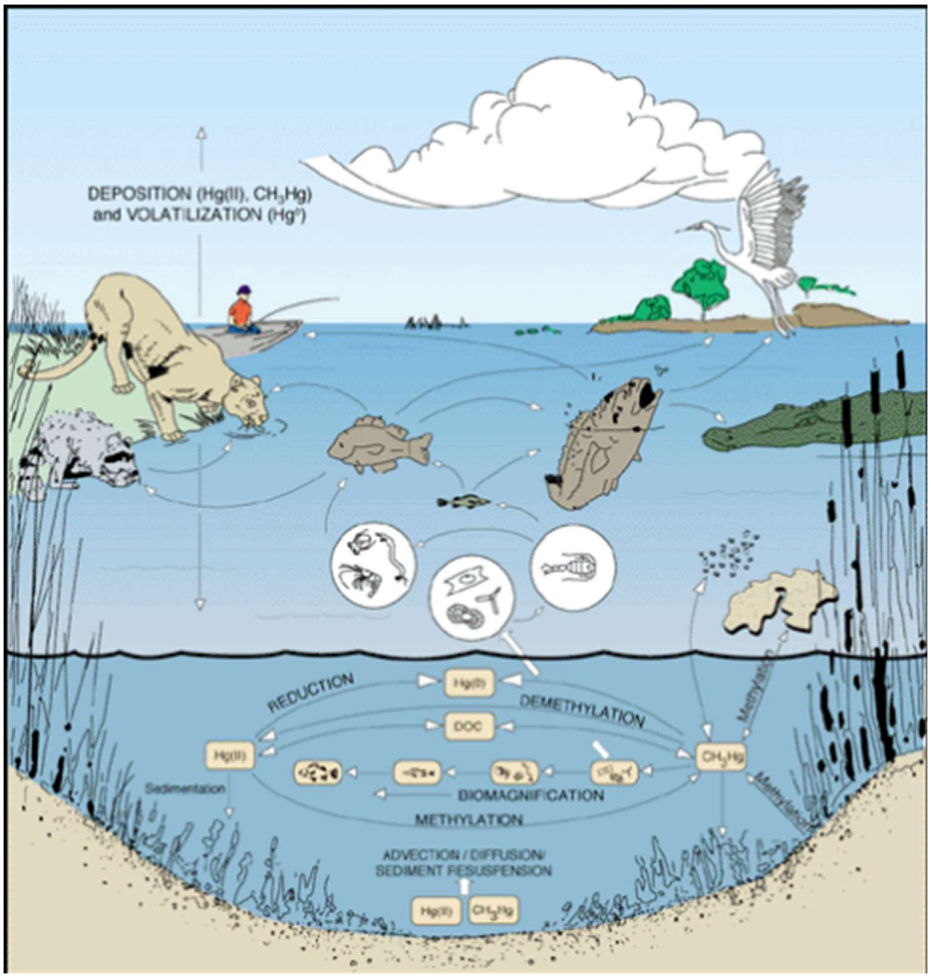
• low rate of excretion or internal breakdown of the substance (often due to water-insolubility)

Mercury

• Minamata a disease or neurological syndrome caused by severe mercury poisoning.
• Symptoms include ataxia, numbness in the hands and feet, general muscle weakness, narrowing of the field of vision and damage to hearing and speech. In extreme cases, insanity, paralysis, coma and death follow within weeks of the onset of symptoms

Mercury case study
• Mercury is often absorbed by humans in two ways:

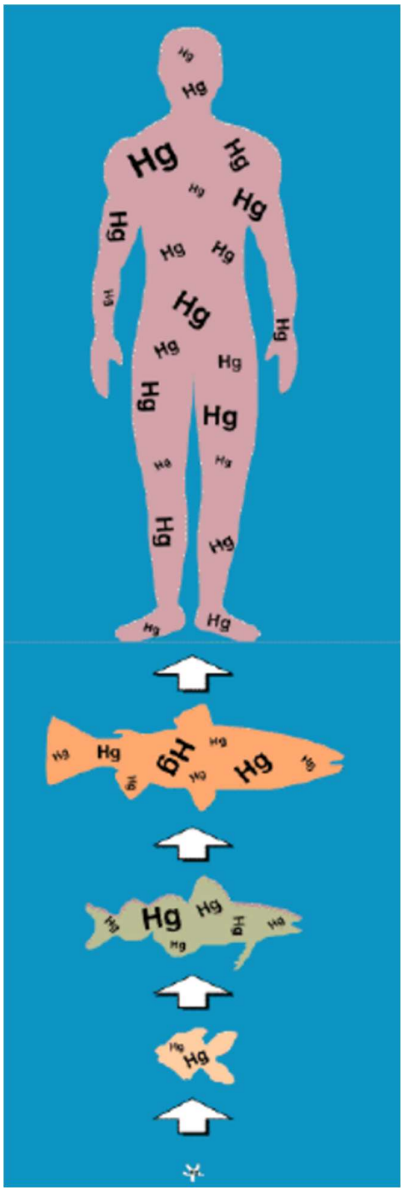
• As methylmercury (CH_3Hg^+) from fish consumption, OR
• By breathing vaporous mercury (Hg^0) emitted from various sources such as metallic mercury, dental amalgams, and ambient air.
• Our bodies are far more equipped to reducing the potential toxicity effects from vaporous mercury, so health effects from this source are relatively rare.



Bio magnification

• So what is happening because methyl mercury (CH3Hg+) is Persistent Meaning it cannot be broken down through natural process it moves up the food chain.

• Every rung in the food chain has a greater concentration, because it is not broken down at the lower levels.



Other things which Biomagnify

• DDTs are a type of insecticide that were formerly

used all the time. It was later found out it

increases the food chain's biomagnification and makes birds eggs soft. The use stopped in most industrialized countries after a large environmental movement.

DDT's still in use
• Some countries with large pest problems
and little money still use DDT's
• Do you think this is right?

ENVIRONMENT EDUCATION

EUTROPHICATION

- ► It comes from the Greek word *eutrophos*, "well-nourished"
- ► It is also known as **hypertrophication,**

- When a body of water is highly loaded with minerals and nutrients, plants and algae grow out of control.

- Excessive plant and algal growth brought on by a rise in one or more limiting growth factors—such as sunlight, carbon dioxide, and nitrogen fertilizers—that are necessary for photosynthesis is known as eutrophication (Schindler 2006). As lakes mature and fill with sediments over centuries, eutrophication happens naturally (Carpenter 1981). However, through point-source discharges and non-point loadings of limiting nutrients, like phosphorus and nitrogen, into aquatic ecosystems, human activities have accelerated the rate and extent of eutrophication (also known as cultural eutrophication). This has had a significant impact on fisheries, drinking water sources, and recreational water bodies (Carpenter et al. 1998). For instance, through bottom-up effects on higher trophic levels, aquaculture scientists and pond managers frequently purposefully eutrophy water bodies by applying fertilizers to improve primary productivity and raise the density and biomass of fishes that are economically and recreationally significant (Figure 1) (Boyd & Tucker 1998). But in the 1960s and 1970s, researchers connected nutrient enrichment from human activities like sewage disposal, industry, and agriculture to algal blooms (Schindler 1974). Blue-green algae blooms (cyanobacteria, Figure 2), contaminated drinking water sources, diminished recreational options, and hypoxia are among recognized effects of cultural eutrophication. In the United States alone, eutrophication-mediated damage is projected to cost $2.2 billion a year.

WHAT ARE ITS EFFECTS?

May cause the aquatic body to lose oxygen.

The "bloom" or significant rise of phytoplankton in a body of water as a result of elevated nitrogen levels is one example.

The development of thick blooms of toxic, foul-smelling phytoplankton that degrade water clarity and damage water quality is the most obvious consequence of cultural eutrophication (Figure 2). In addition to hindering the growth and die-offs of plants in littoral zones, algal blooms also make it more difficult for predators that depend on light to hunt and capture food (Lehtiniemi et al. 2005). Moreover, eutrophication-related high rates of photosynthesis can elevate pH to extremely high values throughout the day and deplete dissolved inorganic carbon. By affecting their chemosensory skills, organisms that depend on the sense of dissolved chemical cues for survival may become "blind" as a result of elevated pH (Figure 3) (Turner & Chislock 2010). Microbial breakdown drastically reduces dissolved oxygen when these dense algal blooms finally die, resulting in a hypoxic or anoxic "dead zone" that is insufficiently oxygenated to sustain the majority of life. Many freshwater lakes, including the Laurentian Great Lakes, have dead zones. (for instance, Lake Erie's central basin; Arend et al. 2011) in the summer. Moreover, it has been demonstrated that these hypoxic events impact over 245,000 square kilometers in more than 400 near-shore systems and are

especially prevalent in marine coastal environments around large, nutrient-rich rivers (such as the Mississippi River and the Gulf of Mexico; the Susquehanna River and the Chesapeake Bay) (Diaz & Rosenberg 2008). Globally, profitable commercial and recreational fisheries are still at risk from hypoxia and anoxia brought on by eutrophication.

Because they generate harmful toxins (such as microcystin and anatoxin-a; Chorus and Bartram 1999), certain algal blooms present an extra risk. Harmful algal blooms (HABs) have been associated with three things throughout the past century: (1) deterioration of water quality (Francis 1878), (2) loss of commercially significant fisheries (Burkholder et al. 1992), and (3) dangers to human health (Morris 1999). Cyanobacteria are the most significant phytoplankton linked to HABs in freshwater environments (Paerl 1988). Because of their superior competitive abilities under high nutrient concentrations, low nitrogen-to-phosphorus ratios, low light levels, reduced mixing, and high temperatures, toxic cyanobacteria such as Anabaena, Cylindrospermopsis, Microcystis, and Oscillatoria (Planktothrix) tend to dominate nutrient-rich freshwater systems (Downing et al. 2001; Paerl & Huisman 2009; Paerl and Paul 2012). Since Francis (1878) first noticed dead livestock connected to a cyanobacteria bloom, poisonings of domestic animals, wildlife (Figure 4), and even humans by cyanobacteria blooms have been reported worldwide. Additionally, cyanobacteria are the cause of a number of off-flavor substances that are present in municipal drinking water systems, such as geosmin and methylisoborneal. in addition to fish raised for aquaculture, which causes significant financial losses for state and local economies (Crews & Chappell 2007). Apart from presenting noteworthy hazards to public health, laboratory studies have demonstrated that cyanobacteria are low-quality food for the majority of zooplankton grazers (Wilson et al. 2006; Tillmanns et al. 2008). This lowers the effectiveness of energy transfer in aquatic food webs and may hinder zooplankton's ability to regulate algal blooms.

Significant alterations in the structure of aquatic communities are also linked to eutrophication. Small-bodied zooplankton typically predominate in plankton communities during cyanobacterial blooms; previous observational studies have ascribed this pattern to cyanobacteria's anti-herbivore characteristics (such as toxicity, morphology, and low food quality) (Porter 1977). Nonetheless, nutrient levels and ecological productivity are frequently favorably correlated with planktivorous fish biomass. Planktivorous fishes, such as shad and bream, become more prevalent with nutrient enrichment, whereas piscivorous species, such as bass and pike, typically dominate the fish community in nutrient-poor, oligotrophic lakes (Jeppesen et al. 1997). Therefore, planktivores' ingestion of zooplankton may be another explanation for why cyanobacterial blooms are not controlled by zooplankton.
HOW IS IT CAUSED?

by the release of fertilizers, sewage, or detergents that contain phosphate or nitrate into an aquatic environment.

THE EUTROPHICATION MECHANISM

Excess of nutrients, which causes plants and algae to proliferate. When these organisms die, the oxygen in the water is used by the bacteria that break down their biomass, which results in hypoxia.

ACCORDING TO ULLMANN'S ENCYCLOPEDIA

- The primary factor limiting eutrophication is phosphate.
- promotes excessive plant growth and decay,
- Favouring simple algae and plankton over other more complicated plants, and causes a severe reduction in water quality.
- In many freshwater habitats, phosphorus is the limiting factor for plant development, despite being an essential ingredient for plant life.
- phosphorus generally is transported by erosion
- The slow rate of phosphate extraction into water after translocation to lakes makes it challenging to reverse the consequences of eutrophication.
- However, numerous literature report that nitrogen is the primary limiting nutrient for the accumulation of algal biomass.

PHOSPHATE SOURCES

- These extra phosphates come from fertilizers, detergents, and home and industrial runoff.
- industrial/domestic run-off and agriculture have emerged as the dominant contributors to eutrophication

REMEDIES TO CURE EUTROPHICATION

Controls

Fisheries, recreational water bodies, and sources of potable drinking water have all been and still are seriously threatened by eutrophication due to the extensive amount of water quality degradation linked to nutrient enrichment. Eutrophication and cyanobacterial blooms are nevertheless common in surface waterways worldwide, despite the fact that many towns have enacted laws to control point-source loading of nutrients (Smith & Schindler 2009). It is urgent for water resource managers to learn ways to reduce the frequency and severity of algal and cyanobacterial blooms since human population expansion and predicted climate change could worsen water quality and quantity (Paerl & Paul 2012).

A range of tactics are often used by water resource managers to reduce the impacts of cultural eutrophication, including

1. rerouting surplus nutrients (Edmondson 1970).,

(2) (Downing et al. 2001) changing the ratios of nutrients

(3) According to Husman et al. (2004), physical mixing",

(4) using opaque liners or water-based stains to shade water bodies, and

(5) using powerful pesticides and algaecides (Boyd & Tucker 1998).

According to Edmondson (1970), these approaches have generally been shown to be inefficient, expensive, and/or impracticable, particularly for large, complex ecosystems. Reducing nitrogen and/or phosphorus inputs into aquatic systems can frequently enhance water quality, and there are a number of well-known instances where bottom-up nutrient control has significantly increased water clarity. However, regulating nutrient reduction can be difficult (and expensive), especially in agricultural areas where nonpoint sources provide the algal nutrients. Furthermore, when external loading of nutrients has decreased, internal loading of nutrients from sediments may hinder improvements in lake water quality (Søndergaard et al. 2003). Additionally, algaecides like copper sulfate can be used to temporarily lower HABs (Boyd & Tucker 1998). Algaecides, however, are costly to employ, do not address the root cause of the issue (i.e., ample supplies for primary producers), and endanger people, animals, and wildlife in addition to damaging a wide range of aquatic creatures that are not their intended target.

Biomanipulation, which involves changing a food web to restore ecosystem health, has been another option for enhancing water quality in nutrient-rich lakes (Shapiro et al. 1975). The underlying idea is that in order to regulate phytoplankton, large-bodied, generalist grazers (like Daphnia) can take over by either harvesting or adding tertiary consumers (piscivorous fishes) to replace secondary consumers (planktivorous fishes). Less effective small-bodied zooplankton grazers, such as rotifers and herbivorous copepods, usually dominate zooplankton communities when planktivorous fishes are prevalent and there is no predation refuge (such as oxygenated hypolimnion) for large-bodied zooplankton. This allows phytoplankton (also known as algal bloom) to overgrow. Numerous previous studies have demonstrated a substantial relationship between phytoplankton abundance and the size structure of zooplankton groups. The idea that predatory top-down forces can have significant effects on aquatic populations and ecosystems is supported by these results. Having said that, the impacts of fish-centric biomanipulation on water quality are usually brief (weeks to months), most noticeable in small, manageable systems (ponds), and influenced by the availability of resources, specifically nitrogen and phosphorus (Benndorf 1990; Carpenter et al. 1995).

- ► reducing extra nutrients from entering water bodies is the best, simplest, and most effective method of reducing eutrophication.

- ► There are several ways to accomplish this, but the most basic one is simply being conscious of the fertilizers and chemicals we use. **Module II**

Unit 4

Environmental Impact assessment
Meanings, steps and significance

Significance, steps, and meanings

OVERVIEW

A proposed project's potential positive or negative effects on the environment are evaluated using ecological, social, and economic factors in an environmental impact assessment (EIA). Overview Evaluating a project's or development's anticipated environmental effects while accounting for interconnected socioeconomic, cultural, and human health effects—both positive and negative—is known as environmental impact assessment, or EIA. According to UNEP, an Environmental Impact Assessment (EIA) is a method used to determine a project's effects on the environment, society, and economy before making a decision. It seeks to anticipate environmental effects early in the planning and design of projects, identify strategies to lessen negative effects, adapt projects to the local environment, and provide decision-makers with the options and projections. The Environment Protection Act, 1986, which includes numerous sections on EIA methodology and process, provides legal support for environment impact assessments in India.

Significance

The International Association of Impact Assessment (IAIA) claims that

the procedure for determining, forecasting, assessing, and minimizing the biophysical, socioeconomic, and other pertinent impacts of development projects before important choices are made and promises are made.

India's EIA history

Environmental impact assessments were first used in India more than 20 years ago. It began in 1976–1977 when the Planning Commission requested that the Department of Science and Technology do an environmental analysis of the river-valley projects.Prior to 1994, the Central Government's environmental clearance was a decision made administratively without legislative backing.Under the Environmental (Protection) Act of 1986, the then-Union Ministry of Environment and Forests issued an EIA notification on January 27, 1994, requiring Environmental Clearance (EC) for any activity that was being expanded or modernized, as well as for the establishment of new projects listed in Schedule 1 of the notification.In September 2006, the Ministry of Environment, Forests, and Climate Change (MoEFCC) announced revised EIA regulations.

According to the announcement, environmental approval is required for a number of projects, including those involving mining, thermal power plants, river valleys, infrastructure (roads, highways, ports, harbors, and airports), and industries, including very tiny electroplating or foundry units.However, in contrast to the 1994 EIA Notification, the new law has placed the responsibility for project clearance on the state government, contingent on the project's size

and capacity.The EIA Procedure

India's EIA

Environmental clearance is handled by the Ministry of Environments and Forests, or MOEF. It may, if required, confer with an expert committee whose makeup is listed in schedule III of the notification.

- **The main laws in India**:

1. Water Act (1974)
2. Indian Wildlife Protection Act (1972)
3. The Air (Pollution Prevention and Control) Act of 1981
4. Environment (Protection) Act (1981)

The Central Pollution Control Board is in charge of this.

With the assistance of an outside consultant or organization, the project proponent is in charge of creating the EIA statement.

When compared to the whole project expenses, the amount that the project proponents have set aside and spent on EIA preparation is typically pitifully small (typically less than 1% of total project costs).

The main steps in EIAs process:

Screening

Scoping

Impact Analysis

Prediction and Mitigation

Reporting and Monitoring

Review or Audit

Decision Making

Post Monitoring

- **Screening** frequently leads to the project being categorized, and based on this, a decision is made regarding whether or not a complete EIA should be conducted.

- The project's possible effects, the impact zone, potential mitigation strategies, and the necessity of monitoring are all covered via scoping (Boundary sets). Gathering baseline information: The research area's environmental condition serves as baseline data. Impact forecast: Predicting both positive and negative, reversible and irreversible, temporary and permanent outcomes requires the assessment agency to have a solid grasp of the project.

- Impact Analysis: Economic, environmental, social, and personal.

- Mitigation: -. The activities and procedures for preventing, minimizing, or passing the impacts—or else the amount of compensation for likely environmental harm or loss—should be included in the EIA report. Public hearing: Public and environmental groups residing near the project site may be notified and consulted upon completion of the EIA report.

- Reporting: - The main output report is called an Environmental Impact Statement, and contains a detailed plan for managing and monitoring environmental impacts both during and after implementation. Environmental Impact Assessment Report:

- Every project should assess environmental parameters and identify potential alternatives. Both project site and process technologies should be covered by the alternatives.

- A mitigation strategy for the chosen option should be created once the alternatives have been examined, and it should be accompanied by an Environmental Management strategy (EMP) to help the proponent make environmental changes.

- Review/Audit: After the EIA procedure has been implemented, an audit is conducted. The audit has a beneficial feedback and education purpose. Based on the final EIA report, the results of the public consultation, which included public hearings, and the project proponent's application, the EAC/SEAC would examine the proposal. The assessment committee will invite the applicant to provide the required clarification in person. The expert appraisal committee will provide categorical recommendations for the granting of prior environmental clearance or rejection with reasons upon the conclusion of the proceedings.

- **Making Decisions**: The EIA report should outline the measures to prevent, minimize, or mitigate the impacts; if not, it should outline the amount of compensation for likely environmental loss or damage.Public hearing: After the EIA report is finished, the local community and environmental organizations may be notified and consulted.

- **Post Monitoring:** The mitigating measures are being implemented in accordance with the EIA report's guidelines and legal requirements.

Importance

1. Natural resource depletion.
2. Destruction of habitats.

3. Water toxicity, oxygen content, and pH changes.

4. Increase in toxicity of air.

5. Global warming.

6. Ozone depletion.

Other Significances cont…..

- Clear, well-organized, objective study of the impact and repercussions of suggested projects helps make well-informed decisions.
- Pre-emption or early withdrawal of unsound proposals.
- Helps choose the most environmentally friendly and feasible option among the available options.
- Results in best practice prediction and mitigation of adverse effects of projects.
- Influences both project selection and design by screening out environmentally unsound projects, as well as modifying feasible projects - Mitigation of negative environmental and social impacts.
- Guides formal approval, including the establishment of terms and conditions of project implementation and followup.
- Reduction of adverse effects on the environment and society.

1. Serves as an adaptive, organizational learning process, in which the lessons of experience are feedback into policy, institutional and project design - Enhancement of positive aspects
2. environment impact assessments, project managers know which project need full screening to prevent any damage to the environment.
3. Helps to assess potential impacts relevant to the environmental legislation based on the legislative requirements.
4. Identifies problems and helps through mitigation process in advance to anticipate disasters likely to happen.
5. Protects the biodiversity environment by suggesting alternative safe project designs and methods.Predicts the impact rate for proposed projects, this can be negative or positive.
6. Highlights possible alternative safer to the environment and methods with less impact.EIA produces an environmental management plan and summery for the none-tech general public.
7. Helps stakeholders in decision making of whether to approve the project or not based on the findings after assessment.
8. Predicts impact and proposes mitigation measures according to EMP.To identify, evaluate and predict the environmental, economic and social impact of new development activities. To record and rate the impact levels impact the environment by projects that are being planned. Before making a decision, information about the effects on the environment is provided.

Conclusion

An excellent way to determine if a project is environmentally friendly or not is to do an environment impact assessment.

Since technology and natural resources combine to produce economic development, all human endeavors should be socially, economically, and environmentally responsible.

ENVIRONMENTAL MANAGEMENT AND PROTECTION

INTRODUCTON

What is environmental management?

The technological revolution, extensive industry, increased mobility, unplanned urbanization, and, of course, resource exploitation have all upset the ecological equilibrium of our world. The stability of ecosystems is at risk due to the worsening of human-environment relations. If people begin to support initiatives like conservation, regeneration, and environmental protection, the relationship can once again be harmonious.

Environmental management focuses on problems like deforestation and global warming and addresses situations on land, in the ocean, and in the atmosphere. It examines the carbon footprint and finds for strategies to lessen the permanent harm that individuals cause.

The goal of environmental management is to reduce waste and increase compliance. It was developed to address environmental problems that negatively affect the world both directly and indirectly. It deals with preventing ecological disasters and identifying suitable solutions to environmental problems. In order to prevent the depletion of fossil fuels, environmental management also looks into possible renewable energy sources.

- The administration of contemporary human society in relation to the environment and its effects on it is known as environmental management. Natural resources can only sustain a specific population within any species due to their limited and finite nature.

- Depending on the individual, environmental management might mean different things.

WHAT ENVIRONMENTAL MANAGEMENT IS

• Administrative functions that create, implement, and oversee an organization's environmental policy.

• Environmental management is the process of making decisions that control how human

activity affects the environment so as not to compromise the environment's ability to support human progress.

ENVIRONMENTAL CONCERNS IN INDIA OR NEED FOR ENVIRONMENTAL MANAGEMENT

- THE MAJOR ENVIRONMENTAL CONCERNS IN INDIA ARE :-
    - Population control and health care.
    - Water pollution control in river systems.
    - Air pollution control in industries pockets.
    - Solid waste utilization through recycling.
- Education about the environment at all societal levels.

CHARACTERISTICS OF ENVIRONMENTAL MANAGEMENT

- It's frequently used as a general term.
- It supports sustainable development.
- In addition to addressing risks and issues, it displays opportunities.
- A multidisciplinary approach is required.
- Environmental management need are given below.
- For use of resources
- To overcome environment and ecology crisis
- For the sake of economic necessity and ideals, sustainable development
- To reduce disasters to decide the limiting line between environment and development
- It deals with a human-influenced universe;
- It supports sustainable development
- It demands a multidisciplinary approach;
- It must incorporate several perspectives on growth;
- Both short-term and long-term planning, as well as local to global scales, are covered; and
- It aims to combine planning, policymaking, and social and natural sciences.

- Too much awareness about environmental conservation and quality of life has grown during the past three decades. New terms like clean technology, environmental auditing, eco-friendly products, environmental impact assessment, environmental resource conservation, etc. are frequently introduced to the lexicon of the environment.

- However, when the broader idea of environmental management evolved and was acknowledged as a tool for sustainable development, all of these elements came together. Goudie (1994) described environmental management as "providing resources from the planet's bioenvironmental systems while simultaneously attempting to maintain sanative, life-

- Maintaining ecosystems. Thus, it is an effort to balance and harmonize the several businesses for his personal gain.

- The time has come for society and our policymakers to work toward protecting, conserving, and regulating development so that it doesn't negatively impact the ecology and that people's needs may be met.

- The management of the entire environment is urgently needed everywhere, but especially in developing nations.

The following are reasons why environmental management is necessary in relation to development:

1. For resource utilization

Resources are finite, and they will quickly run out if we don't use them wisely. Environment management is required for the proper and sensible utilization of resources. Establishing precise coordination and balance between our needs and environmental processes is our fundamental responsibility.

2. To resolve the ecological and environmental problem

The control of the environment is urgently needed. The ecology and environment are currently in a critical crisis due to current development; if this trend continues, the ecosystem will suffer greatly. It will annihilate the entire planet.

3. For the sake of sustainable growth

For development to occur without destroying or overusing natural resources, as well as to lessen pollution and environmental deterioration, environmental management is necessary. Making wise choices about how to use the environment is essential when taking future generations' well-being into account.

4. For values and financial necessity

In order to preserve a clean environment and provide new guidance for our economic requirements and ideals, environmental management is necessary.

5. To lessen calamities
Disasters such as flooding, forest fires, earthquakes, desertification, transportation accidents, and global warming are less likely to occur when environmental management is in place. The relationship between environmental systems and disasters, as well as the overlaps between natural and man-made disasters, must be investigated.

6. To determine the boundary between development and the environment
Setting boundaries between the environment and development requires environmental management. For instance, we must stop using the materials and change our development strategy if it causes global warming or ozone layer depletion. We might decide to implement the afforestation policy.
Around the world, environmental protection is now a hot topic of conversation. India is experiencing a number of environmental challenges as a result of uncontrolled urbanization and high population expansion. The environmental problem results from economic growth that disregards ecological considerations. Consequently, it progressively lowers the standard of living for both the current and upcoming generations.

In the past, industries were solely focused on their profits and outputs. However, there has recently been a public outcry against the resource exploitation and the dangerous effects of corporate operations on the environment. Due to growing concerns about environmental deterioration, corporate sectors in the worldwide market are now focusing more on eco-friendly outputs.

Environmental Management's Significance

The goal of environmental management is to restore the natural environment. It is a systematic method of overseeing an organization's environmental matters. This management process's primary goal is waste reduction. An efficient environmental management procedure lowers carbon emissions, stops pollution, aids in waste processing, and makes prudent use of energy and resources.

Our use and waste of natural resources is excessive. One day, everything will be destroyed if we keep doing this. Because of this, environmental management has become crucial to keeping us safe from the problem. To reduce the production of waste, the management controls the appropriate use of resources.

It's critical to broaden management's perspective on environmental protection given the state of economic development today. Rapid industrialization for economic growth is causing excessive pollution and other negative consequences. As a result, it is now crucial to carefully

examine the environmental effects when establishing an industrial facility.

In order to achieve targeted goals, environmental management also encourages staff to receive training. This encourages accountability and responsibility inside a company and aids in controlling the impact and goal of a good or service. Environmental management makes sustainable development possible by incorporating the enterprise's ecological capacity.

Since there is a powerful environmental lobby against environmentally unfriendly enterprises, the environmental management system encourages green reporting that combats all unfavorable public perceptions in the global economy. To solve numerous environmental issues, remarkable decisions should be made by applying environmental management.

Ineffective production and consumption practices, abuse, or insufficient use of resources and assets, such as water, are echoed by environmental resource management. Only with the aid of an environmental management system can these limited resources be distributed throughout the economy in the most efficient manner. It is necessary to promote the use of renewable energy sources, such as wind and solar power.

All biophysical environmental components, both living and non-living, are included in environmental resource management. The interconnectedness of all living things and their surroundings is the reason behind this. This environment also encompasses the connections between the biophysical environment and the human environment, such as the social, cultural, and economic environments. The technological, ethical, social, and economic facets of environmental resource management are crucial.

Because firms must prove their compliance with permits that require frequent reporting and recordkeeping, environmental management duties must be completed. In order to submit compliance reports to federal or state regulators, corporate sectors must keep an environmental balance sheet, often known as a "Green Report," that includes information on their chemical stocks, chemical usages, waste generation, air emissions, and water discharges. In the event that an auditor comes to look at the facilities, this information is also required.

To sum up, in order to prevent environmental degradation, it is now imperative that all businesses adopt a strong environmental management system. For businesses, environmental management is all about striking the correct balance—what goes in has to come out.

Environmental auditing

OVERVIEW

• Although pollution is today an unavoidable byproduct of modern industrial technology and quick and easy transportation, excessive pollution can negatively impact a person's mental,

social, and financial well-being.

• The cry to "save the nation from this menace the pollution" is now loud and clear in every corner of society.

• We are familiar with the phrase auditing, which refers to the examination of financial accounts and records.

• Environmental audits look at how industries and their products affect the quality of the environment and natural resources.

• To guarantee sustainable industrial developments, a "Environmental Audit" is required.

Interpretation and Definitions

- A management technique called environmental auditing merely examines the environmental management practices carried out by businesses or organizations and informs them of new, greener technologies.

- To guarantee sustainable industrial advances, a "Environmental Audit" is required to assess how industries and their products affect natural resources and environmental quality.
- To help protect the environment by facilitating management control of practices and evaluating compliance with company policies, which would include applicable regulations and standards, a management tool that includes systematic, documented, periodic, and objective evaluation of how well environmental organization, management, and equipment are performing.
- Aim of environmental audit –
- A green audit may be conducted for many purposes, for example, to comply with environmental laws or as a social responsibility measure or to meet some certification requirements. But the main and ultimate aim of any environmental audit is to evaluate and control the adverse impact of economic activities of an organization on the environment.
- Environmental Performance –
- As mentioned before, the essence of any environmental audit is to find out how well the environmental organization, environmental management and environmental equipments are performing. The ultimate goal is to make sure that the environmental performance of the company satisfies the objectives outlined in its environmental policy and that standards and legal requirements are followed.
-

- Management tool –
- Environmental audit is generally considered as one of the management tool which is a part of internal control system and is mainly used to assess, evaluate and manage environmental performance of a company.
- Different from EIA-
- Environmental audit should be distinguished from Environmental Impact Assessment (EIA) – EIA is a tool used to predict, evaluate and analyze environmental impacts mostly before a project commences. t evaluates how a planned facility might affect the environment. The methodical examination of environmental performance across an organization's current operations is the primary goal of an environmental audit.
- Next 4 points are Environment Audit Process Related
- Systematic –
- Environmental audit is a systematic process that must be carefully planned, structured and organized. As it is a part of a long-term process of evaluation and checking, it needs to be a repeatable process so that over time, it can be easily used by different teams of people in such a way that the results are comparable and can reflect change in both quantitative and qualitative terms.
- Objective Evaluation –
- Though environmental auditing is conducted using pre-decided policies, procedures and a proper documented system, there is always an element of subjectivity in an audit, particularly if it is conducted internally. In addition to internal environmental audits, having independent audit teams that have specialized skills and who come back periodically (say annually) to repeat audits tends to increase objectivity in the system. Therefore, external environmental audits are preferred for the sake of objectivity. Additionally, several certification criteria (like ISO 14001) require this.
- Periodic – Environmental audit is generally conducted at pre-defined intervals. It is a long- term process.
- Documented –
- Like any other audit, the base of any environmental auditing is that its findings are supported by documents and verifiable information. In order to make sure that past actions, activities, events, and procedures were carried out correctly and in accordance with system requirements, the audit process is set up to verify them on a sample basis using the evidence that is currently accessible.

Features

1. Environmental system is with a broad aim for a green environment.
2. It helps in reducing waste.
3. It aids in evaluating adherence to legal requirements.

4. It also aids in the prevention and management of pollution's effects. It fosters connections between industries, governmental bodies, industrial associations, and certified technician specialists, among others.
5. Setting aside money for waste reduction, recycling, reuse, pollution management, and prevention.
6. Giving managers a chance to take pride in their excellent environmental performance.
7. Assessment of environmental input and risks.
8. Determining areas for improvement based on strengths and weaknesses.
9. Evaluation of pollution control.
10. Verification of compliance with laws.
11. Ensuring human, environmental, and plant safety.
12. Enhancement of loss prevention, manpower development and marketing.

Types of ENVIRONMENTAL AUDITING

1) Environmental Compliance Audit

2) Environmental Performance Audit

3) Environmental Financial Audit

Audit of Environmental Compliance

Audits of environmental compliance Audits of environmental management Audits of the functional environment

The environmental compliance audit examines the legal compliance status of the business or location.

The organization or business can better comprehend its performance in relation to its own environmental performance requirements with the use of the environmental management audit.

The impacts of a specific problem or activity are measured by a functional environmental audit. It looks into certain issues including wastewater management, materials management, and air quality monitoring. Less frequently performed, the functional environmental audit might be a part of an environmental management or compliance audit.

Environmental Compliance Audits

The goal of environmental compliance audits is to ascertain whether a predetermined checklist is being followed.

Compliance audits evaluate and confirm elements pertaining to or carried out by an organization in relation to a particular goal. Various regulatory licenses, such as an

Environmental Authorization or a specific management license (pertaining to waste, water, the atmosphere, and more), contain these compliance promises. In order to prevent environmental harm, the approval document specifies particular legal management procedures for the operation. When performing the activity, these guidelines, or requirements, must be followed. The holder of these authorizations is required by the appropriate authorities to make sure that these terms are followed.

As an impartial third party, an environmental auditor can objectively track and report on the activity's compliance. The auditor reviews all of the authorization's conditions and requirements, and a report detailing the current state of compliance with those requirements is created. An audit report that details adherence to the project's responsibilities can be provided to the Component Authority as the outcome of this audit procedure. In order to help the holder of the authorization improve overall compliance with the requirements set for the activity, the audit report suggests aspects for improvement.

In order to prevent environmental harm and, indirectly, to ensure that the activity continues as planned, compliance audits inevitably identify features (or threats to the continued operations) that require direct involvement, whether from a management perspective or a specialized job title.

- Goal: To guarantee that organizational operations are carried out in compliance with environmental regulations, standards, guidelines, and policies.

- Criteria: Industry guidelines, corporate policy, applicable standards, international agreements, and national legislation.

- Benefits:
    - Helps in ensuring compliance with laws.
    - Reduces risk / costs with non-compliance.
    - Gap between promises and results.
    - Pollution & Waste reducing, conserving resources.
    - Helps in improving Environmental Performance.

Environmental Performance Audit

- Goal: To determine if a company achieves its environmental goals and is successful in generating economical and efficient environmental outcomes.

  • Criteria: Indicators that are recommended by academic literature, government agencies, non-governmental organizations, or environmental organizations.

- **Benefits:**
    - Health & Safety Audit
    - Site Audit
    - Activity Audit
    - Process Audit
    - Product Life Cycle audit

Environmental Financial Audit

- • Goal: To allow an auditor to determine whether key environmental costs, benefits, assets, liabilities, and contingencies have been properly identified, valued, and reported by the reporting firm.

  • Criteria: Standards published by reputable organizations, authority that determine standards, and other scholarly works.

- **Benefits:**
    - International Auditing Practices Statement (IAPS) 1010. Environmental Matters affect financial statements.
    - Initiatives to prevent damage to Environment.
    - Consequences of violating laws.
    - Consequences of damage to resources.
    - Consequences of vicarious liability levied by law.

Tools & Techniques Used

- Checklist
- Questionnaires
- Questioning
- Observation
- Photographs / Electronic data
- Research

Functional Environmental Audits

Functional environmental audits are performed to ascertain whether a particular aspect of an organization's operations is being carried out in compliance. For example, the implementation of an Atmospheric Emissions Management Plan in compliance with air

quality monitoring regulations, or the specific management of waste in accordance with a Waste Management Plan. Because it plays a verification and check role in compliance and environmental management system audits, functional audits are related to both. To identify particular compliance or system components that need improvement, functional audits can also be included in a combined audit program. A functional audit has the advantage of being able to be integrated into another audit program or maintained as a stand-alone evaluation that concentrates on a recognized area that needs management input.

Without waiting for a regulatory process to finish, these audits guarantee that prompt action can be made on a particular issue.

Audits of Environmental Management Systems

Environmental Management System (EMS) audits are the process of assessing an EMS to make sure it is operating efficiently and demonstrating ongoing system improvement. ISO 14001:2015 Clause 9, which outlines how the EMS's performance must be assessed, serves as the guide for the EMS Audit. The purpose of the performance review is to guarantee:

That the EMS works well. The performance of the EMS is evaluated. A review of the goals and objectives is conducted.to find fresh possibilities or objectives. Confirmation of compliance with stakeholder, organizational, and legal criteria. Evaluating the EMS's ongoing acceptability, sufficiency, and efficacy. There is constant progress.

Through the verification of elements that conform to the planned outcome of the EMS and the identification of aspects that contribute to non-conformance of the intended outcome, or even potentially negatively impact the intended outcome of the EMS, EMS audits are beneficial to an organization. The EMS audit helps organizations adhere to the plan, do, check, and act cycle of project management as well as continuous improvement.

The advantage of environmental auditing is obvious: whether it is a self-evaluation, a regulated process, or a company review on environmental performance, the goal is always to improve the activity's overall environmental performance. In order to adequately ensure that the avoidance, management, and mitigation of environmental impacts associated with the activity are managed, the audit process is relevant in that it details findings made during the audit process and helps identify fatal flaws or areas of concern where future attention can be placed.

Steps in an Environmental Audit

At the very least, the following steps are part of the environmental audit process:

Organizing the audit, outlining the tasks to be performed and who is responsible for each task Examine the business's environmental protection policy as well as any applicable local, state, and federal regulations. Evaluation of the company, its personnel, and its apparatus Collect facts and statistics that are pertinent. Analyze overall performance. Determine what needs to be improved. Inform management of the results. Is an Environmental Audit Required?
An essential component of a business's environmental performance and policy are environmental audits. But a lot of businesses either don't perform them at all or do them incorrectly.

Every business must abide by a plethora of environmental laws and regulations. Does your company adhere to all of them? Are you in complete compliance with all the requirements of each permit and do you possess all the necessary permits? Unless you have conducted an audit by an impartial environmental auditor, you are unaware.

An environmental audit is necessary if you lack expertise in environmental compliance and legislation. You will be able to show documents detailing all of your efforts to maintain compliance and will know that you are in compliance when an inspector shows up at your workplace.

How to Perform an Environmental Assessment

Three primary phases or stages make up an environmental audit:

Phases of Pre-Audit and Post-Audit

1. The Pre-Audit Form the audit team with a range of abilities, viewpoints, and capabilities. Make an auditing strategy. Request and examine the following documents: Applications for permits or permits Reports on Production Records Corrective measures and the status of previous audit items are included in previous audits. Create a list of inquiries that regulators might make, as well as follow-up inquiries regarding previous audits and requests for any extra materials that may be required. As problems are found, start filling out the Disclosure of Violation Table. Stage

2. The Audit Establish the ground rules. Decide what occurs and what problems are found. Hold daily meetings to keep everyone updated. Review the documents: Regulations Compliance Training Records, monitoring, and controls for air, water, waste, and noise Procedures for Emergency Response Addressing Complaints Verify papers for accuracy, consistency, and adherence to the law and whether it's current Examine the Site Assess Operations to Ensure Compliance If necessary, collect samples. To determine whether policies are understood and used consistently, speak with EHS staff members in operations, management, and maintenance .Find matters of concern Hold a closing meeting where all issues are listed, discussed, and corrective measures are developed for each.Phase Three: After the AuditCreating the Disclosure of

Violations form and the Environmental Audit ReportEnumerate verified problems and areas of concern.List the necessary follow-up and action items.What Records Are Necessary for an Environmental Audit?

All necessary documentation should be gathered and examined prior to starting an environmental audit. To start an environmental audit, you will require the following six categories of documents:

The facility's floor plans and maps will assist you in determining the audit's scope. They will alert you to modifications that have been made and procedures that may require a comprehensive review due to changes. Compile all environmental permit copies. Verifying that the facility complies with the permit terms begins with these permits. Compile the environmental inspection checklists and reports that attest to the completion of the necessary inspections. It is possible to demonstrate that recordkeeping is current and compliant by using hazardous waste manifests, sampling data, and other inspection reports. They can also assist in locating compliance problems. Which environmental rules are applied to the facility is determined in part by an inventory of all chemicals and other raw materials utilized, along with their locations and quantities. Best management practices, environmental plans and procedures, and other relevant documentation demonstrate how the facility is handling environmental concerns and averting complications. If appropriate, include written emergency response plans, Standard Operating Procedures (SOPs), and the EPA Risk Management Plan.Tests, certificates, and employee training records attest to the fact that staff members have received the instruction they need to carry out their jobs. These documents also show the company's attempts to create and uphold environmental standards for the sites. An audit can be a useful tool for documenting progress and assessing a facility's compliance with current environmental standards. It offers the company more advantages:

By detecting non-compliance concerns and giving you time to take necessary action prior to an inspection, an environmental audit can help you avoid fines from regulatory bodies.Audits raise awareness of employee obligations and environmental requirements. Penalties and enforcement actions decrease as compliance rises.Frequent environmental audits find the most recent rules that affect the company and notify management of them.Environmental audits enhance the company's reputation in the community and foster better employee connections.Investors and employees prefer companies with environmental stewardship initiatives.Through early problem detection, waste reduction, and the ability to plan corrective action, environmental audits lower operational costs workers. Through early problem detection, waste reduction, and the ability to plan corrective action, environmental audits lower operational costs.

FINAL RESULTS

An environmental audit is conducted to give management of the company information on the performance of the environmental organization's equipment and systems. The best practical

methods can therefore be used to protect soil, water, air, and plant and animal life from the negative effects.

EVS Unit 5

Sustainable Development: - Meaning, Need and Guiding Principles

Overview:

According to environmental research, industrial and scientific advancements are primarily to blame for the environmental issues facing wealthy nations, while poverty, overpopulation, and illiteracy are the main causes of environmental issues in developing nations. Unquestionably, a country's socioeconomic interests might be served by promoting and bolstering developmental activities, but this shouldn't come at the expense of environmental deterioration, since this will negatively effect not only the current generation but also future generations. Sustainable development is therefore necessary in order for environmental preservation and development to continue in harmony.

The Rio Declaration of 1992 identified "development" as a human right. However, every country (party) to this summit agreed in unanimity that industrial or economic development should be conducted in a way that does not negatively impact the environment because environmental pollution poses a risk to human life. If this is the case, what good is such development? Since it was realized that progress and the environment should coexist, the concept of sustainable development was developed during this world summit to preserve a balance between the two.

Sustainable Development: What Is It?

The fundamental premise of sustainable development is that two seemingly incompatible ideas—environment and development—can coexist. However, from a practical standpoint, sustainability's ecological, economic, and social facets are intertwined. There should be a convergence of ecological and economic aspects in the developmental process because, as William Rees correctly noted, maintaining ecological integrity must take precedence above meeting socioeconomic human requirements.

The concept of sustainable development places a strong emphasis on two fundamental needs: the need for socioeconomic advancement and the need to restrict the environment's capacity to meet both current and future demands.

According to the Brundtland Report (1997), conservation and sustainable development are interdependent.

"Development that satisfies current needs without jeopardizing the capacity of future generations to satisfy their own needs is known as sustainable development." Meeting everyone's fundamental necessities and giving everyone the chance to realize their dreams

of a better life are essential components of sustainable development.

The fundamental goals of sustainable development

The following three fundamental goals are the focus of the sustainable development principle:

(1) to continue producing goods and services for efficiency and growth;

(2) discussion and administration of neutral resources, including biological integrity and biodiversity protection;

(3) upholding and improving living standards while embracing the idea of fair wealth and material resource distribution.

These goals might be referred to as the sustainable development principle's economic, environmental, and social goals, respectively.
From an environmental perspective, the goal of the sustainable development concept is around three issues: (i) ensuring the sustainable use of species and ecosystems; (ii) protecting genetic variety; and (iii) maintaining vital ecological processes.

Range of Sustainable Development's Impact

According to chairperson Ms. Brundtland's study, often known as the Brundtland report, the idea of sustainable development aims to meet present-day requirements without sacrificing the capacity of future generations to meet their own. Former World Bank President James D. Yolkenson said, "It is for us to think as to what kind of world we want," in reference to sustainable development. Would we choose to leave our next generation with the world's worse conditions, where countless people perish from starvation, a changing climate, dwindling biodiversity, and fragile social structures? Volkenson's observation makes it abundantly evident that the main goal of sustainable development is to protect the interests of future generations as well as the satisfaction of the present.

Important Sustainable Development Principles

All of the countries largely embraced the concept of sustainable development, which gained international prominence as a result of the Brundtland Commission Report (1987). A few of the key ideas that form the basis of the notion of sustainable development were outlined in Agenda 21 and the Rio Declaration in 1992. Therefore, in order to accomplish the goal of sustainable development, these principles must be adhered to. The following are these principles:

(1) equity across generations;

(2) Natural resource utilization and preservation;

5. preservation of the environment;

(4) The principle of precaution;

(5) The notion of "polluter pays";

(6) The obligation to assist and cooperate;

(7) Elimination of poverty; and

(8) The "protection of forest" principle.

1. Equity Across Generations. The idea of intergenerational fairness assumes that every human generation has the right to profit from the natural and cultural resources of the previous generation and that it is our "duty" to protect this legacy for coming generations. The idea places a strong emphasis on protecting biological resources and renewable resources, such as soil, water, and forests.

2. Use and Conservation of Natural Resources: According to this principle, the natural resources of the planet must be used properly in order to preserve and improve them for future generations. Keep in mind that poverty, population growth, urbanization, industrialization, and other factors are already causing natural resources to deplete, and that there will probably be a severe scarcity of these resources in the future. As a result, it is imperative to create methods and technologies that may require the least amount of natural resources.

3. Preservation of the Environment
An essential component of sustainable development is environmental protection. To guarantee sustainable growth inside their borders, the majority of countries have passed environmental protection legislation. An efficient system of environmental protection is required to support sustainable growth. Since they rely heavily on unlabeled environmental resources like forests, hand-pumped water, noisy and polluting slum houses, etc., it is widely acknowledged that the lowest segments of society are most affected by inadequate environmental protection or degradation. Since water resources, forests, agriculture, industry, energy, and power are the main sources of environmental protection issues, policy actions in these areas should be well-thought-out and environmentally focused to guarantee that there is no deterioration of the environment.

4. The Principle of Precaution

Even in cases when there isn't concrete scientific evidence connecting a product or human activity to environmental harm, the precautionary principle aims to make sure that potential environmental threats are avoided. Therefore, the precautionary principle assumes that the manufacturer bears the burden of proving that his behavior is benign and does not affect the environment.

5. The "Polluter Pays" Theory

In order to avoid subsidies that would be harmful to trade, all of the member nations of the Organization for Economic Co-operation and Development (O.E.C.D.) decided to include the "polluter pays" principle in their environmental policies. They believed that in order to save the nation from the dangers that environmental degradation poses in contemporary industrial civilizations, this was essential. The "Polluter Pays" concept was thought to be among the most effective ways to stop pollution in the environment. However, there were practical challenges in defining the principle precisely because there may be disagreements regarding the precise extent of the principle's applicability and the cap on damages paid.

6. The Liability to Help and Cooperate Principle

This principle was specifically included in the Rio Declaration (1992) as Principle 9, which states that states should work together to strengthen indigenous capacity building for sustainable development by enhancing the development, adaptation, diffusion, and transfer of technologies, including new and innovative technologies, and by improving scientific understanding through scientific and technological knowledge exchanges.

7. Eradication of Poverty

The biggest contributor to environmental pollution and degradation is probably poverty. The late Indian Prime Minister Smt. Indira Gandhi stated at the 1972 Stockholm Conference on Human Environment that "poverty is the worst of all pollutants we face." According to the Brundtland Report (1987), poverty can also contribute to environmental degradation since it impairs people's ability to use resources sustainably, which ultimately increases environmental strain and causes it to deteriorate. The majority of emerging nations struggle with poverty, which has a negative impact on the environment.

8. Forest Protection

It must be acknowledged that the public trust principle, which applies to the preservation of natural resources, is intimately related to awareness of forest protection. Since the State is a steward of forest resources, it is the Government's moral and legal duty to prevent indiscriminate tree-cutting from destroying forests. When forests are properly maintained, they will decrease soil erosion, improve land fertility, and produce enough rainfall to provide water for home and agricultural uses. However, despite these advantages, records indicate that, up until 1970, deforestation had lost nearly one-third of the tropical region's forest. Regretfully, Nearly 1,70,000 square kilometers of forest area have been turned into plains for the development of complexes, industries, and other commercial uses, and the destruction of forests is still ongoing. In addition, volumes of contaminated water are flowing through

rivers, lakes, and seas, inflicting irreversible harm to the environment and ecosystem, and seven lakh hectares of land have become desert.

In conclusion

It is true that sustainability between the environment and development is necessary to enhance and safeguard the environment from contamination. Utilizing natural resources for the benefit of current and future generations is the foundation of the sustainable development idea. As is well known, growing industrial activity around the world necessitates the use of natural resources, which are running out daily. It is also true that there is now global recognition of the necessity of resource conservation, resource efficiency, and environmentally responsible company practices and regulations. In order to be internationally responsive, the nation must have an environmental strategy and planning that is grounded in local requirements. Last but not least, the entire world—developed and developing—must transition to a new global order that integrates new economic and technical systems if sustainable development is to transcend simply idealistic rhetoric and catchphrases. Since poverty and inequality are the weakest links in the chain of sustainable development, such an order must be designed to help the poor. Finally, environmental protection can undoubtedly be maintained as a nation's economy and industry grow if the principles of sustainable development are adhered to.

Environmental Practices:-

Rain water Harvesting

Around the world, rainfall varies with the seasons. Depending on the rocks and soil, percolation capacity varies by location. As a result, the quantity of rainwater varies by location. However, the amount of water needed now exceeds the amount that is available. if the rate of groundwater removal exceeds the rate of percolation-based recharging. Groundwater levels will drop, and pumping water from deeper depths will demand an increasing amount of energy.

Conservation practices can be implemented.

- Reduce water waste by using as much water as is necessary. Use sprinkler systems and drip irrigation, for example.

- One method of conserving water is to reuse it. Install treatment facilities in businesses so that the water can be used for other purposes and that just the necessary amounts are purchased. Water is expensive for industries. Irrigation can be done with sewage water.

- Improve water storage and recharge: Rather than allowing water to run off, we should increase our water storage in surface water bodies (tanks, canals, dams) and recharge aquifers (a layer of rock or sand through which water percolates).

Groundwater recharge is required to guarantee its continuous availability.

Strategies for conserving water

- Rural areas: canals, tanks, wells, dams, etc.
- Rooftop rainwater harvesting in urban areas. It makes use of rainfall and keeps it from falling.
- Rainwater that falls on the roof is directed into storage tanks. Additionally, water is recharged into the aquifers with the use of recharge pits, enhancing the quality of groundwater. Flooding is also arrested.
- The roadside runoff can be redirected into a trench and utilized for cleaning and washing.
- To be used for drinking and garden watering in the home with the proper filtration.
- To serve as unfiltered irrigation for landscapes, particularly in dry land farming.
- To improve groundwater recharge, which will further raise soil fertility.
- To reduce storm water discharges, urban flooding, and sewage treatment plant overloads; maintains pure, fresh surface water free of sediments, metals, fertilizers, and pesticides.
- To reduce the amount of saltwater that enters coastal towns.
- Rainwater gathering techniques guarantee high-quality water and are less expensive than other pumping or purification techniques.
- The need for groundwater is lessened. A rainwater collection system increases aquifer productivity, which raises groundwater levels.
- Rainwater collection methods for rooftops

Examples of several rooftop rainwater harvesting techniques are shown in this section.

1. Storage for direct usage

- This method directs rainwater that has collected on the building's roof to a storage tank. Water use, rainfall, and watershed availability must all be considered while designing the storage tank.

- Each drainpipe should have a mesh filter at the mouth, a first flush mechanism, and a filtering system before it is connected to the storage tank. Every tank should have a way to handle excess water overflow.

- More water may be added to the recharge system. Storage tank water can be used for extracurricular tasks like washing and gardening. This is the most cost-effective way to gather rainwater.

- The main advantage of collecting and using rainwater during the rainy season is that it lowers energy costs related to water distribution and transportation in addition to conserving water from conventional sources. Additionally, groundwater is conserved if it is being extracted to meet demand during rainy seasons. An illustration of a storage tank is shown in Figure 5.

2. Recharge of groundwater aquifers

   Groundwater aquifers can be refilled using a variety of structures, allowing precipitation to seep into the earth rather than surface. Typical recharging methods include the following:

   - replenishment of bore wells
   - filling up of excavated wells
   - refilling pits
   - trenches for recharge
   - shafts of recharge or soak ways
   - filtration tanks

3. Bore well filling

   - Rainwater collected on the building's roof is routed to a settlement or filtration tank via drain pipes. After settlement, filtered water is moved to bore wells in order to refill deep aquifers. It is also possible to recharge abandoned bore wells.

   - The catchment area, amount of rainfall, and rate of recharge can all be used to determine the proper capacity of the settlement tank or filtration tank. The recharging structure should be kept clear of silt and floating debris since they could clog it.

   - A rain separator should be used to clean up the first one or two rains to avoid contamination.

4. Pits for recharge

- Recharge pits are small pits with a weep hole spaced at regular intervals and enclosed by a wall made of brick or stone masonry. The top of the pit can be covered with perforated covers. The bottom of the pit should contain the filter medium.

- The capacity of the pit may be determined by the catchment area, rainfall intensity, and pace of soil recharge. Depending on the depth of the stratum that came before it, the pit's dimensions usually vary from 1 to 2 meters in width to 2 to 3 meters in depth.

- These holes can be used to recharge shallow aquifers and small homes.

5. Soakaway or recharge shafts

    - Shafts for soakaway or recharge are provided in areas where the topsoil is alluvial or less permeable. Depending on the thickness of the preceding layer, these 30 cm-diameter drilled holes may descend to a depth of 10 to 15 meters. PVC/MS pipe with slots or perforations should be used to line the bore in order to prevent the vertical sidewalls from collapsing.

    - A sump of the appropriate size is constructed at the top of the soakaway to collect runoff before it filters through. Filter media should be part of the sump.

6. Dig wells being filled

    - Dignified wells can serve as recharging structures. Rainwater from the rooftop is routed to drilled wells after passing through the filter bed. To speed up recharge, dug wells must be cleaned and desalted on a regular basis. Using the filtering method recommended for bore well recharge is one choice.

7. Recharge trenches

    - A recharging trench is provided in areas where the topmost layer of impermeable soil is shallow. After excavating the recharge trench, porous materials such as brickbats, boulders, or pebbles are used in its place. It is frequently made to collect surface runoff.
    - Bore wells can also be constructed inside the trench as recharge shafts to enhance percolation. The length of the trench is determined by the expected amount of runoff.

    - This technique can be applied to roadside drains, parks, playgrounds, and small homes. The recharging trench might be anywhere between 0.50 and 1.0 meters wide and 1.5 meters deep.

8. Percolation in tanks

- A area of land with sufficient permeability to permit sufficient percolation to restore the groundwater is submerged in artificial surface water pools known as percolation tanks. These can be built on large campuses with sufficient topography and accessible land.

- Both surface and roof runoff can be directed into this tank. Water that has accumulated in the tank percolates through the solid to augment the groundwater.

- The saved water can be used directly for gardening and other purposes. It is recommended that percolation tanks be placed in parks, gardens, and urban greenbelts.

Importance:

- Preserves or raises the groundwater level
- Prevents the erosion of soil
- Aids in enhancing irrigation techniques
- Enhances vegetation (trees, forests)
- Controls rainfall
- Preserves the climate Prevents the occurrence of drafts.

Rainwater harvesting in India

In India, water is a state topic. However, by providing financial and technical assistance, the central government supports state efforts to conserve and recharge water, including rainwater collecting and conservation. Alongside state government programs and with citizen participation, the government has also been putting numerous rainwater conservation and harvesting initiatives into action.

The Jal Shakti Abhiyan, which was implemented in 1,592 blocks across 256 water-stressed districts nationwide from July to November 2019, is one of the government's primary projects to encourage water conservation and resource management. On March 29, 2022, the Jal Shakti Abhiyan: Catch The Rain – 2022 initiative is also introduced in every district of the nation to promote rainwater collection and water conservation. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and the Atal Bhujal Yojana both prioritize rainwater gathering, even though the National Water Policy promotes water conservation and rainwater collecting.

Management of Mangroves
Overview:

The Portuguese term "mangue" and the English word "grove" are thought to have combined to form the word "mangrove." Mangroves can withstand salt. These serve as breeding, feeding, and rearing grounds for a variety of marine and estuarine creatures, but they are also incredibly delicate and sensitive.

With their high saline concentration, high temperatures, powerful winds and tides, muddy sediments, and anaerobic soils, mangroves are a special kind of ecosystem that sits at the meeting point of terrestrial and marine ecosystems [1]. This kind of ecosystem serves social purposes for coastal populations [4] and is one of the most economically and environmentally beneficial ecosystems in many tropical and subtropical nations [2, 3].

Mangrove forests provide as a source of biodiversity, wood, and non-timber forest products [8,9], as well as protection from storms and tsunamis [5,6,7], water system control, and habitat for a variety of fish and other species. In addition to providing food, mangrove forest habitats are visually appealing for ecotourism activities. Mangroves can store and sequester a lot more carbon than terrestrial forests in tropical and temperate locations, which makes them a crucial part of efforts to mitigate climate change [10].

Throughout the archipelago, Indonesia boasts 3.3 million hectares of "mega diversity" mangrove forests, of which 2.2 million are located inside forest areas and 1.3 million are outside [11,12]. The archipelago's mangroves are incredibly diverse and widely distributed, with 166 species found in Java, 157 in Sumatra, 150 in Kalimantan, 142 in Papua, 135 in Sulawesi, 133 in Maluku, and 120 in the Lesser Sunda Islands [13]. According to estimates, 637,000 hectares, or 10–33% of mangrove areas, have been degraded and transformed in recent decades [13,14,15,16], primarily as a result of coastal development activities such aquaculture, forestry, mining, pollutants as well as reclamation [13,15,16]. The area covered by mangroves drastically decreased as a result of the greatest mangrove deforestation, which took place between 1987 and 1998 [17].

A number of laws pertaining to mangrove management and protection were passed in Indonesia in response to the significant loss of mangroves. Mangrove conservation in Indonesia is based on Law No. 5 of 1990 on the Conservation of Biological Natural Resources and their Ecosystems. Logging operations in mangrove areas that respect the sustainability of coastal biological functions are permitted under Law No. 27/2007, which was modified into Law No. 1/2014, on the Management of Coastal Zone and Small Islands. Presidential Decree No. 73 of 2012 on the National Strategy for Mangrove Ecosystem Management, which governs the standards, criteria, standards, principles, and indicators of mangrove forest management, was issued subsequent to the issuance of this policy. In order to manage national coastal areas and small islands in a sustainable, integrated, synergistic, and peaceful manner, the government also issued Presidential Decree No. 73/2015 on the

Implementation of the Management of Coastal Areas and Small Islands at the National Level [18].

MANGROVES IN INDIA

A Government of India status report states that the total area of mangroves in India is around 6,740 square kilometers. This included roughly 8% of the Indian coastline (Untawale, 1987) and 7% of the world's mangroves (Krishnamurthy, 1987). However, a recent remote sensing study from India (Nayak, 1993) revealed that the mangroves' overall size had shrunk to 4,474 square kilometers.

Mangrove Benefits & Functions:

Ecological Roles

• Natural environment for species that are endangered

• Mud Deposition: Marine water quality is protected from silt erosion by mangrove forests.

• Nutrient enhancer: Mangrove forests' physical characteristics tend to restrict water flow and precipitation. Mangroves have 25 times the benefits of paddy farming due to the leaching of nutrients from agricultural land.

• Sources of germ plasm.

The process by which photosynthesis converts inorganic carbon (C02) into organic carbon in the form of vegetation is known as carbon sequestration. These materials break down and return carbon to the atmosphere as (C02) in the majority of ecosystems. An estimated 3.8 x 1014g C stored as mangrove biomass has been lost as a result of the loss of roughly 35% of the world's mangroves. Preserving the microclimate. Stop the formation of acid sulfate soil. preserving natural systems and processes
The management process for mangroves:

- A comprehensive zoning proposal must to comprise
- A detailed list of acceptable and unacceptable usage;
- Accurate names of the land, beach, and marine locations that fall under the zone;
- A legal process for granting and implementing licenses;
- penalties for breaking both the zone's and the permit's restrictions;
- Procedures and policies for granting zone or nonconforming use variances.

Natural hazards

- Typhoons, cyclones, and powerful waves
- Wildlife browsing and trampling
- Barnacle infestation slows seedling growth by attaching to immature seedlings and interfering with respiration and photosynthesis
- Oyster damage to the immature leaves
- Young seedlings are attacked by crabs, which girdle the root collars.
- Gastropods that consume mangrove blossoms and young leaves are a major issue in the Middle Andamans;
- Insect pests that destroy the wood and consume the mangrove foliage include wood borers and caterpillars.
- Often found in deforested mangrove environments, weeds like Acrostichum aureum and Acanthus species prevent the recovery of economically valuable mangrove tree species.

STRATEGIES TO DEVELOP NEW APPROACHES FOR MANGROVE ECOSYSTEM MANAGEMENT

Prior to the establishment of the Ecuador PMRC, Snedaker et al. (1986) examined the condition of the mariculture industry in Ecuador and its impact on mangrove ecosystems. They found that the mangroves were less dense, had smaller trees, and had fewer species. The demise of artisanal fisheries was probably caused by significant mangrove deterioration, which may also have had an impact on the shrimp larvae fishery. After providing data from Asia showing the link between improved mangrove habitat and shrimp productivity, the authors proposed a study of the Rio River to develop local understanding on these links. They added that mangroves in Latin America were once thought to be of low value and that there was no prior experience with multiple-use management or forestry. Rather than examining the The majority of timber harvesting was done on an extractive basis, and other nations sought to emulate Ecuador's establishment of a mariculture corporation as an example of sustainable multiple-use management in Asia. The report also called on Ecuador to carefully zone all mangrove areas to preserve access for traditional uses and to swiftly create suitable use plans for the intertidal zone that take into account all economic activity. In order to justify the acceptance of concessions and agricultural investments, the authors suggested that the cost of resource access should be met because of the potential productive value of coastal locations.

One of the PMRC's first efforts was the creation of a mangrove working group, an inter-institutional entity charged with improving the corpus of knowledge and management practices in mangrove ecosystems. It consisted of about 20 people from academia, government, and non-governmental organizations who met informally to exchange ideas, talk about issues, and organize and carry out projects.

Mangrove management working group members:

The provinces of Guayas, Esmeraldas, Manabi, and El Oro's forest districts

Center for Remote Sensing (CLIRSEN)

Navy Merchant Marine (DIGMER)

Subsecretary for Fisheries Resources

National Fisheries Institute (INP)

Faculty of Natural Sciences, University of Guayaquil

Technical University "Vargas Torres" in Esmeraldas

Technical University of Manabi

Technical University of Machala

Nongovernmental groups:

Fundacion Pedro Vicente Maldonado

Fundaci6n Natura-Guayaquil

FUNDECOL, Muisne

Fundacion "Seeds of Life," Guayaquil

FUNDEPRENA, Guayaquil

CORPORENA, Guayaquil

Luis Arriaga and Jose Visconez of the Ministry of Energy and Mines' Environmental Directorate (DIGEMA) presented the PMRC's first declaration on the characteristics of a mangrove management strategy to Ecuador's first environmental congress in February 1987. They proposed a work program that would include the following objectives: evaluating mangrove ecosystems while considering the various conflicts between uses and the impacts of human activity; promoting sustainable fishing, forestry, and recreational activities; strengthening the country's capacity to manage multi-use areas; increasing public support for environmental conservation through public education, training, and outreach; and providing technical guidance, resources, and extension support. for the sake of conservation. In July of the following year, the first workshop to raise awareness of Ecuador's mangrove resources

was held by the PMRC's mangrove working group. Concerned about the swift depletion of mangrove resources, national officials, experts, and leaders of non-governmental organizations gathered for the conference sponsored by DIGEMA.

Five concepts served as the foundation for the mangrove management effort, which was started under the PMRC's Year 3 (1988) work plan:

Invite outside specialists in mangrove ecosystems to Ecuador so that the working group on mangroves can share knowledge and concepts. Identify site-specific concerns, raise awareness of mangrove issues among the general population, and record changes to the mangrove environment.
Develop and assess mangrove management strategies.

Examine site-specific mangrove management techniques.

Make a national mangrove policy strategy.

The following sections provide a detailed analysis of the strategies and activities that resulted from them, as well as an assessment of the initiatives' outcomes in terms of how they contributed to the PMRCfs' main goal of developing a rich experience that would enable a fundamental shift in the governance strategy for mangrove ecosystems.

Method 1: Bring international scientific information to Ecuador.

Ecuador's scientists, government officials, and mangrove resource users not only needed to gain more knowledge about mangrove ecology and stewardship, but they were also in a good position to offer the world a laboratory in which to conduct research and test ideas that were new to Latin America. Research initiatives, training exercises, and visits and tours were conducted by international researchers.

Activities for training

Through the mangrove working group, the PMRC funded several training initiatives, such as educational trips to Puerto Rico for working group members in 1989 and workshops on mangroves in the provinces of Guayas and El Oro. Gulf of Mexico Ecology, Fisheries, Tourism, and Oceanography Program (EPOMEX) director Alejandro Yanez Arnacia; Puerto Rican specialists Gilberto Cintron and Ariel Lugo; and Robert Twilley. In Ecuador, the mangrove working group organized three more training sessions focused on forestry (led by Francis Putz of the University of Florida), fisheries (led by Arencibia), and mangrove ecology (taught by Twilley).
During these events, the lessons were taught in both directions. The response of Yanez-Arencibia (1991) of EPOMEX to his visit to Ecuador is arguably the most noteworthy. He came to the conclusion that a combination of factors, including turbidity and erosion causing the degradation of mangrove ecosystems, organic enrichment of coastal waters, changes in

drainage patterns and circulation in estuaries, and an increase in agrochemical residues, were responsible for the declining profitability of Ecuador's shrimp mariculture industry. He believed that Ecuador now served as a paradigm for shrimp mariculture development in Latin America. He was particularly worried that his own Mexico wouldn't make the same mistakes in its coastal region again, and he promoted trying out different approaches for attaining a mariculture endeavor that is sustainable.

International experts' visits

Numerous students, professionals, and Ecuadorian researchers have continued to be active with the PMRC as a result of the two financed scientific projects that were produced by the visits of international experts. These visits also encouraged the drafting of further research proposals. Instead of directly funding scientific research, the University of Rhode Island Coastal Resources Center (CRC)/USAID Coastal Resources Management Project (CRMP-seepage 11) aggressively encouraged the creation of proposals that other funders would find acceptable.

An analysis of Churute's mangrove reserve A comparative analysis of the role that mangroves play in maintaining fisheries and managing water quality in coastal ecosystems was the most significant study pertaining to the PMRC's mangrove initiatives. Churute Ecological Reserve was the study's primary focus, along with on Mexico's Terminos Lagoon. Lucia Solorzano of Robert Twilley suggested the proposal.

Roger Zimmerman of the National Marine Fisheries Service (NMFS) of the United States and the National Fisheries Institute (INP) of Ecuador. Nora Berwick, the USAID Washington project officer for the PMRC, and Stephen Olsen, the director of CRMP, pushed for the USAID Office of the Science Advisor to fund the research. The PMRC assisted in organizing and supporting the fieldwork logistically.

In summary:

Mangrove trees have been used as a renewable resource by humans in different regions of the world. Mangroves have been harvested for their sturdy, water-resistant wood, which has been used to construct furniture, boats, pilings, and homes. Charcoal has also been produced using the wood of buttonwood and black mangrove trees. Mangrove bark is used to extract tannins and other pigments. Leaves have been used as a tobacco replacement for smoking, as well as in tea, medicinal, and animal feed. In Florida, beekeepers have established hives near mangroves to produce honey from the nectar.

Solid Waste management

Introduction:

Waste is the collective word for all undesired and abandoned materials from residential, commercial, industrial, and agricultural activities. Non-liquid waste, such as that which comes from household trade, commercial, industrial, agricultural, mining, and public services, is referred to as solid waste. For instance, waste from building, industry, pathology, food, paper, and discarded apparel.

There are 3 categories:

- Waste from municipalities

- Municipal solid waste composition differs substantially between municipalities [1] and undergoes substantial changes over time. Plastic film and non-recyclable packaging materials are among the intractable wastes that make up the majority of the waste stream in towns with advanced trash recycling systems. Coal ash from open fires made up 53% of household garbage in the UK at the beginning of the 20th century.[2] Food waste, market garbage, yard waste, plastic containers and product packaging materials, and other various solid wastes from residential, commercial, institutional, and industrial sources are the main types found in developed areas with little recycling activity.[3] Industrial, agricultural, medicinal, radioactive, and sewage wastes are not typically included in definitions of municipal solid waste sludge.[4] The municipality is responsible for collecting waste in a specific area. Waste from domestic sources that include items that haven't been separated out or sent for processing is referred to as residual waste.

- Waste from industry,

- Waste from industrial activities, such as factories, mills, and mining operations, encompasses any material that is rendered unusable during the manufacturing process. Dirt and gravel, masonry and concrete, oil, solvents, chemicals, scrap lumber, and even restaurant veggie waste are examples of industrial waste. Waste from industry might be liquid, semi-solid, or solid. It could be non-hazardous waste or hazardous waste, some of which are toxic. Industrial waste can contaminate groundwater, lakes, streams, rivers, and coastal seas, as well as the surrounding soil and water bodies.[1] Accurate assessments are challenging because industrial trash is sometimes combined with municipal waste.

- Hazardous waste.

- Hazardous waste refers to waste that poses significant or possible risks to public health or the environment.[1] Hazardous waste is a category of unsafe commodities.

They typically exhibit one or more of the following hazardous characteristics: ignitability, reactivity, corrosivity, and toxicity. Listed hazardous wastes are items that have been designated as hazardous waste by regulatory bodies and come from non-specific or specified sources, as well as abandoned chemical goods.[2] Hazardous wastes can be found in a variety of physical forms, including gas, liquid, and solid. Hazardous waste is unique in that it cannot be disposed of in the same way that other byproducts of our daily life may. Depending on the physical condition of the waste, treatment and solidification operations may be necessary.

Handling of Waste

"Management of waste" is the collective name for the variety of actions taken to either utilize or make safe waste materials.

Domestic garbage

Solid Waste Management Process

1. Collection: Gathered from homes
2. Storage: Bins are kept in designated regions.
3. Segregation—the division of garbage
4. Deliver the trash to the appropriate location.
5. Recovery and processing: Solid wastes and certain of their components may be useful as an industrial raw material, power generation fuel, or landfill material.
6. Disposal: It is necessary to dispose of any other garbage that is no longer useful. For example, leftover residue from processing solid waste
7. Handling of Solid Waste

Treatment and disposal of solid waste

After collection, municipal solid waste can be treated to reduce the total weight and

quantity of material that must be disposed of. To change its form and make it easier to handle, waste is treated. It can also be used to recover certain materials and thermal energy for reuse or recycling.

Burning

Incineration: Incineration is a waste treatment method in which organic compounds found in waste products are burned. "Thermal treatment" refers to incineration and Ash, flue gas, and heat are produced when waste items are incinerated. The inorganic components of the waste mostly form the ash, which can be carried by the flue gas as solid lumps or particles. Before the flue gases are released into the atmosphere, they must be purified of gaseous and particle contaminants. In certain situations, electricity can be produced using the heat produced by cremation.

Anaerobic digestion, pyrolysis, gasification, and incineration with energy recovery are some of the various waste-to-energy techniques. The main energy result of gasification is often combustible gas, whereas the energy produced by incineration is high-temperature heat, despite the basic similarities between the two processes. It is also possible to employ gasification and incineration without recovering materials or energy.

&

How a furnace works

Burning is a particularly effective approach to reduce the weight and volume of solid rubbish, despite the fact that it emits greenhouse gases. In modern incinerators, waste is burned in a specifically designed furnace under carefully controlled conditions. The primary byproducts of the reaction between the combustible component of the waste and oxygen are heat, water vapor, and carbon dioxide. After incineration, which can cut the amount of uncompacted trash by more than 90%, bottom ash—an inert residue of ash, glass, metal, and other solids—is left behind.Fly ash, a finely divided particulate matter, and the gaseous byproducts of incomplete combustion are all carried by the incinerator airstream. Fly ash is made up of cinders, soot, and dust. In order to capture fly ash and gaseous by-products prior to their escape into the atmosphere, modern incinerators need to incorporate advanced emission control devices. These consist of cloth baghouse filters, acid gas scrubbers, and electrostatic precipitators. (See also air pollution regulation.) Fly ash and bottom ash are usually combined and disposed of at a landfill. If it turns out that the ash contains dangerous materials, it must be treated as a hazardous waste.

Incinerators for municipal solid waste are made to accept and burn a steady stream of garbage. A deep tipping area, often called a garbage storage pit, has enough space to hold rubbish for around a day. The garbage is lifted out of the pit by a crane equipped with a grapple device or bucket. It is then put in a hopper and chute above the furnace and released onto a charging grate or stoker. As the grate trembles and moves waste

through the furnace, air can move around the burning material. Rectangular furnaces are commonly used in modern incinerators, while vertical circular furnaces and rotary kiln furnaces are also available. Furnaces are constructed with refractory bricks, which can withstand the high temperatures required for combustion.

There are two phases of combustion in a furnace: primary and secondary. In primary combustion, the waste is burned and volatilized after the moisture is forced out. Secondary combustion reduces the amount of fly ash in the exhaust and gets rid of odors by oxidizing the leftover unburned gases and particles. Sometimes the primary combustion is started by burning fuel oil or auxiliary gas when the waste is extremely wet.
For primary and secondary combustion, air must be well mixed with the burning waste to supply sufficient oxygen. Air is either introduced to the space above or supplied via apertures beneath the grates. To achieve optimum combustion efficiency, the plant operator must decide the relative proportions of this underfire air and overfire air. A tall chimney's natural draft or mechanical forced-draft fans can both sustain an uninterrupted air flow.

Recovering energy

Depending on the amount of paper, the energy value of waste can be up to one-third that of coal. A boiler and a refractory-lined furnace can be used to recover the heat released during incineration. Boilers enable the recycling of the waste's energy content by converting the heat of combustion into steam or hot water. Waste-to-energy plants are incinerators that recycle heat energy in this manner. For energy recovery, a water-tube wall furnace can also be utilized in place of a separate boiler and furnace. Vertical steel tubes that are sufficiently near together to form continuous wall sections line the inside of such a furnace. To minimize heat loss, the exterior of the walls is insulated. In addition to absorbing heat to create steam, the water flowing through the tubes helps regulate combustion temperatures without using too much air, which reduces the expense of controlling air pollution.

Waste-to-energy facilities can function as either refuse-derived fuel systems or mass burn systems. All of the waste is burned in a mass burn system without any prior preparation or treatment. Before burning, a refuse-derived fuel system separates flammable debris from non-flammable materials like metal and glass. Cogeneration is the process of producing both steam and electricity at a plant if a turbine is fitted.

Because waste-to-energy systems require specialized equipment and controls, highly qualified technical staff, and auxiliary fuel systems, they are more costly to construct and run than standard incinerators. However, recovering heat energy from trash is a feasible solid-waste management solution from both an engineering and an economic perspective, and the sale of generated steam or power more than makes up for the

additional expense. Garbage-to-energy facilities make up around 80% of municipal garbage incinerators in the US.

Using compost

Composting is a biological process that allows the organic component of trash to break down under carefully monitored circumstances. It is another way to handle municipal solid waste. The organic waste material is broken down by microbes, which can cut its volume by up to 50%. Compost or humus is the stabilized product. It has a texture and smell similar to potting soil and can be used as mulch or as a soil conditioner.

One way to process and recycle waste and sewage sludge simultaneously is through composting. Composting is expected to become more common as landfill and solid-waste incinerator choices are limited by stricter environmental regulations and siting restrictions. The procedure entails sifting and separating the waste, reducing its size, and digesting it.

Shredded and sorted
Sorting and separating processes are used to separate the recyclable materials from glass, metal, and other inorganic materials in garbage. These are accomplished mechanically by taking advantage of differences in the waste's size, density, and magnetic properties, among other physical characteristics. By shredding or grinding the waste materials, their size is decreased and a uniform mass of material is created. It is done with hammer mills and rotating shredders.

Digesting and processing

Pulverized garbage can be composted in an enclosed mechanical facility or using the open windrow approach. Long low piles of trash are called windrows. To provide the bacteria that are breaking down the organics air, they are rotated or mixed every several days. Five to eight weeks may pass before the waste is fully digested, depending on the moisture content. Pathogenic organisms that may be present in the waste material are killed when temperatures in an active compost pile reach approximately 65 °C (150 °F) due to the metabolic activity of aerobic bacteria.

Composting in open windrows necessitates comparatively vast land areas. Enclosed mechanical composting systems can cut the amount of land needed by around 85%. In one or more closed tanks or digesters used in mechanical composting systems, rotating vanes mix and aerate the shreds of waste. The garbage takes about a week to completely break down.

Digestible compost must be prepared before it can be used as a mulch or soil

conditioner. Processing includes things like drying, screening, and granulating or pelletizing. These steps improve composting's lower market value, which is the main barrier to its efficacy as a waste management option. There is usually little use for digested compost in agriculture because it is costly to transport and competes with inorganic chemical fertilizers.

- **Landfill:** A landfill is a thoughtfully constructed building made into or on top of the ground where waste is kept apart from the surrounding environment. The purpose of landfills is to keep waste out of the environment, particularly groundwater, and to manage waste. The purpose of landfills is to bury waste, not to decompose it. This is due to their low oxygen and moisture content, which inhibits the quick decomposition of waste. Therefore, during their active years and for up to 30 years after they are closed, landfills are meticulously filled, inspected, and maintained. A dump is an open pit in the ground where animals frequently congregate and waste is buried. Dumps are unregulated and provide no environmental protection. A landfill is a meticulously planned and supervised building that separates waste from the environment (e.g., rain, air, and groundwater). A bottom liner and daily soil covering are used to achieve this isolation.

- Clean landfill

- Examine how bacteria and other microorganisms effectively break down solid waste in sanitary landfills.
- Examine how bacteria and other microorganisms effectively break down solid waste in sanitary landfills. View all of the article's videos.

- The most popular method of managing municipal solid waste is land disposal. Sanitary landfills, which are disposal sites that are carefully chosen, planned, built, and run to safeguard the environment and public health, are safe places to dispose of refuse. The fact that the buried waste never comes into touch with groundwater or surface water is one of the most crucial aspects of landfilling. The seasonally high groundwater table and the landfill's bottom must be at least a certain distance apart, according to engineering design specifications. The majority of newly constructed landfills must feature a system of groundwater-monitoring wells and an impermeable liner or barrier at the bottom. To prevent surface runoff or precipitation from getting to the buried garbage, completed landfill sections need to be covered with an impermeable material. Clay soil layers, flexible plastic membranes, or a mix of the two can be used to make bottom and cap liners.

- **Building the landfill.**

- Sanitary landfill

- Sanitary landfill

- The trash cell is the fundamental component of a sanitary landfill. Trash is dispersed and compacted in thin layers in this little area of the site. Up to a maximum depth of roughly three meters (10 feet), many layers may be compressed on top of one another. About a quarter of the initial loose volume is occupied by the compacted waste. To get rid of windblown litter, smells, and rodent or bug issues, the trash is covered with dirt at the conclusion of each day's operations. Thus, the daily volume of soil cover and compacted waste is contained in a single refuse cage. A lift is made up of several neigh boring garbage cells; eventually, a landfill may have two or more lifts placed one on top of the other. A coating of topsoil that might encourage vegetative growth may also be applied to the final cap of a finished landfill.

- Daily cover dirt can be brought in and built up from off-site sources, or it can be accessible on-site. To disperse and compact the soil and trash, a variety of heavy equipment is utilized, including crawler tractors and dozers with rubber tires. High-density compaction of the waste can also be accomplished with heavy steel-wheeled compactors.

- A new landfill's area and depth are meticulously staked out, and the foundation is ready for the installation of any necessary leachate-collection and liner systems. When using a plastic liner, make sure you properly sprinkle at least 30 cm (12 inches) of sand over it to protect it from landfill vehicles. The trench technique of construction may be used at locations where excavations can be made below grade. The area approach, which creates a mound or hill rising above the original ground, may be used when terrain or groundwater circumstances make this impractical. Soil must typically be transported to the site from another location because the area approach does not involve excavating any ground place. When a landfill site is situated in a ravine, valley, or on sloping terrain, variations of the area approach may be used. Eventually, the finished landfill becomes part of the surrounding environment.

Managing byproducts

Anaerobic microbial action breaks down organic material buried in a landfill. It often takes more than 20 years for complete decomposition to occur. Methane gas is one of the byproducts of this breakdown. Methane is a powerful greenhouse gas that is both toxic and explosive when diluted in the atmosphere. Additionally, it can travel great distances through soil layers that are porous, and hazardous situations could develop if it is permitted to gather in basements or other small spaces. In contemporary landfills, gas-venting devices and

impermeable barriers regulate the flow of methane. Methane gas is extracted and recovered in certain landfills for use as fuel, either directly or as a component of biogas.

- In sanitary landfills, another by-product of decomposition is leachate, a highly contaminated liquid. The majority of leachate is produced when runoff enters the refuse cells and comes into touch with decaying waste. Leachate can cause major environmental pollution issues, including the potential contamination of drinking water supplies, if it enters the groundwater or leaks out onto the ground surface. Leachate can be managed by using impermeable liners or barriers between the garbage and the groundwater, as well as by intercepting surface water to keep it from entering the landfill. Additionally, leachate-collection and treatment systems and groundwater-monitoring wells should be installed at new landfill sites.

- Ocean disposal, often known as ocean dumping, is a technique for getting rid of radioactive or nuclear waste at the ocean's bottom. The waste products included reactor vessels with and without spent or damaged nuclear fuel, as well as liquids and solids stored in different containers.[1] Since 1993, ocean disposal has been banned by international treaties. (Basel Convention, MARPOL 73/78, London Convention 1972) However, the United Nations claims that some businesses have been exploiting Somalia's lack of a functioning government since the early 1990s by disposing of radioactive waste and other dangerous items into the country's coastal seas. This led to health issues for residents in the coastal area and constituted a serious threat to Somalia's fishing sector and marine life, according to a United Nations official. The UK and Sweden researched "ocean floor disposal" (also known as sub-seabed disposal), a more intentional technique of transporting radioactive waste to the ocean floor and depositing it into the seabed, but it was never put into practice.

- Solid waste disposal

- Gathering and delivering

- The preservation of environmental quality, public safety, and public health all depend on proper solid-waste collection. Approximately three-quarters of the overall cost of solid-waste management is attributed to this labor-intensive activity. The task is frequently given to public employees, but occasionally it is more cost-effective for private businesses to complete it under contract with the municipality or for individual homeowners to pay private collectors. Each collection vehicle is staffed by a driver and one or two loaders. Usually, these are enclosed, compacting trucks with a maximum capacity of 30 cubic meters (40 cubic yards). You can load from the side, back, or front. The amount of trash in the vehicle is reduced to less than half of its loose volume by compaction.

- Selecting the most effective collecting route can be difficult, especially in large, congested cities. An optimal route results in the most efficient use of both manpower and equipment, and selecting one requires computer calculations that account for all the many design factors in a large and complex network. Variables include things like climate, haulage distance, service type, and frequency of collection. Garbage collection can be particularly difficult in remote areas because of low population density and high unit costs.

- Refuse collection usually occurs at least once a week because food waste breaks down quickly. The quantity of waste in a home can be decreased with the use of garbage disposals or garbage grinders. Ground waste puts additional burden on sewerage systems, however this is usually controllable. Many communities now use recycling and source separation systems in which citizens and businesses separate recyclables from garbage and place them in separate bins for collection. Additionally, some communities have drop-off points where residents can bring recyclables.

Transfer stations

If the waste's final destination is far from the location where it is created, one or more transfer stations may be necessary. Waste from multiple collection vehicles is combined into a single, bigger vehicle, such as a tractor-trailer unit, at a transfer station. Open-top trailers may carry up to 76 cubic meters (100 cubic yards) of uncompacted waste to a local processing or disposal location. Although they must have ejector devices, other trailers are closed compactors. In a direct discharge station, many collection trucks empty directly into the delivery vehicle. Prior to being hoisted or pushed into the transport vehicle by machinery, garbage is first discharged into a storage pit or onto a platform in a storage discharge type of station. Over 500 tons of garbage can be handled daily by large transfer stations.

Recycling

Discover how municipal recycling waste-management initiatives reduce the amount of solid waste that ends up in landfills.

Discover how municipal recycling waste-management initiatives reduce the amount of solid waste that ends up in landfills.View all of the article's videos.

Learn about the recycling and reuse of cars.

Learn about the recycling and reuse of cars.View all of the article's videos.

Discover why trash is the most useful resource.

Discover why trash is the most useful resource. View all of the article's videos.

- Recycling is the process of separating, recovering, and reusing solid waste components that may still be economically valuable. Recovering and reusing heat energy is one kind of recycling; incineration is covered separately. Since composting recovers the organic components of solid waste for use as mulch or soil conditioner, it can also be regarded as a recycling process.

- Separation

  All materials must be sifted and removed from the raw garbage before they can be recycled. Separation might be carried out at a central processing plant or at the waste's origin. Individual citizens practice source separation, also known as curbside separation, by gathering newspapers, bottles, cans, and trash individually and putting them at the curb for pickup. Glass, metal, and plastic recyclables that aren't paper can be "commingled" in many towns. In either scenario, the cost of municipal source-separated waste collection is higher than that of regular waste collection.

- Reuse

  Broken glass that has been recovered can be crushed and utilized to make asphalt pavement. Color-sorted glass is broken up and supplied to glassmakers as cullet, which is a necessary component of glassmaking. Aluminum is baled or compacted for reusing by smelters, whereas steel cans are baled and sent to steel mills as scrap. Aluminum is the most valuable recyclable resource, despite being one of the smallest parts of municipal solid waste. Plastic is difficult to recycle, mostly due to the wide variety of polymeric ingredients utilized in its manufacture. Only inferior goods, like "plastic lumber," can be produced with mixed thermoplastics.

- To eliminate mixed papers and corrugated materials, old newspapers are manually sorted on a conveyor belt. After that, they are loose-loaded or baled into trailers and transported to paper mills, where they are recycled into new newspapers. For sale to tissue manufacturers, mixed paper is separated from corrugated paper. The market for recycled paper has expanded as additional processing facilities have been established, despite the fact that the costs associated with pulping, de-inking, and screening wastepaper are often higher than those associated with producing paper from virgin wood fibers.

The Significance of Waste Management

- Waste management includes processing, disposing of, treating, and recycling liquid and solid waste for future use.

- Digging a hole into a distant land area was the method of disposing of rubbish centuries ago. Due to the lower population at the time, this garbage disposal method was designed to be effective. Because there were fewer people, there

was less waste produced, making waste management simpler. However, garbage output has also increased due to population growth, making disposal challenging. These days, garbage is made up of inorganic and non-biodegradable materials. This garbage will take a long time to degrade organically if it is dumped in a landfill. Waste management enables people to effectively and appropriately Get rid of all types of garbage.

Importance

- It keeps pollution at bay.
- Recycling gives industry access to raw materials.
- Land becomes available for sports, leisure, and community activities.
- As toxic waste builds up and contaminates the air, water, and land, it contributes to biodiversity preservation.
- offers a healthy life free from illnesses.
- Cost-effective

The Value of Trash Management
An illustration of the significance of trash management.

Waste management is crucial because it protects the environment from the harmful impacts of the biodegradable and inorganic materials found in waste. Air pollution, soil erosion, and water contamination can result from improper waste management.

If waste is gathered and handled well, it can be recycled. Paper, glass, and plastic waste can be separated into separate columns and processed to create new goods while conserving natural resources. Furthermore, if this trash is not recycled, it typically winds up in landfills or the ocean, endangering both marine life and human health. Beach closures and eutrophication result from improper sewage treatment in the majority of the world's regions. The World Wildlife Fund (WWF) estimates that 8 million tons of plastic enter the ocean annually.

Food Waste Management's Significance

When food waste is disposed of in landfills, it breaks down without oxygen, producing methane gas. Even more dangerous than carbon dioxide, methane is a greenhouse gas. Methane is 84 times more harmful to the environment than carbon dioxide within the first 20 years of its discharge, according to the Environmental Defense Fund (EDF). As a result of its absorption of sunlight, the global temperature rises.

Solid waste disposal was estimated to have resulted in 1.6 billion tonnes of greenhouse gas emissions in 2016 (WHAT A WASTE 2.0). Food waste was the cause of around half of these emissions. These emissions will rise to over 2.4 billion tonnes by 2050, and solid waste management won't get any better.

Waste Management's Economic Significance

In addition to protecting biodiversity, human life, and natural resources, waste management will boost the economy by creating additional jobs necessary to operate an effective waste management system. Waste is typically dumped on streets and in empty spaces in developing economies, whereas in developed nations, it is disposed of in garbage disposal sites. This untreated trash affects the infrastructure and poses environmental risks when it is released into the atmosphere. Waste management is becoming increasingly significant over time, both for the preservation of the environment and as a developing sector of the economy.

Recycling the materials that businesses create might result in cost savings. Their garbage disposal expenses would go down as a result. Additionally, being aware of the many garbage types the business produces will help them locate waste management services that meet their needs and save money on transportation. Furthermore, it contributes to environmental sustainability by reducing greenhouse gas emissions and conserving natural resources, both of which enhance the company's reputation. Instead of throwing away perishable food items and damaging the environment, restaurants can donate them to the less fortunate.

Systems of Indigenous Technical Knowledge (ITK) in Agriculture

The significance and benefits of Indigenous Knowledge Systems for Agriculture (IKS), as well as how they integrate with scientific knowledge and case studies Date of Assignment: February 14, 2018 In front of Dr. M. Sreenivasulu, professor and course instructor at the Department of Agricultural Extension College of Agriculture, PJTSAU Telangana 500030 I, Bhuvana, N. RAD/17-09, PhD student in the Department of Agriculture at the Extension College of Agriculture, PJTSA, presentStudent 1 for UBhuvana N, Ph.D.

Native American Wisdom "The cumulative and intricate bodies of knowledge, know-how, practices, and representations that are preserved and developed by local communities who have long histories of interaction with the natural environment are referred to as local or indigenous knowledge" (UNESCO, 2012).
The actual knowledge of a particular group that incorporates more recent experiences with contemporary technologies as well as traditional knowledge is known as Indigenous Technical Knowledge (ITK) (Haverkort, 1995).The knowledge of indigenous agricultural practices (IAPs) is not codified. What they are, what they do, how they do it, how they can be altered, how they operate, their boundaries, and their applications are all not systematically documented. It is held in as many groups, cultures, and situations as are now available, and it

involves a variety of brains, languages, and skills (Atte, 1989). Therefore, there is tremendous pressure on Indians to gather, conserve, verify, and use IAPs in order to lessen reliance on outside inputs, lower agricultural costs, and spread environmentally friendly (Sundramari and Ranganathan, 2003) agriculture.

Local knowledge that is exclusive to a particular culture or community is known as indigenous technical knowledge. It stands in contrast to the global knowledge system produced by private companies, research institutes, and universities. In rural communities, it serves as the foundation for local-level decision-making in a variety of fields, including agriculture, healthcare, food preparation, education, and natural resource management (Warren 1991). A society's information base, or ITK, makes communication and decision-making easier. Interest in indigenous technical knowledge (ITK) that incorporates the use of natural resources to address issues related to agriculture and related activities has increased since the late 1980s, when the notion of sustainable agriculture first emerged in the Indian agricultural landscape. Indian farmers have been cultivating food and surviving in harsh conditions for ages, and their agricultural methods are entwined with the rich legacy of ITK. By ignoring this rich history of ITK, it would be impossible to improve the quality of life for the vast majority of Indians who live in and rely on agricultural production systems. According to the World Bank (1998), indigenous technological knowledge has unique characteristics. Because it is based in a specific town and placed within larger cultural traditions, it is "local"; it is a collection of experiences created by the residents of those areas. Thus, it may be difficult to distinguish between the technical and the non-technical, the rational and the non-rational. Consequently, when moved to different locations, there is a possible danger of displacing native technological expertise.

Indigenous Technical Knowledge's (ITK) goals

to maintain a healthy atmosphere.

Pesticides are free of cost.

No risks to health.

There is no pollution.

lower labor costs.

utilization of regional resources.

ITK's attributes based on experience Pay attention to local characteristics Recognize the connection between each component and the environment. Resource utilization that is sustainable reliance on the local environment's health Cultural survival and sustainability

It is the customary knowledge of farmers in rural areas on the production, preservation, and safeguarding of crops grown by themselves and the local population.

The significance of ITK

• The ability of a nation to create and mobilize knowledge capital is just as crucial for sustainable development in the new global knowledge economy as the availability of financial and physical capital (World Bank, 1991).

• Indigenous knowledge is the foundation of any nation's knowledge system.

• It includes people's abilities, knowledge, and perceptions that are used to preserve or enhance their standard of living.

• Because of their deep awareness of their surroundings, indigenous people have made significant contributions to global knowledge, such as in the fields of medicine and veterinary medicine.
• The poor's primary resource for investing in their fight for survival is indigenous knowledge, which also serves as their social capital.

• As a result, agricultural, animal husbandry, ethnic veterinary medicine, natural resource use and management, primary health care (PHC), preventive medicine, and psychosocial development all greatly benefit from indigenous knowledge.

• ITK is simple to learn and becomes dependent on. so that a community's members can readily resolve their issues.

• There is scientific merit in many ITK. ITK could be used in scientific studies.

• It involves the use of inexpensive inputs, is subjective, and is related to farming.

• ITK is environmentally beneficial to the farming system.

• The extension worker can gauge the level of knowledge by looking at the ITK of a particular community.

• The information is situation-specific and localized. Thus, ITK assists the farmer in making their own decision.

Sustainability of Indigenous Knowledge Systems

• The agricultural system approach (FSA) incorporates indigenous knowledge in a significant way.

• In FSA, farmers and researchers collaborate on a shared platform to identify issues farmers have and create appropriate technology to address their top concerns utilizing both scientific and indigenous knowledge.

• Farmers' technical knowledge is gathered under the heading of indigenous technical knowledge (ITK), whereas the knowledge that researchers are contributing is called scientific knowledge.

• Information technology, practices, beliefs, tools, experimentation, human resources, and materials are all included in ITK.

• Farmers' input in the form of ITK is crucial for sustainable agricultural development since their involvement is crucial to the success of FSA.

Combining Scientific Knowledge with ITKs When comparing farmers to scientists, it frequently includes:

• The knowledge and discipline gained from the physical, social, and economic growth of a genuine farming system.

• Constant monitoring of natural resource change processes.

• The ability to gradually alter, manage, and modify sequences without being constrained by quick experimental design.

• Technology development and adaptation for various local conditions.

• The comprehension, advancement, and administration of technology with numerous components and connections.

• An extended time frame (unless desperate and insecure). Comparative competency between scientists and farmers typically consists of:

1. Procedures where exact measurement and reductionism are effective.

2. Biotechnology and breeding

3. Microscopic and minute occurrences

4. Creating package technology for situations that are consistent and ubiquitous

5. Obtaining information and genetic material from

Indigenous knowledge's function in development

• IK is a crucial component of development since sustainable development is fundamentally based on a participatory approach. Three layers make indigenous knowledge pertinent to the process of development:

• The local community where those who possess this expertise reside and create

• In their interactions with local communities, development agents (CBOs, NGOs, the government, donors, local leaders, and private sector enterprises) must acknowledge, value, and appreciate it. They must comprehend it and critically assess its applicability to their desired goals before implementing it into their strategies.

• Indigenous knowledge is included in the body of knowledge worldwide. It is possible to absorb, adapt, transfer, or conserve indigenous knowledge in other places.

Documentation Methods for Indigenous Technical Knowledge "The process of turning traditional knowledge information supplied by communities into written documents, illustrations, or audio recordings is known as documentation." By showing material that is prior art, documentation serves the dual purposes of protecting communities and ensuring that information is preserved. Justifications for ITK documentation in the agricultural industry

• To understand scientific rationale

• To accelerate technological change

• To enable better understanding technology development and development of newer concept

• To increase awareness among the younger generation and develop appreciation of traditional system

• To revive and restore pride among the farmers and other practitioners themselves.

• Mapping

• Case histories

• Critical incident

• Preference raking

• Inventory of farmer’s indicators

In conclusion

Indigenous Technical Knowledge (ITK) focuses on the effective use of environmentally friendly resources and is socially acceptable, economically accessible, sustainable, and low risk. The integration of traditional skills, cultural knowledge, and artistic truths with

contemporary abilities, viewpoints, and tools in local knowledge systems is not a relatively new phenomenon. Establishing a foundation at the national level that aids in creating a national register of innovations, filing patent applications, and offering micro-venture capital support for businesses founded on indigenous knowledge, along with non-material incentives like recognizing or honoring innovators and communities that possess indigenous knowledge, is urgently needed. The development of markets for organic and indigenous products, as well as the inclusion of local ecological knowledge in the curriculum, must be the goals of policy changes goods and aiding structures for the collective management of resources, which strengthens conservation ethics. Only by taking a multifaceted, all-encompassing strategy will sustainable agriculture be achieved in the long run.

EC-3 Notes of EVS unit 6

Movements:-Tarun Bharat Sangh

Summary:

Water conservation is the process of using less water and reusing waste water for a variety of purposes, such as cleaning, manufacturing, and agricultural irrigation. Water conservation includes the policies, programs, and actions to manage fresh water as a sustainable resource in order to maintain the water environment and meet current and future human demands.

What was done

In just 28 years, seven entire river systems that had been dormant for 80 years were revived. In strategic places, the locals built over 10,000 Johads, or little clay dams. Food supplies were secured, underground aquifers were refilled, and rivers began to flow once more, all of which helped the villages recover and become thriving communities. Currently, the project is being replicated across India.

The method used

Rajendra founded the Tarun Bharat Sangh (TBS), www.tarunbharatsangh.in, to carry out this task. TBS started out in the village by fostering the Village Council, a customary body made up of representatives from every home where decisions are made together. By agreeing to provide labor and materials for the construction of the Johads, the villagers fostered a sense of ownership and guaranteed their continued dedication to upkeep. When the river started flowing again, the first results of their labors were seen in the very next rains.

Results of using this approach to support community-driven decentralized water conservation and management:

It guarantees sustainable water availability, promotes the wise use of natural resources, boosts milk and agricultural output, and ensures food security while reestablishing the local ecology.

revitalizes thriving, healthy communities
enhances democracy and political openness, even modifies government procedures, and its main goal of replenishing the planet's groundwater yields enduring, validated, all-encompassing community development.
The river reclaims its place as the physical and spiritual hub of existence.

The approach tackles two distinct universal issues:

Even in the affluent world, communities are becoming more and more endangered by natural resource constraints, and communities everywhere are losing the ability and motivation to survive on their own.
By using the innate abilities of the community to address endemic challenges, these problems are treated holistically at the community level.

By working with real communities, TBS has demonstrated that allowing traditional wisdom to flourish and incorporating relevant modern knowledge will address problems like river flow and enhance their ability to adapt to other threats like climate change, instead of imposing universal solutions.

TARGETS

- THE THREE GOALS OF WATER CONSERVATION ARE:
- Resilience.
- Saving energy
- The preservation of habitat

ACTION TO CONSERVE WATER IN INDIA

The Tarun Bharat Sangh (TBS) is a Rajasthani non-governmental organization. directing it is Rajendra Singh. The group strives to supply people with clean water.

- Tarun Bharat Sangh was established in Jaipur in 1975 by a group of University of Rajasthan academics and students. The Indian water man
- Using JOHAD, rainwater storage tanks, check dams, and other tried-and-true methods, the NGO in the Thanagazi tehsil village of Kishori-Bhikampura has assisted the residents in taking control of water management.

- TBS has restored water to more than 1,000 villages, restored five rivers in Rajasthan (arvari, Ruparel, Sarsa, Bhagani, and Jahajwali), and helped build over 8,600 johads and other water conservation structures to collect rainwater for the dry seasons. The project began in 1985 with a single village.

- Opposed to river interconnection and the privatization of water resources.

- Several rivers around Alwar were revitalized.

- In order to raise public understanding of the country's water policy, TBS also launched the "Jal BIRADARI" program in April 2001. JAL SATYAGRAH Using a new nonviolent protest strategy, individuals demonstrated by going to the water. Villagers in M.P. fell waist deep into the Narmada River, and they were afraid that their land would be submerged by the dam's growing water level. To demand that the project be stopped down, demonstrators in Chennai also swam into the sea close to the Kundankulam nuclear power station.

PERKS

- Cattle and wildlife are provided with water.

- Each season yields more harvests.

- A decrease in migration

- Women's social issues and education receive increased attention.

- A greater understanding of how forest resources are used

INDIGENEOUS KNOWLEDGE APPLICATION IN TBS WORK

- INFORMALITY IN THE COMMUNITY

- Knowledge of many facets of water management

- Respect for historical customs, culture, and traditions

- Willingness to cooperate for the common good of the community

WORKING PLAN

- Articles of the Village Council Constitution All adults meet once a month.
- Making the most of conventional technologies while seeking guidance from engineers where necessary
- Gram Sabha makes all technical decisions, including those pertaining to placement, materials, design, etc.
- Every decision is made by consensus rather than by a majority.
- Women's contribution to reaching an agreement
- At least 30% of the whole cost is covered by the community; the remaining amount is covered by TBS from support agencies.
- UPkeep and Operation
- The community's complete assumption of responsibility
- USE MANAGEMENT AND WATER ABSTRACTION
- All 72 settlements in the Arvari Basin are represented in the River Parliament (Arvari Sansad).
- In charge of organizing and implementing sustainable water usage, especially in agriculture

THE PURPOSE

Tarun Bharat Sangh uses sustainable development initiatives to improve the lives of a poor segment of the population and provide them dignity and prosperity. Notwithstanding differences in caste, religion, or economic status, TBS strives for the holistic development of men, women, and children. TBS encourages decentralized, community-driven natural resource management.

PURPOSE:

TBS supports local self-rule, or Gram Swarajya, and works to empower communities. The distinctive aspect of TBS's development strategy is fostering neighborhood self-sufficiency. This is what occurs when you include the community in all phases of development activity.

- Restoration or expansion of social and cultural values through welfare action leadership.
- Striking a balance between the development of natural and human resources.
- Ensuring the involvement of women in the decision-making process.
- The community's educational quality has improved.
- Better health facilities are incorporated to generate healthy
- Increasing human potential, particularly that of young people, in order to channel it into employment that is founded on values.

STRATEGIES:

- The TBS strengthened by constant contact with local communities to evolve a method of working with the people. Its strategy gradually crystallized into five themes.
- The effort has to be collective one from the community in which all would benefit proportionately from the improvement that would be planned.
- The collective wisdom could be conceived in an atmosphere where informal communication took place, and every one had an equal opportunity to be heard.
- All decisions would be strictly enforced, and the community would be its own self-disciplinarian.
- Each person in the collective community would be individually responsible to carry out the tasks.
- The community would only use outside help as a catalyst for their guidance and for the facilitation of the work processes.

Other TBS Projects

Sariska's Anti-Mining Campaign

Illegal and irrational mining caused damage to the soil and forests and threatened biodiversity. According to the rules establishing and regulating the Sariska Tiger Project and National Park Status, mining operations have been conducted in locations even though they are prohibited.[2] Concurrently, a Public Interest Litigation (PIL) against mining was brought at the Supreme Court, which resulted in the court forbidding the granting of new mining leases. On October 11, 1991, TBS submitted a petition to the SC asking it to stop mining operations and demarcate the Saraika region. The mine owners' fervent and desperate interests even led to the General Secretary of TBS in front of the commission's chairwoman, as well as district and state law enforcement and administrative representatives. To discourage them, TBS activists were attacked in a number of locations. By this point, the

national media had begun to support TBS, and the network made the decision to fight to the end. The top court convicted the mine owners of assaulting the TBS General Secretary and sentenced the perpetrator to the proper length of imprisonment. Given the concerning ecological deterioration of the Aravallis, the GOI's Environment Ministry issued a notice prohibiting mining and industrial operations. However, the state government disregarded the court rulings despite pressure from multiple sources. TBS led the Satyagraha, SARISKA BACHAO ANDOLAN, in January without slowing down.1993 in response to a particular request to close the mines.[4] Advocate SC, TBS activists, and Dr. Rajeev Dhawan were brutally attacked by the mine owners on April 4, 1993. The criminals continued their assault, even targeting the TBS Ashram's dispensary. In a swift series of actions, the SC directed the Rajasthani government to immediately halt all mining operations. The SC directed the state government to give TBS protection coverage in May 1993.

For Tarun Water School

Edit During the National Water Literacy Campaign, it emerged. The school's main goal is to improve the knowledge and abilities of individuals involved in water management concerns. Additionally, it aids in teaching social workers, professionals, and farmers about TBS-innovated and conventional water management techniques. In order to investigate problems pertaining to the management of water resources, the school regularly collaborates with research universities and other institutions overseas.[5]

River revitalization
Edit

With the help and participation of the community, TBS has built 11,800 johads. It keeps up its excellent work, much like Arvari Sansad.[5][1] It began with TBS's revitalization initiative and Dr. Rajendra Singh's creative community strategy. Arvari Sansad, which meets twice a year, represents 72 villages. Protecting and integrating community water management initiatives in river catchments is the main goal.[6] The Sansad were also instrumental in defending the community against the exploitation of fish harvesting contractors.(2) Rashtriya Jal Biradari (28), an organization that organizes local people in Indian villages to prioritize water. The national water congress in April 2001 served as the impetus for the effort. There are almost a thousand members of the initiative. Its current focus is on the "save the river campaign." (3) The Rashtriya Jal Chetna (National Water Awareness Campaign) aims to raise awareness of the negative effects of the Indian government's national water policy on the country's 37 rivers. Over the course of 14 months, the campaign reached 320 districts throughout 30 Indian states, as well as metro-affiliated individuals in 90 cities and four metropolises.[7]

Andolan's Narmada Bachao

CONCERNING NARMADA RIVER……

The Narmada River is the sixth longest river in India. It starts in the Madhya Pradesh village of Amarkantak and flows 1312 kilometers (813 miles) to the sea, then on to Maharashtra, Gujarat, and finally the Arabian Sea. Together, the Narmada and its tributaries drain 98,796 sq km (37,542 sq miles) of area. → Water from 41 tributaries, 22 on its southern side and 19 on its northern side, augment the Narmada along the route.

NBA: Establishment
Medha Patkar and Baba Amte, who were awarded the Right Livelihood Award in 1991, were the principal spokespersons for the Narmada Bachao Andolan.
The NBA campaign's tactics include hunger strikes, legal actions, protests, and enlisting the help of well-known figures in the arts and movies.
A number of non-governmental organizations joined Narmada Bachao Andolan, which was founded by activists, experts, and locals using a non-violent strategy.
Numerous organizations, including the Narmada Asargrastha Samiti in Gujarat, the Narmada Ghati Nav Nirman Samiti (Committee for a New Life in the Narmada Valley) in Madhya Pradesh, and the Narmada Dharangrastha Samiti (Committee for Narmada Dam-Affected People) in Maharashtra, supported the NBA.

The NBA's catchphrases are "koi nahi hatega, bandh nahi banega!" and "Vikas Chahiye, Vinash Nahin!" (Development desired, not destruction). The dam won't be built, and we won't relocate.

How did it start?

The Narmada Bachao Andolan, the most powerful mass movement, was established in 1985 to oppose the construction of a huge dam on the Narmada River. More than 3000 major and small dams were to be built along the Narmada River as part of the Narmada Dam Project.

The proposed Sardar Sarovar Dam and Narmada Sagar were expected to displace more than 2,500 people. The Save the Narmada Movement's primary point of contention was the removal or rehabilitation of these people.

Important Narmada Points Andolan Bachao
India's first prime minister, Jawaharlal Nehru, promoted the construction of dams on the Narmada River to prevent excess water from flowing into the Arabian Sea through Madhya Pradesh and Gujarat, benefiting the local populace and the nation's development.

Among the largest dams under consideration were Sardar Sarovar and Narmada Sagar.

The Narmada Water Disputes Tribunal approved the Narmada Valley Development Project, which involves 30 large dams, 135 medium dams, and 3,000 small dams, including raising

the Sardar Sarovar dam's height.
After learning about the development of the Narmada Dam Project, Medha Patkar and her colleagues went to see the site in 1985. There, they noticed that the project work had been ordered to be evaluated by the Government of India's Ministry of Environment and Forests. The people who would be affected were given no information at all when construction on the Sardar Sarovar Dam began in 1987; they were only offered rehabilitation.
After staging a five-day, 2,000-person sit-in outside Prime Minister V. P. Singh's residence in New Delhi, the Narmada Bachao Andolan convinced Singh to "reconsider" the project in May 1990.

About 6000 men and women marched more than 100 kilometers as part of the Narmada Jan Vikas Sangharsh Yatra (Narmada People's Progress Struggle March), which began in December 1990.

Beginning in January 1991, Baba Amte and the seven-member crew embarked on a 22-day indefinite hunger strike and vowed to sit-in till death.
In 1999, work on the Sardar Sarovar Dam was resumed, and it was finished in 2006. The height of the project was increased from 138 meters to 163 meters. It was formally launched by Prime Minister Narendra Modi in 2017.

The history of the project →

The idea of building dams in the Narmada river basin existed before India gained its freedom. In 1946, the Central Waterways, Irrigation, and Navigation Commission of India formed a committee to look into the feasibility of the project. Fifteen years later, the Indian government revealed plans to construct several dams across the Narmada River. As a result, a multi-crore project was started that would generate a substantial sum of money for the government. In 1978, the Indian government applied for World Bank assistance to build a system of dams along the Narmada River as part of the Narmada Valley Development Project.

The Narmada Project included the construction of 3,000 small dams, 135 medium dams, and 30 big dams. According to the Indian government, the dams will contribute to the provision of drinkable water for about 40 million people, hydroelectric power for the entire region, and irrigation for more than six million hectares of land. Additionally, the government claimed that the dams were essential to India's economic growth and that the millions of people who live in the Narmada River basin would purportedly profit from them.

A feature of the Narmada Andolan Bachao
The Narmada, also known as the Reva, is the fifth-longest river in India. In order to support the growth of the area and the government after independence, the government insisted on constructing large, medium, and small dams on the river. The construction of the Sardar Sarovar and Narmada Sagar dams was suggested. The Narmada Valley Development was

sanctioned by the Narmada Water Disputes Tribunal. There were 3000 small dams, 135 medium dams, and 30 major dams in the project.

It was also proposed to increase the height of the Sardar Sarovar dam. Following the project's approval, Medha Patkar and her associates made the decision to visit the location in 1985. She mentioned that the project's work was being evaluated in compliance with directives from the Indian government's Ministry of Environment and Forests. In 1987, work on the Sardar Sarovar Dam got underway. The people who were expected to be impacted by the dam's construction, however, were not the subject of any investigation. It's possible that they received therapy.

In May 1990, the Narmada Bachao Andolan was organized by 2000 people after the condition of the community was evaluated. The PM's home in New Delhi was the scene of a five-day sit-in. This action led to a reexamination of the Narmada Valley Development Project by PM. The Narmada People's Progress Struggle March was also started in December 1990 by 6000 men and women. Over 100 kilometers were marched during this yatra. Baba Amte and his seven-member team went on a 22-day hunger strike in January 1991. Finally, work on the Sardar Sarovar Dam was resumed in 1999. It was dedicated in 2017 after construction started in 2006. The elevation of the project was raised to 163 meters.

Why Narmada Bachao Andolan Is Important The movement's primary objective was to halt the construction of dams till displaced people were being completely rehabilitated and resettled. In India's political history, it was one of the most important public campaigns against the government to support environmental protection. Many castes came together as part of the fight to prevent their homes and land from being flooded.

The battle was led by environmentalists, farmers, human rights advocates, and tribal representatives. International environmental organizations supported it. The movement also assisted individuals in defending their rights and acted as a check on government persecution.

Advantages of Multipurpose River Projects

• contributes to the generation of power.
• The influence on the river's natural course results in poor sediment row.
• It makes irrigation easier. Excessive sedimentation at the reservoir bottom results in rockier stream beds.
• contributes to the supply of water for home and commercial uses.
• It helps guard against flooding.

The World Bank's involvement in Narmada Bachao Andolan

After receiving approval from the Narmada Water Disputes Tribunal, the World Bank started working on the Narmada Project.
On the linked page, candidates can also learn about India's numerous interstate water issues.

Without first engaging the indigenous populations who would be relocated, the World Bank agreed to provide $450 million to the construction of the Sardar Sarovar Dam in 1985.
In 1989, Medha Patkar and other demonstrators testified about the Bank's involvement in Washington, D.C. As a result, demand mounted on the Bank to establish an impartial study to evaluate the current state of affairs. Following this, the initiative lost a lot of support.

The project's funding source, the World Bank, declared that it would launch an independent review of the Narmada Dam Project.
In 1991, the Morse Commission was formed to investigate the dam's construction, environmental costs, and people displacement. The Bank's environmental and resettlement policies were being broken, according to its study.
In 1993, the World Bank canceled its involvement in these projects.

THE NBA'S WORKS

The NBA campaign's creative opposition tactics, which were implemented concurrently at the local, national, and worldwide levels, were the reason for its success. ← The NBA concentrated on stopping the Sardar Sarovar Dam. Medha Patkar, exercising her right to fast, fasted for 22 days in June 1991, nearly dying. She also fasted again in 1993 and refused to leave the dam site. In 1994, Patkar and other activists were allegedly attacked by a few political parties at the Narmada Bachao Andolan office, and they were verbally and physically abused.

Together, Medha Patkar and Baba Amte allowed a number of protests, some of which were unsuccessful. ↑ Amte organized a 60,000-person anti-dam NBA march in Harsud, a 20,000-person town in Madhya Pradesh that was in danger of being submerged, in September 1989. A large NBA five-day sit-in at the home of then-Prime Minister V. P. Singh in New Delhi in May 1990 compelled the Prime Minister to "reconsider" the project. ↑ Amte started the Narmada Jan Vikas Sangharsh Yatra in December 1990, marching more than 100 kilometers with 5,000 protesters. In response, thousands of government-backed pro-dam protesters from Gujarat's cities were bussed in and the Gujarati police force was called in.

↑ When the government declared that villages would be submerged by the dam's rising waters, internal protests grew more intense, and the state responded accordingly. ↑ Amte started a "dharna [sit-in] unto death" on January 5, 1991. Under the leadership of socialists like Medha Patkar and Baba Amte, the movement began with the goal of protecting the

environment and providing shelter for the thousands of people who live along the banks of the Narmada River. Today, it has been going on for 31 years.

THE NBA'S LEADERS

Medha Patkar was the one who started the movement. In the middle of the 1980s, she relocated to the Narmada Valley to live with the indigenous people. ↑ She has been detained multiple times and has experienced repression. ← She participated in numerous satyagrahas and extended fasts. ← She stated that the NBA would not take any packages since the NBA opposes blocking the "natural" flow of rivers.

Baba Amte left Anandvan in 1990 to join the Narmada Bachao Andolan, which was started by Medha Patkar. Statements by Baba Amte "I'm moving to the Narmada to live. The nation will never forget Narmada as a representation of all the fights against social injustice. The United Nations Human Rights Prize is the first award. 2. The 1985 Ramon Megasessey Award 3. The 1990 Templeton Prize 4. The Gandhi Peace Prize

Aamir Khan took part in the hunger strike on Friday, April 14, 2006, which had been started on March 29 by the NBA committee in response to the government's plan to raise the Narmada Dam's height. → Aamir Khan's remarks "I have come here as a concerned Indian citizen to offer my support to these impoverished Adivasis who will lose their land and be forced to leave their homes if the dam's height is increased." ↑ He freely and bravely spoke his ideas and provided the NBA movement with positive media publicity.

Challenges of the Narmada Bachao Andolan

Another challenge for the project was the dispute over Narmada water distribution among the three states of Gujarat, Maharashtra, and Madhya Pradesh. To solve this issue, the Narmada Water Dispute Tribunal (NWDT) was created in 1969. The NWDT reviewed the various findings and released its conclusion in 1979.

The dam would release 35 billion cubic meters of water for human use, according to the court's ruling. Of the three states, Madhya Pradesh would get 65% of it, Gujarat would get 32%, and Rajasthan and Maharashtra would be eligible for the remaining 3%.

NBA ACHIEVEMENTS

--A global network of supporters has embraced the NBA.
Their early successes came from their ability to create transnational connections and petition international organizations like the World Bank from Sardar Sarovar in 1993. They have also had some success in securing concessions for those impacted by the Narmada River's already constructed dam.

↑ From 1994 to 1999, the NBA managed to stop the Sardar Sarovar Dam's construction. Foreign investors withdrew from Maheshwar Dam between 1999 and 2001.
↑ The NBA has contributed to the formation of the National Alliance of People's Movement, a nationwide network of activists.

Narmada Bachao Andolan's success

- The "Right Livelihood Award," which aims to promote justice to society as a whole, was given to Narmada Bachao Andolan for its persistent nonviolent effort.
- With NBA actions, the concerns of land for the displaced, national rehabilitation policy, and development planning without displacement have taken on a national dimension, impacting popular movements and policymaking.
- The NBA has been successful in its many tactics at the legislative, executive, and judicial levels, advocating for the rights of those impacted, including farmers, laborers, fishermen, and others, and opposing the devastation and displacement brought about by massive dams.

The following are some of the movements' accomplishments:

• The 1993 withdrawal of the World Bank from Sardar Sarovar
• The Sardar Sarovar building from 1994 to 1999
• Between 1999 and 2001, foreign investors left Maheshwar Dam.

CURRENT STATUS OF THE NBA

In October 2000, the Supreme Court declared that the Sardar Sarovar Dam should be built to a height of 90 meters, ruling in favor of the project. After the Supreme Court's decision, the Gujarati government started building the dam. ↑ State governments and market borrowings are currently the project's main sources of finance after the World Bank stopped providing it in 1993. While its height is significantly higher than the 88 meters that anti-dam demonstrators desired, it is noticeably shorter than the projected height of 130 meters. It is currently anticipated that the project will be completed by 2025.

ANALYZATION OF THE NBA

One NBA partner claims that the campaign opposing the building of dams on the Narmada For individuals all throughout the world, the NBA is a "symbol of optimism that "Symbolic of a global struggle for social and environmental justice," one NBA partner said of the campaign against the construction of dams on the Narmada River. Other partners are pushing for equitable, participative, and just development. The government spends a lot of money fighting the NBA, despite the fact that it is one of the most active social groups of our time.

the reality that it has yet to accomplish the objectives for which it has fought so valiantly.We may see that the Madhya

PROJECTS

The Tiger Project

The largest stadium for the Royal Bengal Tigers is located in India. Over 70% of the tiger population in the world is found in India. Not surprisingly, then, we are also the target of tiger hunters and poachers. Project Tiger was launched in India in 1973 to address this threat. Due to the fact that these incredible, massive cats are spread throughout multiple Indian states, the government is responsible for their care. In response to this call to duty, the government launched Project Tiger.

When did Project Tiger begin in India?

Approximately forty thousand Royal Bengal Tigers lived in India at the beginning of the nineteenth century. Seventy years later, there were just 1800 Royal Bengal Tigers left. A clear demonstration of the disrespect for India's national animal, it was shocking and frightening. It was certainly a failure.

After these numbers were widely criticized, the government looked into the matter and took action to bring the tiger population back to normal. An important wildlife conservation project in India, Project Tiger, was started on April 1st, 1973. It originated in Jim Corbett National Park in Uttarakhand.

Funded by the Union Government of India, the initiative is managed by the Ministry of Environment, Forests, and Climate Change. Direct supervision is provided by the National Tiger Conservation Authority (NTCA).

As of 2019, the core, buffer, and total acreage of India's "list of Tiger Reserves" are all available for download in PDF format.

India should be the Tiger Project's initial location.

Project Tiger's stated goals were

- To identify and implement suitable management strategies to address the reasons behind the decline in tiger habitat. It is necessary to repair the habitat loss in order to restore as much of the natural ecosystem as feasible.

- The ecology, economy, culture, and aesthetics all depend on tigers, so it is imperative to maintain a healthy population.

At what time did Project Tiger begin?

- In 1973, Project Tiger was launched. To save India's tigers, it was one of the largest conservation campaigns ever started. To safeguard the country's tiger population from dangers like poaching, it was the first program of its sort in India.

The Tiger Project's history in India

Nine tiger reserves totaling 9,115 square kilometers were first designated for special protection when Project Tiger got underway in 1973. There were nine protected tiger reserves at the start, but by the late 1980s, there were fifteen. Additionally, 24,700 square kilometers of forest land were set aside specifically for the Tigers.

By 1984, there were roughly 1100 tigers in Project Tiger reserves. Over the following few years, Project Tiger expanded the size of its tiger habitats. Project Tiger had safeguarded 23 tiger reserves in India by 1997, covering an area of 33,000 square kilometers.

The number of tigers did not significantly rise in spite of the expansion of protected areas.

The Tiger Census, also known as Tiger Counting

As of the inaugural Tiger Census in 2006, 1,411 tigers remained in the nation. The adoption of technology-based census methodology increased the credibility of the results.

There were 1,411 tigers in total, ranging from 1,165 to 1,657 adult and sub-adult tigers, according to the results. A second round of discussion and controversy regarding tiger conservation was sparked by the 2006 Census. Since then, there has been a notable increase in protection measures.

The renewed dedication to tiger conservation resulted in a steady increase in tiger populations over the next decade. According to the 2014 Tiger Census, there were 2,226 Bengal tigers in India, while 2,967 were estimated in the 2018 one.

In 2014, the state with the most tigers was Karnataka. According to the 2014 tiger census, there were 408 tigers in the state.
However, in the 2018 Tiger Census, Karnataka and Uttrakhand ranked second and third with 524 and 442 Tigers, respectively, while Madhya Pradesh lost its status as the Tiger State of India with 526 Tigers.

But according to the 2022 Tiger Census, Madhya Pradesh remained the top Tiger State with 785 Bengal Tigers.

There were 3,682 tigers in total, up 24% from the 2018 Census, according to the Tiger Census 2022.

Project Tiger now oversees 50 tiger reserves covering 72,749 square kilometers of green space in order to protect the Royal Bengal Tiger population.

Tiger Safari Parks, renowned

Project Tiger's Management

NTCA is in charge of Project Tiger's overall management. For the same reason, several conservation units have been set up, each with a field director and a group of technical experts to assist. To assist Project Tiger in India, the following conservation groups have been founded:

- The Conservation Unit for the Eastern Ghats
- The Conservation Unit for the Western Ghats
- The Conservation Unit of Central India
- North-East Conservation Unit
- Saraika Conservation Unit
- Kaziranga Conservation Unit
- Shivalik Terai Conservation Unit
- Sunderbans Conservation Unit

The Core-Buffer Approach in Project Tiger

Tiger reserves are established using a "core-buffer" approach for the purpose of effective management and tiger density-based administration.

The "core area of the reserve" is a specific region of land that has been designated as such. No human activity is allowed in these locations. It typically has the legal status of a wildlife sanctuary or national park. Tourism and other human activities are prohibited within the core area. Even routine activities like gathering wood and grazing are prohibited.

- The buffer areas usually surround the core area and are comparatively less frequented by the resident wildlife. Hence, limited human interaction here will not harm their habitat. Hence, it is subjected to ‘conservation-oriented land use’. Certain everyday activities necessary for daily life and living of surrounding villages are allowed.

The buffer area serves twin purposes. One, it serves as a habitat supplement to the spillover population of wild animals from the core area. Two, it becomes a livelihood source for surrounding villages and relieves their impact on the core zone.

The plan of action for each tiger reserve is founded upon the following basic principles:

- All human interference must be removed from the core area, and activities in the buffer area must be carefully rationalized.
- Restricting habitat management techniques to merely fixing ecological harm
- For research purposes, tracking changes in the flora and wildlife throughout time

To deter poaching, wireless communication devices and outstation patrol camps have been built within the tiger reserves. Fire protection is maintained through preventive and control techniques. Water availability has increased as a result of compensatory development projects, which has benefited vegetation. The base of prey for tigers is increased by lush plant cover.

One of the important tasks and a challenge to reserve management in core zones is village relocation. Most villages are reluctant to give up their ancient homes, but some move willingly. In the case of tribal communities, the matter becomes much more delicate.

In 2006, the Forest Rights Act was passed by the Indian government, acknowledging certain forest communities' right to their ancestral forest area. The extent to which tiger conservation efforts will be impacted by the recognition of this right is still unknown.
The accomplishment of Project Tiger

India was facing a big difficulty in the conservation of Tiger, with only 1200 Tigers living in the wild, It was a great threat to this majestic Big Cat. However, a big thank you to NTCA for starting Project Tiger in 1973.

The tiger population now is around 3,000, which is still not healthy and stable, but thanks to Project Tiger. It’s all because of efforts of NTCA and Tiger Project Team

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Overview:

A wildlife conservation initiative called Project Tiger was started in India in 1973 with the goal of preserving tigers.Project Tiger: One of our most effective conservation initiatives in recent years was started in 1973–1974. The project's goal is to conserve tigers in specifically designated tiger reserves that reflect the several bio-geographical regions that make up India. Its goal is to keep the tiger population healthy in its natural habitat.

India's Tiger Project's past

Nine tiger reserves totaling 9,115 square kilometers were first designated for special protection when Project Tiger was launched in 1973. The number of protected tiger reserves rises from nine to fifteen by the late 1980s. Additionally, 24,700 square kilometers of forest land were set aside specifically for the Tigers.

By 1984, there were more than 1100 tigers in Project Tiger reserves. Over the course of the following few years, Project Tiger expanded its tiger habitats. Project Tiger was protecting 23 tiger reserves in India by 1997, covering an area of 33,000 square kilometers.
However, even as the range of protected areas continued to expand, the number of tigers didn’t increase considerably.

Tiger Census (Tiger Counting)

According to the 2006 inaugural Tiger Census, 1,411 tigers remained in the nation. The results were more credible because technology-based census methodologies were employed.

A total of 1,411 tigers, ranging from 1,165 to 1,657 adult and sub-adult tigers, were estimated by the results. A second round of controversy and discussion about tiger conservation was sparked by the 2006 Census. Since then, there has been a significant increase in protection measures.

Tiger populations steadily rose during the following ten years as a result of the renewed commitment to tiger conservation. 2,226 Bengal tigers were projected to exist in India in the 2014 Tiger Census.
The state with the largest tiger population was Karnataka. According to the 2014 tiger census, there were 408 tigers in the state.

However, according to the 2018 Tiger Census, Madhya Pradesh lost its title as India's Tiger

State with 526 Tigers, while Karnataka and Uttrakhand came in second and third with 524 and 442 Tigers, respectively.

According to the 2018 Tiger Census, there are 2,967 tigers in total, which is 33% more than the 2014 Census and more than twice as many as the 2006 Census.

To preserve the Royal Bengal Tiger population, Project Tiger currently manages 50 tiger reserves spanning 72,749 square kilometers of green space.

How did Project Tiger begin in India?

There were roughly 40,000 Royal Bengal Tigers in India at the beginning of the 1800s. The number of Royal Bengal Tigers decreased to just 1800 in just 70 years. In addition to being startling and frightening, it also demonstrated the disregard being shown to India's national animal. Unquestionably, it was a failure.

The government investigated the matter and took action to restore the nation's tiger population in response to the harsh criticism these statistics generated. On April 1st, 1973, Project Tiger, a significant wildlife conservation initiative in India, was initiated. It was launched from Uttarakhand's Jim Corbett National Park.

The Ministry of Environment, Forests, and Climate Change is in charge of overseeing the program, which is supported by the Union Government of India. The direct supervisor is the National Tiger Conservation Authority (NTCA).
The entire "list of Tiger Reserves" in India is available for download in PDF format, with the core, buffer, and total areas updated through 2019.

Tiger Project should be launched in India.

Project Tiger's declared objectives were

to determine the causes of the decline in tiger habitats and address them with appropriate management techniques. In order to restore the natural ecosystem as much as possible, the harm previously done to the habitat had to be repaired.

To keep the tiger population healthy because of its importance to the economy, ecology, culture, and aesthetics

PURPOSE AND GOALS

- The goal of Project Tiger was to pinpoint the limiting issues and address them with appropriate management.

- The goal was to repair the habitat degradation in order to maximize the ecosystem's ability to recover.

- The project's goal is to conserve tigers in areas of India that are designated as tiger reserves. Its goal is to keep the tiger population healthy in its natural habitat.

WORK COMPLETED

More than 40 Project Tiger reserves, totaling more than 37,761 km2 (14,580 sq mi), were in existence in 2008. The number of these tigers increased from 1,200 in the 1970s to 3,500 in the 1990s thanks in part to Project Tiger. However, the number of tigers had decreased to 1,411 according to a 2008 census conducted by the Indian government.

HABITATS DEFINED

The following possible tiger habitats are being discussed:

In Nepal and Uttar Pradesh, Bihar, West Bengal, and Uttarakhand, the Sivalika-Terai Conservation Unit

The Conservation Unit in the Northeast

Unit for Sundarbans Conservation

The Conservation Unit of Central India

The Conservation Unit of Eastern Ghat

Conservation Units in the Western Ghat

BUSINESS

The National Tiger Conservation Authority is in charge of overseeing Project Tiger. A steering committee keeps an eye on the project's general management. Each reserve has a designated Field Director who is supported by technical and field staff. The work for the nation is coordinated by a full-fledged project director at the center.

THE NEED FOR WILDLIFE PROTECTION

In order to conserve wildlife and manage the danger of crime in the current environment, a widely dispersed information network utilizing cutting-edge information and communication technology is necessary. This makes it even more crucial to guarantee the appropriate degree of security in field formations in order to preserve the remarkable results of a targeted

initiative such as initiative Tiger. Mapping/Plotting (graphics) the relative spatial abundance of wild animals, identifying risk factors, proximity to risk factors, sensitivity categorization, crime mapping, and prompt action to apprehend offenders based on effective networking and communication are all crucial components of wildlife protection and control.

THE TECHNOLOGY USED

Using cutting-edge technology, a Tiger Atlas of India and a Tiger Habitat and Population Evaluation System for the nation are being constructed. This includes:

- Maps,
- GIS modeling and data collection
- Gathering and validating field data
- Data Upkeep
- Use and distribution

RESULTS:

Management plans that have been professionally designed and executed with minimal deviation.′ Daily surveillance and anti-poaching camps. Professional direction, management experimentation, and thinking. Strong leadership resolve and inspired field staff. Effective collaboration with law enforcement, district administration, and other organizations. Coordinated efforts to address issues pertaining to individuals.

GANGA ACTION PLAN

Overview of the Ganga Plan of Action:

The Ganga, the biggest river in India and the second-greatest river in the world, is extremely sacred to Hindus, who worship it as the Goddess Ganga. Along its bank are some of the world's oldest inhabited cities, such as Varanasi and Patna. It provides water to about 40% of India's population in 11 states. In the modern day, It's known for being incredibly polluted. The total length of the river is 2525 kilometers. Uttarakhand is 450 kilometers away. Uttar Pradesh is 1000 kilometers long, with Bihar and Uttar Pradesh being 110 kilometers long.In Bihar, In Bihar, 405 kilometers The Jharkhand state West Bengal is 40 kilometers by 520 kilometers. India's 8,61,404 sq. km. catchment area (26.4%) The Ganga basin 4,93,400 million cubic meters of discharge annually on average The bank lists the main cities as follows: Srinagar, Rishikesh, Haridwar, Roorkee, Kanpur, Allahabad, Varanasi, Mizapur, Patna, Bhagalpur, Bahrampur, Serampore, Hawarah, and Kolkata.

On January 14, 1986, Shri Rajeev Gandhi unveiled the Ganga Action Plan (GAP) in an effort to reduce the pollution load on the Ganga river. They also comprised the Yamuna, Gomati, Damodar, and Mahananda, the tributaries of the Ganga. Ganga Action Plans I and II Namami Gange were unveiled in January 1986 with a budget of 450 crore. with a 450 crore budget.

The Ganga Action Plan is necessary.

The urbanization and industrialization that took place in the late 1970s led to a large increase in the amount of untreated sewage that was dumped into rivers. Rising pollution made it harder to get safe drinking water, increasing the danger of water-borne illnesses like cholera and typhoid.

The Ganga, the greatest river, became significantly more polluted due to open defecation, the release of untreated industrial waste, and other issues. Since there were no regulations governing these areas, none of this could have been prevented. The government launched the Ganga Action Plan to clean up the Ganga River nationwide.

Principal Goal:

The reduction of pollution

To enhance the quality of the water by interception,

diversion and treatment of industrial chemical and toxic water entering the river, as well as home sewage.

Additional goals

1. Reduction of non-point pollution from human waste, cattle wallowing, agricultural runoff, and the disposal of partially burned and unburned bodies into rivers.

2. Research and development to improve the river's production by preserving its biological diversity.

3. New sewage treatment technologies, such as afforestation and Up-flow Anaerobic Sludge Blanket (UASB).

4. Soft-shelled turtle rehabilitation has been shown to be effective in reducing river pollution.

5. To serve as a catalyst for implementing comparable measures in other severely contaminated river segments.

The Ganga Action Plan's goals

The Ganga Action Plan seeks to eliminate pollution in the most significant river in a methodical and intentional manner.

The government created the Ganga Action Plan with the intention of preventing the pollution load from entering the river and improving the Ganga's water quality to acceptable standards.

Improving water quality and lowering pollution were top priorities in the Ganga Action Plan. Sewage interception and treatment facilities are a major focus of GAP.

It also placed a strong emphasis on protecting biodiversity, developing an integrated river basin management plan, conducting in-depth research to support these objectives, and developing experience to carry out the program to clean up other contaminated rivers in India.

Ganga Action Plan Phases

The Ganga Action Plan's Phase I and Phase II were implemented independently. Let's examine each GAP phase in more detail below.

Ganga Action Plan Phase One

Three states were included in the first phase. West Bengal, Bihar, and Uttar Pradesh are the three states that make up Phase I. The Ganga Action Plan's initial phase ran from January 1986 to March 2000. Preventing pollution of the Ganga was the aim of this phase. Phase 1 of the Ganga Action Plan was completed at a total cost of Rs. 452 crores.

This strategy was developed based on research conducted by the Central Pollution Control Board (CPCB) in 1984. In 1985, 25 Class 1 municipalities were predicted to create over 1340 million liters of sewage per day, according to the CPCB survey. At a total cost of Rs. 462 crores, 261 pollution abatement projects spanning 25 towns throughout three states—Uttar Pradesh, Uttarakhand, and Bihar—were approved in order to accomplish this goal. On March 31, 2000, the Ganga Action Plan's first phase came to an end. This project created a sewage treatment capacity of 865 million liters per day.

The Ganga Action Plan's Phase II

Delhi, Uttar Pradesh, Haryana, Bihar, Uttarakhand, West Bengal, and Jharkhand were all included in Phase II. Between 1993 and 1996, the Ganga Action Plan's second phase—which included actions for the Yamuna, Damodar, and Gomti in addition to the Ganga—was approved in stages. The degree of contamination in the river was not adequately addressed in Phase 1 of GAP.

Under two different programs—the Ganga Action Plan Phase-II and the National River Conservation Plan (NRCP)—the initiative was extended to other important rivers in India, with the National Mission for Clean Ganga (NMCG) serving as its parent organization (beginning in 2014). The Ganga Action Plan Phase included the approval of the Yamuna and Gomti Action Plans in April 1993.

Its pollution sources include:

- Wastewater
- Domestic garbage: 4.1 million people
- Industrial wastewater
- The leather industry
- Solid waste
- Bathing and washing on ghats: India's most sacred city and one of the world's oldest towns Millions of people flock here to bathe in the Ganga.
- Agriculture-related runoff
- Cremation

Cause of pollution in river Ganga :-

- Acute gastrointestinal disorders, cholera, dysentery, hepatitis A, and typhoid are among the 66% of waterborne and intestinal diseases that arise as a result of pollution in the Ganga River.
- The Ganga's high coliform bacterial content renders it unsuitable for drinking or bathing, let alone agricultural usage.
- "Those who live along its banks in Uttar Pradesh, Bihar, and Bengal are more prone to cancer than anywhere else in the country," according to a 2012 study by the National Cancer Registry Programme (NCRP). According to the data, prostate cancer is the most common disease in the nation and gallbladder cancer is the second most common cancer worldwide along the river channel.
- One of the few freshwater dolphin species in the world is the Ganges River dolphin. The primary cause of the dolphins' declining number is the hydroelectric and

irrigation dams along the Ganges, which stop them from swimming up and down the river.

Agencies' Function in the Ganga Action Plan

- An key part of the Ganga Action Plan was played by other agencies.
- The Japan International Cooperation Agency (JICA) has provided technical assistance for the "Water Quality Management Plan for Ganga" Development Study.
- Four towns are highlighted: Varanasi, Allahabad, Lucknow, and Kanpur.
- JICA hired the JICA Study Team/Consultants to conduct the study, and they worked from March 2003 to August/September 2005.

Creating master plans and site analyses for the four towns' non-sewerage and sewerage components, including sewage treatment, was the main goal of the Ganga Action Plan.

In order to begin pollution prevention schemes for the Ganga river in Varanasi town, the JBIC signed an agreement with the Government of India to provide a loan at an estimated cost of Rs. 540 crore (13.248 billion yen) based on the JICA Study Team's Master Plan and Feasibility Studies report for sewerage and non-sewerage works in Varanasi town in the first phase during 2004–2005.

JICA has received the final feasibility study reports for the final three towns of Allahabad, Kanpur, and Lucknow, which take into account the opinions of the pertinent organizations.

The Ganga Action Plan Phase II projects in the three towns (Kanpur: Rs. 425 crore, Allahabad: Rs. 305 crore, and Lucknow: Rs. 375 crore) would cost about Rs. 1100 crore.

In summary:

CGA underlined that projects must be completed on schedule. • States and NRCD were expected to cooperate to prevent time overruns. • It was completed in December 2017, although according to reports, it has only produced 13.7% of the intended sewage treatment capacity thus far. • Numerous instances of unnecessary spending and misalignment between scheme planning and execution. • There is a lot of room for improvement in the center left GAP monitoring.

India's then-prime minister, Shri Rajeev Gandhi, launched the Ganga Action Plan on January 14, 1986. It seeks to reduce pollution and improve water quality by gathering, rerouting, and treating industrial chemical and hazardous waste that is already entering the river from known highly polluting units. The program is entirely centralized and sponsored. Nearly all

of India's rivers are severely polluted as a result of rubbish being dumped into them from a variety of sources. This is also true of the Ganga River, which is the fifth most polluted river in India. Reducing pollution and improving the water quality of the Ganga River were the main objectives of the Ganga Action Plan.

The Ganga Action Plan's phases, goals, successes, setbacks, and other significant data and statistics will all be included in this article. This subject, which is covered in the environment area of the General Studies Paper-3 syllabus, is crucial for applicants getting ready for the UPSC test. To go closer to your IAS dream, sign up for UPSC Online Coaching now.

Present Ganga River Conditions

- Over the course of the Namami Gange Project (NGP), the Ganga River's water quality has improved.
- According to data made public by the Ministry of Jal Shakti, the water quality has slightly improved based on metrics like dissolved oxygen (DO), fecal coliform, and biological oxygen demand (BOD).
- The Ganga's cleaning is proceeding at a glacial rate, and it will take decades to purify the entire river and render its water suitable for human consumption.
- 310 projects totaling 28790 crores in rupees have been sanctioned by the Ministry of Jal Shakti to clean the Ganga.
- The 97 settlements on the Ganga River's main course produce 2953 MLD of sewage, despite the Namami Gange Project's present savage treatment capacity of 1794 MLD.
- There has been an improvement in the quality of the water. There has been a 30% improvement in Bihar, West Bengal, and the Uttarakhand Hills.

Concerning the Ganga Action Plan

- Rajiv Gandhi, the country's prime minister at the time, introduced the Ganga Action Plan on January 14, 1986, with the primary goals of reducing pollution and enhancing the Ganga River's water quality.
- The Union government is responsible for covering the entire project cost under the centrally supported Ganga Action Plan.
- The National River Ganga Basin Authority (NRGBA), which is chaired by the Prime Minister, was established after the Ganga was designated as India's national river under the Ganga Action Plan.

- In the first phase, the Ganga Action Plan project was carried out by the Ministry of Environment and Forest.
- There were two stages to the Ganga Action Plan project's implementation.
- The Ganga Action Plan's first phase ran from 1985 to 2000.
- The project's first phase encompassed three states: West Bengal, Bihar, and Uttar Pradesh.
- In 1993, the Ganga Action Plan's second phase was introduced, encompassing seven states, including Uttarakhand and Uttar Pradesh. Delhi, Haryana, West Bengal, Bihar, and Jharkhand.
- The National River Conservation Plan (NRCP) was initiated in 1993 as part of the Ganga Action Plan.
- The Environment Protection Act of 1986 established the central Ganga authority, which is headed by the prime minister.

Action Plan for Ganga: Goals

- The Ganga Action Plan's primary goals were as follows:
- By intercepting, rerouting, and treating industrial and domestic trash that enters the Ganga River, the water quality of the river will be improved.
- reducing pollution from non-point sources, such as human waste, agricultural runoff, and the disposal of partially or completely burned remains in rivers.
- Developing and conducting studies to preserve the Ganga River's biological variety.
- Implement advanced sewage treatment technologies, like the Up-flow Anaerobic Sludge Blanket (UASB), and promote sewage treatment by planting trees.
- Rehabilitation of animals such as soft-shelled turtles to reduce Ganga pollution.
- To serve as a model for implementing similar action plans in other Indian rivers' contaminated areas.
- Biodiversity restoration within and around the river

Ganga Action Plan: Stages of Implementation

- The next two stages comprised the implementation of the Ganga Action Plan: Phase 1 of the Ganga Action Plan

- The Ganga Action Plan's first phase ran from January 1986 to March 2000.

- The GAP's first phase was a fully centrally funded program designed to stop the Ganga from becoming contaminated.

- Phase 1 of the Ganga Action Plan came at a total cost of Rs. 452 crores.

- The total amount of sewage produced by 25 Class-1 towns in 1985 was estimated to be approximately 1340 MLD, based on the CPCB survey of the Ganga River Basin conducted in 1984.

- Only 882 MLD (65% at the time) of pollution reduction projects were included in GAP Phase-1 due to a lack of funding and resources.
- In order to achieve this, 261 pollution reduction projects totaling Rs. 462 crores were approved in three states: Uttar Pradesh, Uttarakhand, and Bihar.

- On March 31, 2000, the GAP Phase 1 was closed.

- A sewage treatment capacity of 865 MLD was established during this phase.

Phase 2 of the Ganga Action Plan

The Ganga Action Plan Phase 2 (GAP Phase 2) was approved between 1993 and 1996 since the GAP Phase 1 was unable to address the entire pollution load of the Ganga due to a shortage of funding.

- Action Plans for the Ganga and Yamuna as well as those for the Damodar and Gomti were part of the GAP Phase 2.

- Under a different program known as the National River Conservation Plan (NRCP), the GAP 2 was expanded to include other Indian rivers.

- The Ganga Action Plan Phase 2 was combined with the NRCP upon its launch in 1995.

- The seven states that were covered under the Ganga Action Plan phase two were Uttarakhand, Uttar Pradesh, Bihar, Jharkhand, West Bengal, Delhi, and Haryana.

- On April 1st, 2001, the GAP Phase 2 implementation got underway.

- Initially, the project was entirely sponsored by the central government; however, this was eventually modified to a 70:30 split between the state and the center.

JICA's function in the Ganga Action Plan

- Technical assistance for a Development Study on the "Water Quality Management Plan" for Ganga was supplied by the Japan International Corporation Agency (JICA), a Japanese consulting organization.

- The four towns of Varanasi, Lucknow, Kanpur, and Allahabad were the main focus of JICA.

- In order to develop Master Plans and Feasibility Studies for the sewers, their treatments, and non-sever components of the four cities, the JICA carried out the study between 2003 and 2005.

- A financing agreement of around 1640 crore rupees was signed by the JICA and the Government of India to undertake pollution abatement systems in the four cities following the submission of the Master Plan and Feasibility Study Reports.

Concerning the Central Ganga Authority

Under the direction of the Indian Prime Minister, the Central Ganga Authority (CGA) was established in June 1985 to supervise the Ganga Action Plan's implementation. Today, the National Ganga Council has taken its place.

The Ganga Action Plan's accomplishments

Some of the accomplishments of the Ganga Action Plan include the following:

- Water quality has improved since before 1985.

- 652 of the 764 approved projects under Phase 2 of the Ganga Action Plan were finished by 2014.

- In five states, 35 sewage treatment plants were to be built.

- The greatest accomplishment of the Ganga Action Plan is the recognition that the Ganga River is becoming contaminated and the attempt to clean it up.

Causes of the Ganga Action Plan's Failure

- A number of important factors contributed to the Ganga Action Plan's failure.

- One of the biggest challenges was the inadequate infrastructure for sewage treatment. The plan's goal was to increase sewage treatment capacity, however due to a lack of funding and inadequate cooperation amongst agencies, it was never fully implemented.

- The plan's success was hampered by a lack of community involvement and public awareness.

- There was still industrial pollution in the river. Hazardous materials were released into the Ganges as a result of certain enterprises' disregard for pollution control procedures.

- The proposal encountered difficulties with enforcement and governance. Violations went unpunished due to a lack of strict regulations and oversight procedures.

- The Ganga Action Plan was overwhelmed by the extent of the pollution issue. Since the river covers a large geographic area, it is challenging to address all sources of pollution and put comprehensive remedies in place.

- The Ganga Action Plan's sustainability and long-term vision were lacking. Although this strategy produced short-term gains, it was unable to bring about long-term transformation.

Additional Useful Measures Taken by the Indian Government to Preserve the Ganga River

The Indian government has made a number of steps to safeguard the Ganga River. The following is a list of the initiatives.

- The goal of the Namami Gange Program, which was started in 2014, is the sustainable and coordinated development of the Ganga River basin.

- Building and updating sewage treatment facilities is one way to lessen the amount of untreated sewage that is sent into rivers.

- In order to eradicate open defecation and avoid direct river contamination, sustainable sanitation practices advocate for the installation of individual family toilets and communal sanitation facilities.

- In order to supervise project execution, coordinate activities, and enforce environmental standards, the National Ganga River Basin Authority (NGRBA) was established.

- Participation of the Community: Local communities and stakeholders are included in the restoration process through platforms such as Ganga Praharis and Ganga Vichar Manch.

- Aviral Dhara: To sustain the Ganga's aquatic life and ecological well-being, concentrate on preserving the river's minimum environmental flow.

- The Bhuvan-Ganga web application It's a smartphone application. It guarantees public participation in the Ganga river pollution monitoring program.

- The National Green Tribunal (NGT) outlawed the disposal of garbage of any kind in the Ganga River in 2017.

- The National Mission for Clean Ganga was responsible for the establishment of the Ganga Knowledge Center (GKC). Enhancing the National Ganga River Basin Authority's (NGRBA) program's execution was the goal.

- The Centre for Ganga River Basin Management and Studies (cGANGA) was founded in 2016 with the purpose of gathering data. It serves as a think tank to guarantee the Ganga River Basin's sustainable development.

LAWS AND PROTECTIONS

Wild life Protection Act – 1972

Overview:
India is one of the twelve countries with the highest biodiversity in the world. India ranks fourth in Asia and tenth in the globe with over 47,000 plant species. Approximately 15,000 flowering plants make up 6% of all plants worldwide. There are also a lot of non-flowering plants in the nation, like ferns and algae. In addition, India is home to 89,000 different animal species and a wide diversity of fish in both fresh and saltwater waterways.

Wild Life: What is it?

Wildlife, as everyone knows, is the collective term for wild creatures and the local fauna (and occasionally flora) of an area. ←Originally referring to non-domesticated animal species, the term "wildlife" has evolved to encompass any plants, fungi, and other organisms that

naturally occur in a region without human intervention. There is wildlife in every habitat. Different types of animals can be found in deserts, woods, rain forests, plains, grasslands, and other places, including the most populated urban areas.

IMPORTANT RISKS TO WILDLIFE

- Changes in the climate
- Uncontrolled poaching and hunting
- The issue of pollution
- Overuse of
- Deforestation
- The population
- Utilizing plastics

What is the 1972 Wild Life Protection Act?

In order to safeguard plant and animal species, the Indian Parliament passed the Wildlife Protection Act of 1972. India had just five officially recognized national parks prior to 1972.The purpose of this statute is to safeguard birds and wild animals. With the exception of the states of Jammu and Kashmir, it covers all of India. States are required by this statute to establish Wildlife Protection Advisory Boards. This legislation prohibits hunting any of the wild animals listed in the schedule, with the exception of those allowed by sections 11 and 12. Concerning plants Additionally, no one is allowed to knowingly pluck, uproot, harm, destroy, obtain, or gather any particular plant from any forest land or area designated by the central government.

● The chief wildlife warden permits hunting of wild animals in specific locations.

● If the animal is ill, disabled, or poses a threat to human safety

● It is not illegal to kill or injure an animal in self-defense or in the service of another person.

- Any wild animal killed or injured in self-defense belongs to the government.
- Grant permits are granted for specific purposes, such as scientific management, scientific research, and education.

- Similar restrictions apply to the removal, damage, acquisition, and destruction of any designated plant from any forest land that has been notified by the central government.
- Nothing in this section will stop a Scheduled Tribe from harvesting, gathering, or owning any of the listed plants or parts for her legitimate personal use.

Provisions of the Constitution pertaining to the Wildlife Act

The Indian Constitution's Article 48A requires the State to preserve and enhance the environment, as well as to protect forests and wildlife. In 1976, the 42nd Amendment was ratified, adding this provision to the Constitution.

India's citizens are subject to several basic obligations under Article 51A. One of them is to have empathy for all living things and to preserve and enhance the natural environment, which includes woods, lakes, rivers, and wildlife.

The Chief Wildlife Warden, who has the power to oversee, manage, and maintain all sanctuaries, may allow people to enter or stay in the sanctuary for the purposes of studying wildlife, conducting scientific research, taking pictures, conducting legal business with those who are residing there, and conducting tourism.

It is possible to elevate sanctuaries to the level of "National Park."

Examples include the Dandeli Wildlife Sanctuary in Karnataka, the Vedanthangal Bird Sanctuary in Tamil Nadu, and the Indian Wild Ass Sanctuary in the Rann of Kutch, Gujarat.

National Parks: "The government designates national parks as places to preserve the natural environment."

2. Compared to a wildlife sanctuary, a national park is subject to more limitations.

The State government may designate areas as national parks by issuing a notification. A national park's limits cannot be changed without a resolution approved by the state legislature.

A national park's primary goals are biodiversity conservation and the preservation of the local natural environment.

National parks feature the vegetation, animals, and scenery in its natural state.

Their limits are clear and unchangeable.

Human activity is prohibited here.

No one is allowed to deprive any wild animal of its habitat within a national park, destroy, remove, or exploit any wildlife from a national park, or damage or destroy any wild animal's habitat.

They are not degradable to the level of a "sanctuary."

Kaziranga National Park in Assam, Hemis National Park in Jammu & Kashmir, and Bandipur National Park in Karnataka are a few examples. Read more about India's National Parks List.

3. Conservation Reserves: Following community consultation, the state government may designate a region as a conservation reserve, especially if it is close to a park or sanctuary.
4. The State government has the authority to designate any private or communal land as a community reserve following consultation with the local population or a volunteer who has offered to help preserve the species.

5. Tiger Reserves: In India, these regions are set aside for the preservation and protection of tigers. The National Tiger Conservation Authority's suggestions served as the basis for their declaration.

Goals:

1. The following are the Act's primary goals:

2. Hunting certain wild animals, birds, and plants is prohibited.

3. Establishing and overseeing animal sanctuaries and national parks.

4. Management of Wildlife and Wildlife Product Trade and Commerce.

A Few Terms Associated with It:

- The term "taxidermy" refers to the process of curing, preparing, or preserving trophies. skins, rugs, and specimens of these animals that have been partially or completely mounted using the taxidermy technique. rhinoceros' horn, antler, feather, tooth, musk, nests, and eggs.

- "Vermin" refers to any wild animal included in Schedule V. The term "wildlife" encompasses any aquatic or terrestrial plant that is a component of any ecosystem, as well as any mammal, bee, butterfly, crab, fish, and moth.
  Penalties:

  ● Anyone who violates this act or violates any of the terms of any license or permit granted under this act will be found guilty of an offense against this act.

- Such individuals may face a three-year prison sentence, a fine of Rs. 25,000, or both.

- whenever someone is found guilty of a crime against this act. The state government may be ordered to revoke the license or permit by the court hearing this case.

- A license granted to an individual under the Arms Act 1959 for the possession of an arm with which an offense against this Act has been committed may be revoked by the court, and the individual will not be eligible for another license for five years following the date of conviction.

- If a person is found guilty of hunting in a sanctuary or natural park, nothing in Section 360 of the Code of Criminal Procedure will apply to them unless they are younger than eighteen.

Amendments.

The code has been amended several times.

- The 2002 Amendment Act, which went into effect in January 2003, strengthened the penalties and punishments for violations of the Act.

- The Environment, Forests, and Climate Change Minister presented the Wild Life (Protection) Amendment Bill, 2021 to the Lok Sabha on December 17, 2021. The Wild Life (Protection) Act of 1972 is amended by the bill. The Act governs how wild animals, birds, and plants are protected. The bill aims to implement the Convention on International Trade in Endangered Species of Wild Fauna and Flora and expand the list of species protected by the law.

Offences

- The penalties have been increased for offenses involving wild animals (or their parts and products) listed in Schedule I or Schedule II, as well as offenses involving hunting or modifying the borders of a sanctuary or national park. The minimum sentence is three years in prison, with the possibility of an extension to seven years, and a minimum fine of Rs. 10,000. This type of second offense carries a minimum fine of Rs. 25,000 and a maximum sentence of seven years in jail, with a minimum sentence of three years.

- Violations unrelated to hunting endangered animals

- Except for chapter V A and section 38J, offenses involving the trade and commerce in trophies, animal products, etc. generated from certain animals carry a maximum sentence of three years in jail and/or a fine of up to Rs. 25,000.

In conclusion:

The primary responsibility for wildlife protection should fall on each and every person, not just the government apparatus and its small number of bureaucrats. This was among the factors that led to the addition of a new clause, Article 51 A (g), to our Constitution, which states that it is the fundamental responsibility of every citizen to preserve and enhance the natural environment, including forests, lakes, rivers, and wildlife, as well as to show compassion for all living things.

Environmental Protection Act,1986

Overview:

The Indian Parliament passed the Environment Protection Act of 1986. The Environment Protection Act of 1986 was passed by the Indian government in response to the Bhopal tragedy, in accordance with Article 253 of the Constitution. It was enacted in March 1986 and went into effect on November 19 of the same year. There are four chapters and twenty-six sections. The Act's objective is to put the United Nations Conference on the Human Environment's rulings into effect. They have to do with safeguarding and enhancing the human environment and avoiding risks to people, other living things, plants, and property. The Act is a piece of "umbrella" law that was created to give the central government a framework for coordinating the actions of different state and federal bodies.

GOALS

o Ensuring the environment is improved and protected.

o Preventing all types of environmental contamination.

o To address particular environmental issues that are unique to various regions of the nation.

o To safeguard the nation's wildlife and forests.

o To build laboratories, assign environment officers to inspect the environment for contamination, and many other things

The act's scheme:

The 26 parts of the Environment Protection Act of 1986 are organized into four chapters that deal with

i) Initial

ii) The federal government's general powers

iii) Environmental pollution prevention, control, and mitigation

iv) Other.

Initial brief title, scope, and start.

- Article 253 of the Indian Constitution established the Environment Protection Act.
- Control and minimize pollution from all sources in order to preserve and enhance the quality of the environment.
- One possible name for this act is the Environment Act of 1986.
- It encompasses the entirety of India.

Central government's general powers

- This act gives the Central Government the authority to take any necessary actions to safeguard and enhance the environment.
- Create and implement a national program to prevent and regulate pollution in the environment.
- Establish criteria for environmental quality in all of its facets.
- Establish protocols for the safe handling of dangerous materials.
- Create laboratories and conduct environmental research.
- Create manuals, rules, and guidelines for control and prevention.
- A few guidelines
- No one in charge of a company or industry is permitted to release or emit more pollutants than what is permitted.
- No one is allowed to handle any hazardous material unless they follow the guidelines or precautions that have been established.
- He will undoubtedly reduce or stop pollution if it is excessive.

- The central government may forbid the establishment of businesses or the handling of chemicals in specific locations.

- The government has the authority to access any location to conduct environmental pollution tests and examinations.

- Any sample from the factory or premises may be taken by the government or an officer for analysis.

- When someone arrives for an inspection, the individual in question should help them in every way they can.

- Environmental pollution prevention, control, and mitigation also include

- The central government has the authority to take all necessary actions to safeguard, enhance, and avoid environmental problems, including:

- Establishing criteria for environmental quality in a number of areas.

- Limitations on the places where industry operations are to be conducted.

- Analyzing the manufacturing process, materials, and substances that could harm the environment

Safeguarding particular plants

- No one is allowed to remove, uproot, or destroy any specific plant from a forest.

- No one is allowed to sell or transport any particular plant, component, or derivative.

- Permission is given for scientific, educational, or herbarium preservation.

- No one is allowed to grow a certain plant unless they have a license.

- Any place of ecological significance may be designated as a sanctuary by the state government.

- Unless authorized by the chief wild life warden, no one is allowed to live there.

- All animals that are hunted or bred in captivity, as well as any plants that are obtained in violation of the legislation, belong to the government.

- The chief wild life warden's presence is required for the restricted trade in wild animals and items.

Preventing offenses

Any one suspected of illegally obtaining plants or animals may be stopped or detained by an authorized official.

It is possible to search or inquire about any vehicle or property that has the specified animals and plants.

Any one who violates any of the Act's provisions faces jail time, a fine, or both.

A person's license or permit may be revoked by the court if they are found guilty of a crime.

The Environment Protection Act's principal provisions

- In the area of environmental protection, the EPA gives the Center the authority to "take all such measures as it deems necessary."

- It is authorized by law to organize and carry out national policies and programs to advance environmental protection.

- It has the authority to enforce environmental quality regulations, especially those pertaining to the release or emission of pollutants into the environment.

- The location of industries may be restricted under this law.

- The law grants the government the authority to enter a location for inspection, equipment testing, and other purposes. It also grants the government the authority to analyze samples of soil, water, air, and other substances from any location.

- The release of environmental contaminants in excess of the regulation standards is expressly prohibited by the EPA.

- Additionally, a specific rule prohibiting handling hazardous compounds unless in accordance with legal standards is in existence.

- The Act gives anybody, excluding authorized government officials, the ability to complain in court about any violation of its provisions.

In conclusion:

The best illustration of it is:

1) Why the Even and ODD formulas?----to reduce traffic and air pollution on Delhi's highways.

2) HC requests that the plastics sector appear before the Green Tribunal and declines to extend the plastic ban.

(3) On technical grounds, the Karnataka High Court has banned single-use and non-recyclable plastic products throughout the state.

- In accordance with Section 5 of the Environment Protection Act, the State government issued the plastic ban order on March 11, 2016.

- Recently, a challenge contesting the plastic prohibition was brought in the High Court by plastic manufacturers, led by Canara Plastics Manufacturers and Traders.

It's time to reflect:

1. The average data center's carbon footprint ranges from 3 million to 130 million kg of CO2 emissions.

2. Power expenses or postponing the technological advancements that enable your website function effectively account for 24% of a major data center's yearly budget.

Noise pollution act 2000

Overview:

Human health and psychological well-being are negatively impacted by the rising ambient noise levels in public areas caused by a variety of sources, including construction, industrial activity, generator sets, loud speakers, public address systems, music systems, automobile horns, and other mechanical devices. For this reason, it is thought to be necessary to regulate and control the sources of noise in order to maintain ambient air quality standards regarding noise.

The Act's Draft Draft:

The Ministry of Environment and Forests published a draft of the Noise Pollution (Control and Regulation) Rules, 1999 in response to the Government of India's notification, number S.O. 528 (E), dated June 2, 1999. The notice asked for comments and objections from anyone who might be impacted by the rules before the sixty-day period that followed the date that copies of the Gazette containing the notification were made available to the public ended on July 1, 1999.

Noise Pollution Types

The three categories of pollution are as follows:

Noise from Transport

Noise in the Neighborhood

Noise from Industry

Pollution from noise

Noise from Transport

It is mostly made up of traffic noise, which has gotten worse recently as more cars have been on the road. Increased noise pollution causes headaches, hypertension, deafness of the elderly, and other problems.

Noise in the Neighborhood

The sound of electronics, kitchenware, etc. Transistors, loudspeakers, and musical instruments are a few of the primary sources.

Noise from Industry

Heavy industrial machinery is the source of this intense noise. Numerous studies indicate that industrial noise pollution impairs hearing by about 20%.

Reasons for the Origins of Noise Pollution

The sources and causes of noise pollution are as follows:

Industrialization: Due to the usage of large exhaust fans, mills, generators, and other heavy gear, industrialization has been linked to an increase in noise pollution.

Vehicles: The second factor contributing to noise pollution is the rise in the number of vehicles on the road.

Events: Loudspeakers are used to play music at weddings and public gatherings, which causes undesired noise in the neighborhood.
Construction sites: Noise pollution is increased by mining, building construction, etc.

Examples of Noise Pollution

Here are some instances of noise pollution:

Use of horns excessively

Using loudspeakers during religious or political events

Using fireworks that are not necessary

Industrial noise

Construction-related noise

Noise from trains and airplanes associated with transportation

How noise disturbs people's life Making excessive noise in the surroundings is considered pollution since it lowers the quality of life. There are several specific ways that excessive noise can harm people.

(a) Regular sleep disturbances. In a sociological poll of people living close to London Airport, almost 22% of participants said that the noise from the airport occasionally made it difficult for them to fall asleep. In locations where the noise was particularly loud, up to 50% of people voiced their complaints. Even more people said that loud noises had woken them up, usually in the early morning while they were still sleeping lightly. After a few hours of sleep, people do not readily wake up, even when subjected to very loud noises. People can sleep at different depths and adjust to night time sounds. Unquestionably, nevertheless, noisy nocturnal situations near residential areas should be avoided because the reverse consequence of disrupted sleep occurs. At relatively cheap costs, there are many sound insulation techniques accessible today.

(a) Effect on deafness or hearing. Only at high decibel levels do these impacts become noticeable. Long-term exposure to noise levels much greater than 100 dB causes hearing loss rapidly. After even brief exposure to the clamor of jet jets or highly noisy industries, many workers rapidly develop detectable hearing impairments. Earplugs are now commonly used by employees in these types of situations, and they have no effect on hearing as long as they are worn consistently.

(b) Effect on communication or speech Interference:Conversations and phone calls, as well as the enjoyment of radio and television programs, can all be interrupted by outside noise. The efficacy of educational institutions, companies, and other contexts where communication is essential may therefore be impacted. The maximum noise level that is allowed in some situations is 55 dB. Given that 70 dB is considered to be excessively loud, speaking communications will unavoidably be severely disrupted.

(c) Effects on the Body or Mind: Many people assert that noise contributes to mental disease. To prove or disprove these claims, experiments have been carried out. A paper from the H.M. Stationery Office claims that noise has no bearing whatsoever on mental illness. The disruption of biological organisms and human functioning by noise has been confirmed by scientists and medical specialists. Using fire crackers and other explosives excessively and continuously can lead to mental disorder, neurosis, and bodily discomfort, respiratory conditions, stomach ulcers, and cardiovascular illness, all of which can reduce a person's lifespan. Recent research indicates that a brief exposure to noise (over 100 dB) might result in health problems for the fetus, including headaches, dizziness, intestinal dilatoriness, stomach problems, and sometimes irreversible visual damage.

(d) Effects on productivity and physical or mental health conditions.Noise has very little physical effect on biological function as long as it is below 90 dB. Research has demonstrated that prolonged exposure to noise levels exceeding 100 dB can harm the inner ear, which can result in physical illness. According to new research, noise has a particular connection to physical health, causing tension that can result in problems including mental pain, fatigue, sleep disturbance, speech interference, and aggravation, according to psychologists and psychiatrists. Industrial noise levels hinder productivity and communication while raising the chance of accidents. The World Health Organization believes that the industries lose a lot of money each year.

How to Avoid Noise Pollution

Here are some recommendations for preventing noise pollution.

In public places like schools, hospitals, etc., honking ought to be prohibited.

Enough soundproofing devices should be installed in industrial, commercial, and medical facilities.

Musical instrument sounds should be muted to a level that is acceptable.

Reduced noise pollution is a result of dense tree cover.

Explosives should not be used in mining, mountainous, or wooded areas.

The Noise Pollution Regulation and Control Rules, 2000

1. The title and the opening.

(1) One term for these rules is the Noise Pollution (Regulation and Control) Rules, 2000.

(2) They will go into effect the day they are published in the Official Gazette.

2. Definitions.Unless the circumstances demand otherwise, in accordance with these standards,

(a) The 1986 Environment (Protection) Act is referred to as the "Act" in this context.

(b) "area/zone" means any place that belongs to one of the four categories in the Schedule that goes with these rules;

(c) In accordance with the legislation now in force, "authority" refers to any officer or authority that has been granted permission by the Central Government or the State Government, as applicable. This includes a District Magistrate, Police Commissioner, or any other official designated by any recently passed legislation to uphold the ambient air quality standards with regard to noise;

(d) The occupier or his agent who oversees the facility's operations is referred to as the "person" when discussing a factory or collection of premises;

(e) The Administrator appointed under Article 239 of the Constitution is referred to as the "State Government" when discussing a Union territory.

Accountability for implementing measures to prevent noise pollution.

(1) The noise levels in any zone or region cannot exceed the Schedule's ambient air quality noise requirements.

(2) The authority shall be in responsible of making sure that ambient air quality criteria are appropriately adhered to with relation to noise and implementing noise pollution control measures.

Limitations on the use of public speech systems and loud speakers.

(1) Unless authorized in writing by the authorities, no loud speaker or public address system may be used.

(2) Loud speakers or public address systems are not allowed to be used at night (between

10:00 p.m. and 6:00 a.m.), with the exception of enclosed areas used for internal communication, such as auditoriums, conference rooms, community halls, and banquet halls.

Consequences for violating the silence-designated region.

Anyone who commits any of the following offenses in a location covered by the silent zone or area faces punishment under the Act's provisions:

(i) Anyone who plays music or makes use of sound amplifiers,

(ii) an individual who performs any musical instrument, including blowing a trumpet, beating a drum or tom-tom, blowing a horn, or playing an instrument,

(iii) Anybody who entertains 44raq audiences with a mimetic, musical, or other act.

Complaints should be reported to the appropriate authority.

(1) If the noise level in any area or zone is 10 dB(A) or more than the ambient noise levels indicated in the corresponding columns, a person may complain to the proper authorities.

(2) The authority will address the complaint and take appropriate action against the violator in accordance with the provisions of these regulations and any other applicable legislation.

Power to prohibit playing music or making noise all the time, among other things.

(1) The authority may, by written order, provide anyone with the guidelines he believes are required to stop, forbid, regulate, or control:
(1) If an officer in charge of a police station reports, or if the authority receives other information from him, that what needs to be done is to prevent annoyance, disturbance, discomfort, or injury, or the risk of annoyance, disturbance, discomfort, or injury to the public or to anyone who lives or occupies property nearby:

(a) The occurrence or persistence in or on any property of
(i) any instrumental or vocal music,

(ii) noises produced by playing, thumping, colliding, blowing, or using any kind of noise-producing device, such as loudspeakers, public address systems, appliances, machinery, or devices that can produce or reproduce sound, or

(b) any trade, hobby, operation, or procedure that is conducted on or on any property that produces or is associated with noise.

Safety Measures in Construction Activities

(a) It is advisable to erect acoustic barriers close to building sites.

(b) In industrial areas and other places, the maximum noise levels close to the construction site shall be 75 dB (A) Leg (5 min) and 65 dB (A) Leg (5 min), respectively.

(c)The building site ought to be surrounded by fencing in order to keep people away from it.

(d) It is necessary to stockpile materials and place unused equipment between noisy operational equipment and other locations.

(e) Using soil and other materials that are typically taken away from the construction site, temporary earth must be constructed around the site.

Conclusion:+-

Loss of concentration and weakening of memory are the indirect consequence in the metropolitan cities of India causing adverse effect on students and growing child. To conclude, every individual is suffering directly or indirectly due to rising noise levels which will surely be fatal to the coming generation and if precautions are not taken from today we will surely ruin the total personality of physical beings of the universe. The biggest contributor to the noise pollution as a source which had been identified as small scale power generating sets used for domestic and commercial purposes causing tremendous effect on working efficiency to the users as well as non-users causing serious psychological problems.

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