Date: 13/04/2023

To whom it may concern

Subject: Completion of ENVS Project by PHIA, MTMA and ECOA Gr. B students of Semester II in 2022

The undersigned hereby certifies that the students mentioned in the table given below have completed their AECC 2 - ENVS projects for the University of Calcutta B.A/B.Sc. Semester-II Examination, 2022. These students are mentioned in the modified template of Metric 1.3.2 (as DVV compliance) as ENVS-PHIA_MTMA_ECOA Gr. Bwith pdf link of their projects stated alongside.

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Gokhale Memorial Girls' College Kolkata

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GOKHALE MEMORIAL GIRL'S COLLEGE

PROJECT OF ENVS (AECC-2)

ON

"URBAN POLLUTION"

SUBMITTED BY

NAME – DEBOSMITA JANA

SEMESTER – 2

HONOURS – PHILOSOPHY

COLLEGE ROLL NO – 21/BAH/0091

CU REGISTRATION- 013-1211-0023-21

CU ROLL NO- 212013-11-0009

YEAR - 2022

INTRODUCTION

Pollution is the introduction of harmful materials into the environment. These harmful materials are called **pollutants. Pollutants** can be natural, such as volcanic ash. They can also be created by human activity, such as trash or runoff produced by factories. **Pollutants** damage the quality of air, water, and land. All living things—from one-celled microbes to blue whales—depend on Earth's supply of air and water. When these resources are polluted, all forms of life are threatened.

FIG NO.1 AIR POLLUTION

FIG NO. 2 SOIL POLLUTION

URBAN POLLUTION

The concept of ***urban pollution*** refers to the presence or introduction in cities and urban areas of poisonous or harmful substances. **Urban pollution** may come from natural sources, but the most detrimental are those emissions related to human activities. The anthropogenic sources of pollution, such as factories, industries, transportation, and so on, are typically exacerbated in cities due to the local concentration of humans and human activities. For instance, pollution in cities is affected by **global environmental threads, such as global warming**, and by locally originated environmental challenges, such as waste management, recycling, and light and noise generation.

URBAN POLLUTION

CAUSES

The two main **causes** of **pollutants** in **urban** areas are transportation technologies such as the automobiles and power production technologies such as industrial heating and cooling and coal-burning power plants. Automobiles produce a large amount of carbon monoxides to the air we breathe in. Also to drive hybrid cars which are lower in emission and are environment friendly instead of the gasoline-using counterpart.

AFFECT

Urban people change their environment through their consumption of food, energy, water, and land. And in turn, the polluted urban environment affects the health and quality of life of the **urban population...** For example, urban populations consume much more food, energy, and durable goods than rural populations.

SOURCES

Most air pollution in urban areas comes from motor vehicles and industry. Describe the way in which smog forms. Smog is formed when air pollution hangs over urban areas and reduced visibility.

There are four main types of air pollutions sources:-

- ***Area sources***- Such as agricultural areas, cities, and wood burning fireplaces.
- ***Mobile sources***- Such as cars, buses, planes, trucks, and trains.
- ***Stationary sources***- Such as power plants, oil refineries, industrial facilities, and factories.
- ***Natural sources***- Such as wind-blown dust, wildfires, and volcanoes.

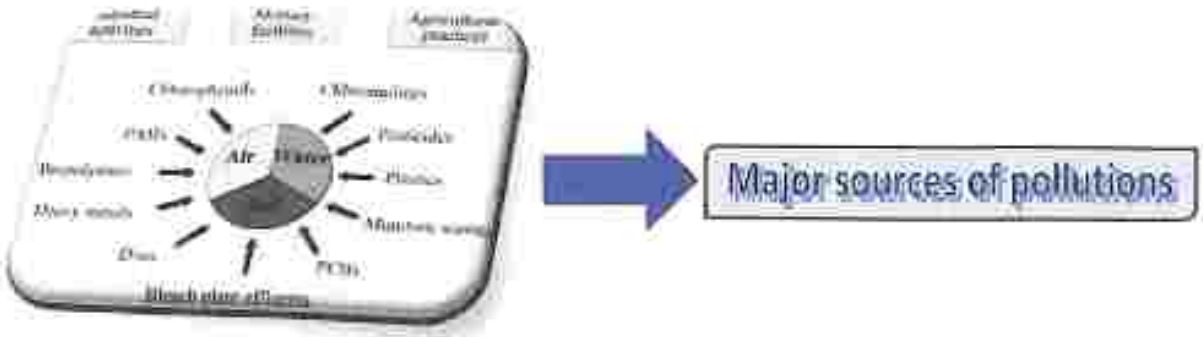


FIG NO. 5

PRECAUTIONS

Here is a set of best practices that can help reduce pollution in our cities:

- **Drive at moderate speed: as this helps producing less pollutants and save energy as you'll be using less petrol.**
- **Park without interrupting traffic movement.**
- **Use public transport, go by bike or walk.**
- **The use of plastic products could be very harmful to the environment as they take a very long time to decompose, due to their material made up of oil. The use of paper bags instead is a better alternative as they decompose easily and are recyclable.**
- **The usage of AC's takes a lot of energy and emits a lot of heat which is bad for the environment. AC's also take a lot of power and energy to work as compared to fans.**
- **The use of crackers during festivals and weddings is sadly one of the biggest contributors to air pollution, leading to a layer of smog which is extremely harmful for health. So, practice of no crackers should be implemented.**

Urban Air Pollution: Sources and Pollutants

Urbanization and rapid industrialization have benefited mankind and made the life of humans easier and comfortable. However, both urbanization and industrialization also pose harm to mankind, the top of which is air pollution. Urban air pollution refers to the air pollution in and around cities. Denser populations experience more urban air pollution. Air pollution affects human health as well as the climate of an area. According to World Health Organization (WHO) 4.2 million deaths every year occur as a result of exposure to ambient (outdoor) air pollution. Although there are some natural sources of urban air pollution, most of the sources are anthropogenic and largely depend on the activities of people. Natural sources of urban air pollution include volcanic eruptions, thunders, dust from the earth's surface and naturally occurring particulate matter. Nevertheless, major factors that contribute to urban air pollution are anthropogenic activities, including transportation, domestic use of fossil fuels, industrialization, power generation, combustion and agriculture and beauty products.

CONCLUSION

Most Indian cities are experiencing rapid urbanisation. Unprecedented growth of cities has brought serious challenges, including environmental degradation, loss of natural habitat and species diversity, and increased human health risks associated with heat, noise, pollution, and crowding. That means many people, and particularly children, are living and growing up in environments with increasing pollution, intense heat, and less access to diverse green spaces. Given these challenges, there is a critical need to find ways to reduce health risks and maximise opportunities for well-being in all urban communities of the country.

From the above project we can conclude that urban pollution or any kind of pollution is harmfull for our environment as well as for us.

ACKNOWLEDGEMENT

I am very thankful to my respected teachers for giving us such an important topic to discuss about because day by day its becoming the most important issues to think about. It is the duty of us to protect our environment as well as reduce pollution as much as possible.

BIBLIOGRAPHY

I took a lot of help from my teachers , internet ,some books , friends and my parents. It helped a lot to gain different kind of information.

THANK YOU

Saman
26/05/2022

GOKHALE MEMORIAL GIRL'S COLLEGE

ENVIROMENTAL STUDIES PROJECT

Title of the project: Biodiversity and Conservation

SUBMITTED BY:

Name: Smrity Gupta

College Roll No: 21/BSCH/0061

CU Registration No: 013-1211-0142-21

CU Roll No: 213013-11-0012

Year: 2021-2022

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my teacher Santanu Samanta as well as our principal Dr. Atashi Karpha who gave me the golden opportunity to do this wonderful project on the topic Biodiversity and its conservation, which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to them.

Secondly, I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

CONTENTS

INTRODUCTION

In 1980 – **Thomas Lovejoy** introduced the term biological diversity to the scientific community. In 1988 – **Edward O. Wilson** edited Biodiversity volume, based on the proceedings of the first US national conference on the subject, which also introduced the term biodiversity into the language.

Biodiversity is the **biological variety** and variability of life on earth. Biodiversity is a measure of variation at the genetic, species, and ecosystem level.

Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life.

Biodiversity supports everything in nature that we need to survive: food, clean water, medicine, and shelter.

But as humans put increasing pressure on the planet, using and consuming more resources than ever before, we risk upsetting the balance of ecosystems and losing biodiversity.

Biodiversity holds ecological and economic significance. It provides us with nourishment, housing, fuel, clothing and several other resources. It also extracts monetary benefits through tourism. Therefore, it is very important to have a good knowledge of biodiversity for a sustainable livelihood.

BIODIVERSITY AND IT'S TYPES

Biodiversity further classifies into three major types. They are:

- Genetic Diversity
- Species Diversity
- Ecological Diversity

1 Genetic diversity | 2 Species diversity | 3 Ecological diversity

GENETIC DIVERSITY

Genetic diversity is the total number of genetic characteristics in the genetic makeup of a species, it ranges widely from the number of species to differences within species and can be attributed to the span of survival for a species. It is distinguished from genetic variability, which describes the tendency of genetic characteristics to vary.

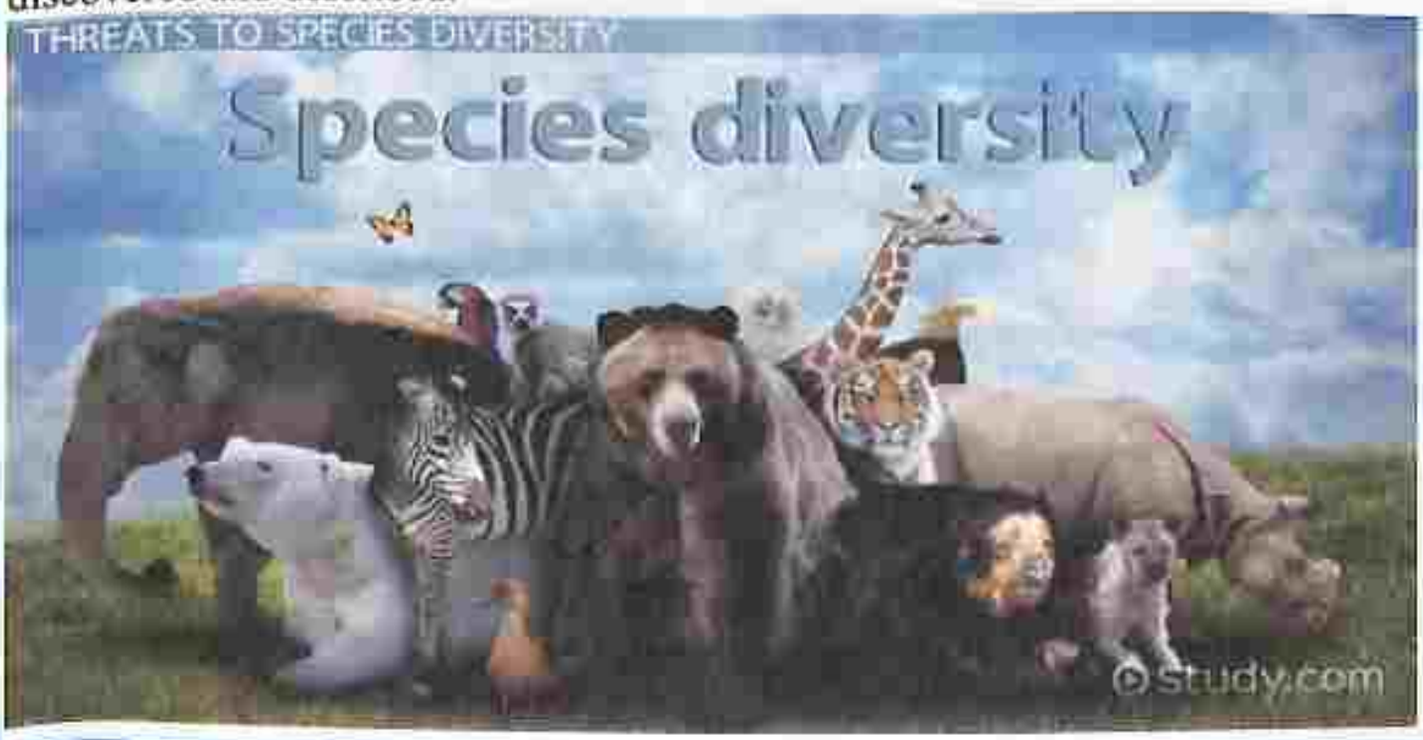
It is basically the variety of species expressed at the genetic level by each individual in a species. No two individuals belonging to the same species are exactly similar. For example, in the species of human beings, each human shows a lot of diversity in comparison to another human. People living in different regions show a great level of variation.

- **Species evenness:** Relative abundance of individuals of each of those species. If the number of individuals within a species is fairly constant across communities, it is said to have a high evenness and if the number of individuals varies from species to species, it is said to have low evenness. High evenness leads to greater specific diversity.

EXAMPLES OF THE ECOSYSTEM WITH HIGH SPECIES DIVERSITY

- **Tropical Rainforests:** They contain half of the world's species. There are about 5-10 million insect species present. 40% of the world's 2,75,000 species of flowering plants are present in the tropical regions. 30% of total bird species are present in tropical forests. The species richness of tropical forests is mostly due to relatively constant environmental conditions.
- **Coral Reefs:** Colonies of tiny coral animals build the large coral reefs ecosystem. The clarity of the water in the coral reef systems allow the sunlight to penetrate deep, resulting in the high level of photosynthesis in the algae present inside the coral. Adaptation to various disturbances and niche specialisation gives rise to species richness.

The Great Barrier Reef of Australia is the world's largest coral reef with an area of 349,000Km^2. It contains about 400 species of coral, 1500 species of fish, 4000 species of molluscs and 6 species of turtles. It provides a breeding site for around 250 species of birds. It covers only 0.1% of the ocean but has about 8% of the world's fish species. There are thousands of species which are yet to be discovered and described.



ECOSYSTEM DIVERSITY

Ecosystem diversity also known as **Ecological diversity** deals with the variations in ecosystems within a geographical location and its overall impact on human existence and the environment.

- Ecosystem diversity can also refer to the variety of ecosystems present in a biosphere.
- An ecosystem is the community of living organisms as well as the physical components of an environment such as water, soil, and climate.
- The first definition of ecosystem biodiversity refers to the number of ecosystems found in a certain area.
- The second definition of ecosystem biodiversity refers to the number of ecological interactions among organisms in a certain area.

Ecosystem diversity has a great deal on both genetic and species diversity, thus it is coined as the "largest scale of biodiversity".

EXAMPLES OF ECOSYSTEM

Ecosystem diversity boosts the availability of oxygen through photosynthesis among plant organisms living in a certain habitat. For instance, in an aquatic environment, once species are diverse it helps in water purification which is processed by plant varieties for it to be used by humans. This diversity may help in increasing the number of plant varieties that can be a great source for the human consumption of medicinal plants.

Fig.1

Fig.2

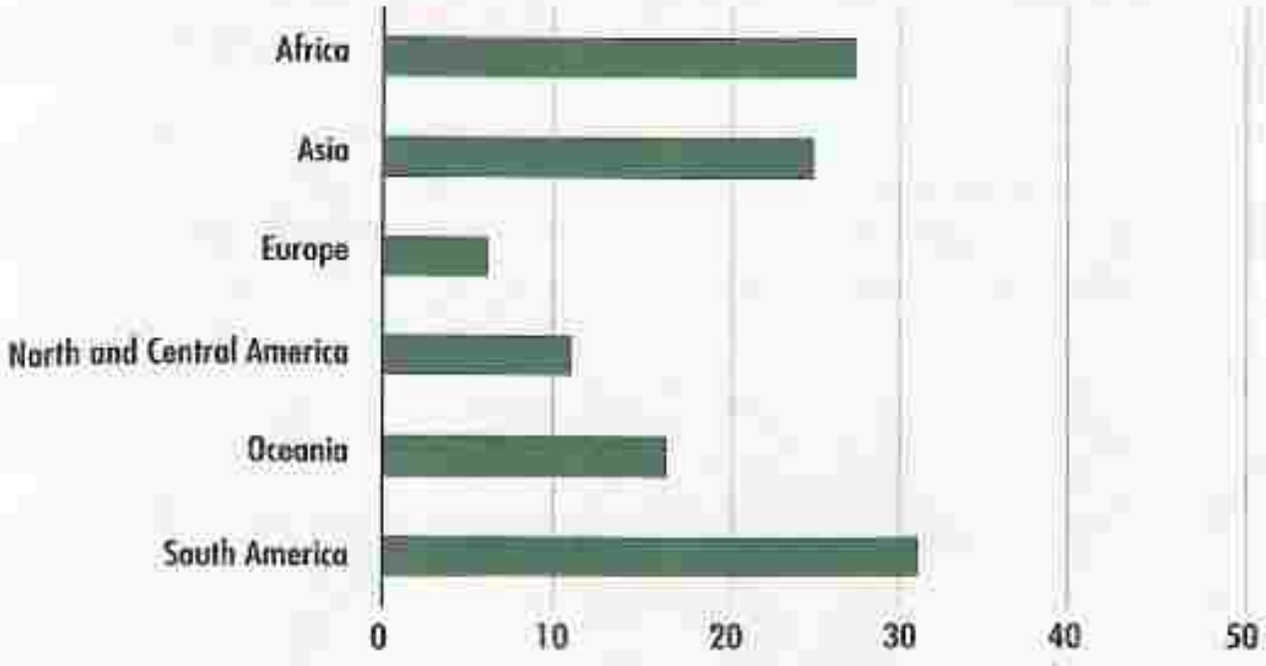
Figure.1- A typical rainforest where a variety of plant and animal species inhabit.
Figure.2- A diverse marine ecosystem.

DISTRIBUTION OF BIODIVERSITY

Biodiversity is not evenly distributed, rather it varies greatly across the globe as well as within regions. Among other factors, the diversity of all living things depends on temperature, precipitation, altitude, soils, geography and the presence of other species.

Terrestrial biodiversity is thought to be up to **25 times greater than ocean biodiversity**. The conservation of the world's biodiversity is thus utterly dependent on the way in which we interact with and use the world's forests.

Protected areas, including forest reserves and biosphere reserves, serve many functions including for affording protection to wild animals and their habitat. Protected areas have been set up all over the world with the specific aim of protecting and conserving plants and animals. Some scientists have called on the global community to designate as protected areas of 30 percent of the planet by 2030, and 50 percent by 2050, in order to mitigate biodiversity loss from anthropogenic causes.



Percentage of forest in legally protected areas

BIODIVERSITY HOTSPOTS

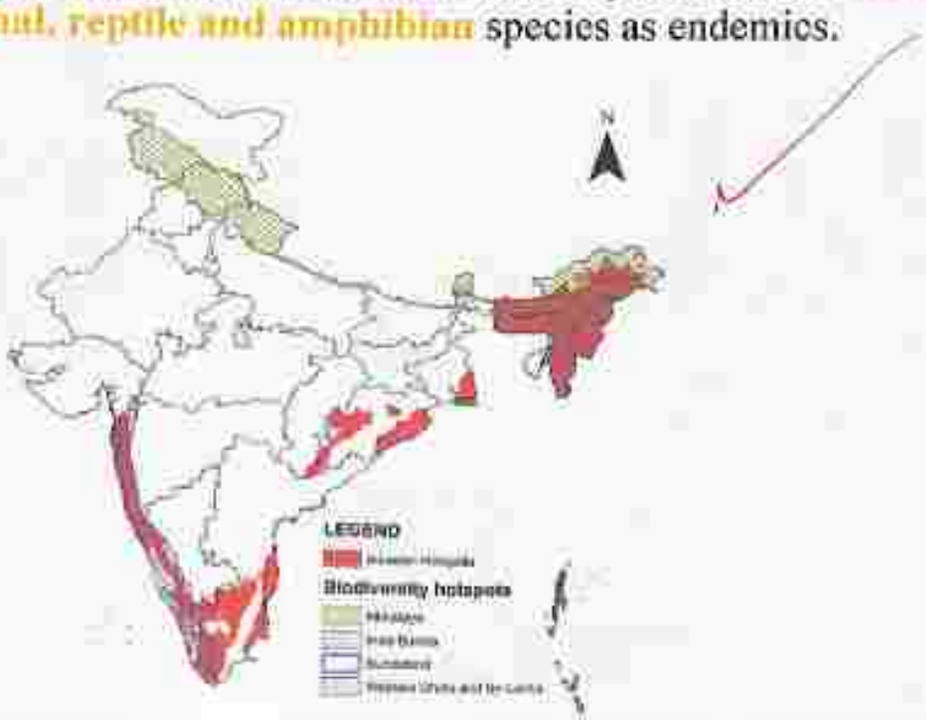
There are places on Earth that are both biologically rich and deeply threatened. For our own sake, we must work to protect them.

Species are the building blocks of Earth's life-support systems. We all depend on them.

To qualify as a biodiversity hotspot, a region must **meet two strict criteria:**

- It must have **at least 1,500 vascular plants as endemics** — which is to say, it must have a high percentage of plant life found nowhere else on the planet. A hotspot, in other words, is **irreplaceable.**
- It must have **30% or less of its original natural vegetation.** In other words, it must be threatened.

Around the world, **36 areas** qualify as hotspots. Their intact habitats represent just **2.5% of Earth's land surface**, but they support more than half of the world's plant species as endemics i.e., species found no place else and **nearly 43% of bird, mammal, reptile and amphibian** species as endemics.

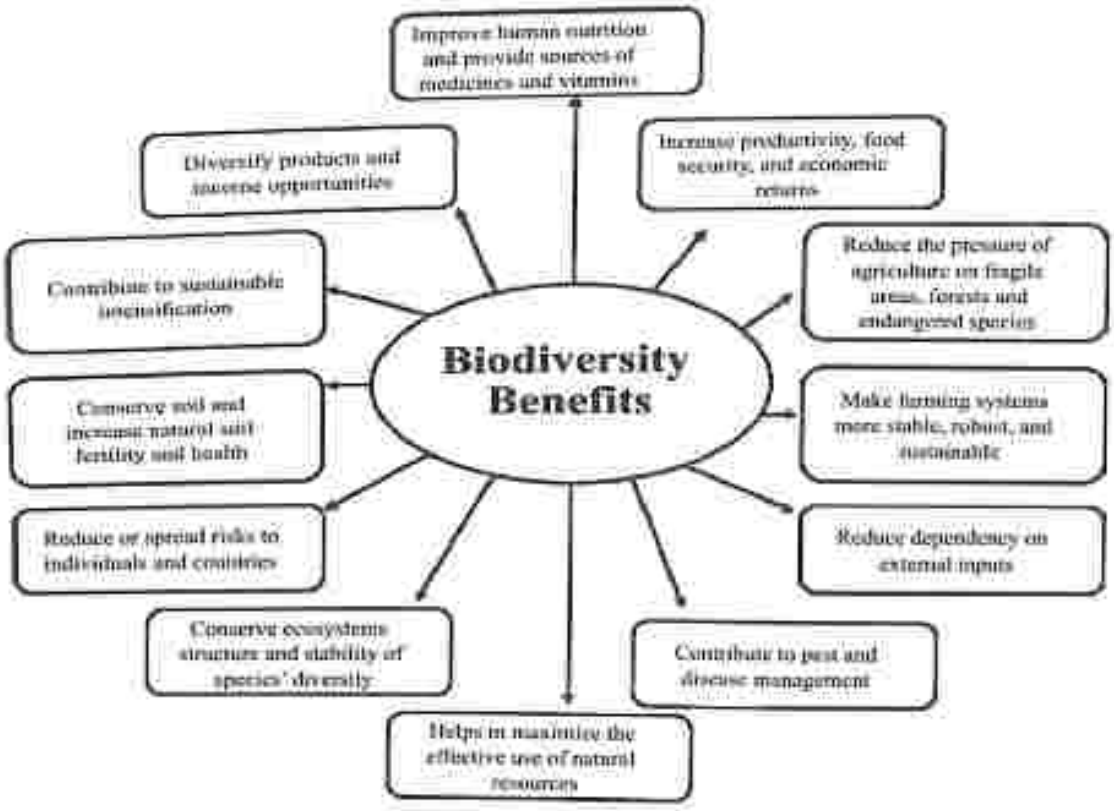


Biodiversity hotspots in India

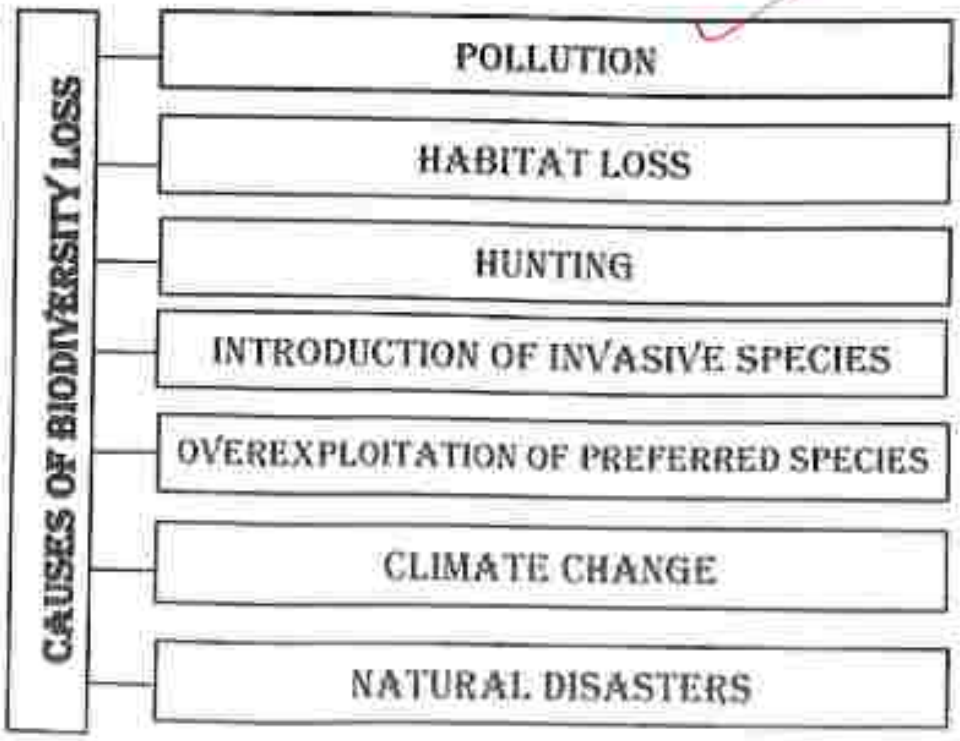
Table 1. Some of the Biodiversity Hotspots in the World

Sl. No.	Name of the Hotspot	Location
1.	Tropical Andes	South America
2.	Chilean Winter Rainfall and Valdivian Forests	South America
3.	Atlantic Forest	South America
4.	Caribbean Islands	North and Central America
5.	Guinean Forests of West Africa	Africa
6.	Himalaya	South Asia
7.	Mountains of Southwest China	East Asia
8.	Indo-Burma	South Asia
9.	Japan	East Asia
10.	New Zealand	Southeast Asia and Asia-Pacific

BIODIVERSITY BENEFITS



THREATS TO BIODIVERSITY



BIODIVERSITY CONSERVATION

"Biodiversity conservation refers to the protection, upliftment, and management of biodiversity in order to derive sustainable benefits for present and future generations."

Biodiversity conservation is the protection and management of biodiversity to obtain resources for sustainable development.

Biodiversity conservation has three main objectives:

- To preserve the diversity of species.
- Sustainable utilization of species and ecosystem.
- To maintain life-supporting systems and essential ecological processes.

BIODIVERSITY AND ITS CONSERVATION METHODS

Biodiversity refers to the variability of life on earth. It can be conserved in the following ways:

- In-situ Conservation
- Ex-situ Conservation

IN-SITU CONSERVATION

In-situ conservation of biodiversity is the conservation of species within their natural habitat. In this method, the natural ecosystem is maintained and protected.

The in-situ conservation has several advantages. Following are the important advantages of in-situ conservation:

1. It is a cost-effective and convenient method of conserving biodiversity.
2. A large number of living organisms can be conserved simultaneously.
3. Since the organisms are in a natural ecosystem, they can evolve better and can easily adjust to different environmental conditions.
4. Certain protected areas where in-situ conservation takes place include national parks, wildlife sanctuaries and biosphere reserves.

National Parks

These are small reserves maintained by the government. Its boundaries are well demarcated and human activities such as grazing, forestry, habitat and cultivation are prohibited. For ex., Kanha National Park, Bandipur National Park.

Wildlife Sanctuaries

These are the regions where only wild animals are found. Human activities such as timber harvesting, cultivation, collection of woods and other forest products are allowed here as long as they do not interfere with the conservation project. Also, tourists visit these places for recreation.

Biosphere Reserves

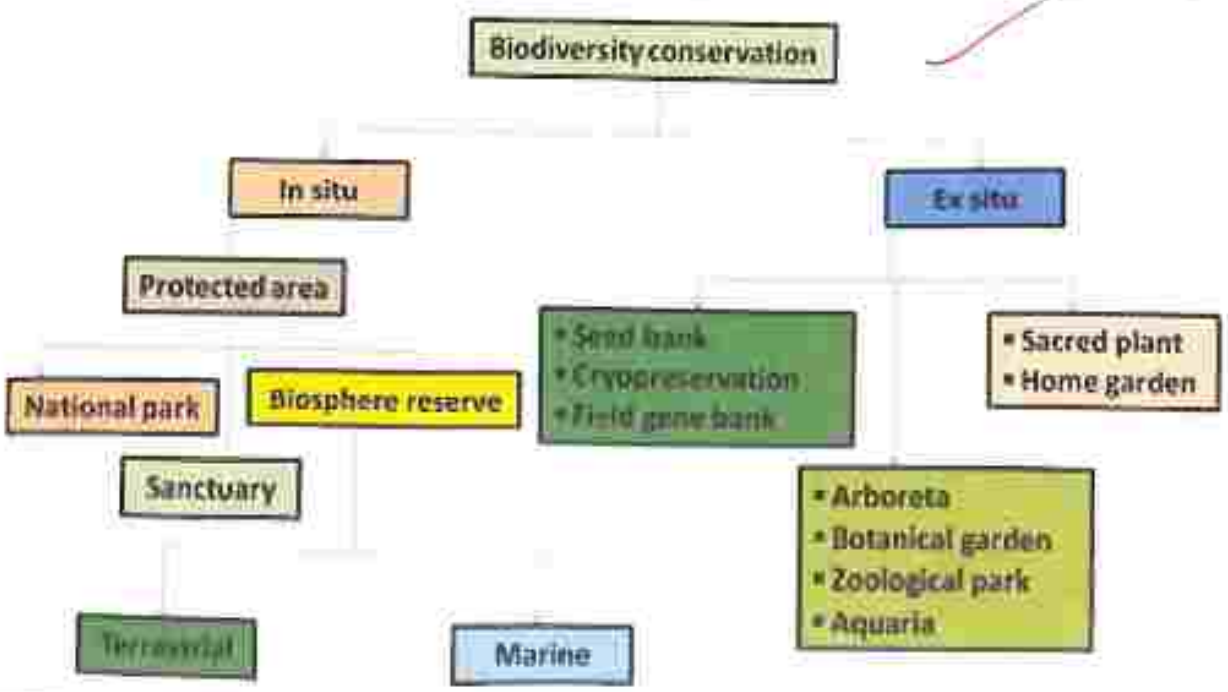
Biosphere reserves are multi-purpose protected areas where the wildlife, traditional lifestyle of the inhabitants and domesticated plants and animals are protected. Tourist and research activities are permitted here.

EX-SITU CONSERVATION

Ex-situ conservation of biodiversity involves the breeding and maintenance of endangered species in artificial ecosystems such as zoos, nurseries, botanical gardens, gene banks, etc. There is less competition for food, water and space among the organisms.

Ex-situ conservation has the following advantages:

1. The animals are provided with a longer time and breeding activity.
2. The species bred in captivity can be reintroduced in the wild.
3. Genetic techniques can be used for the preservation of endangered species.



CONCLUSION

Most biodiversity resources are consumed by humans, so it is our primary responsibility to preserve and protect biodiversity to protect the earth. The richness of the species, the ecosystem, the environment and the sustainable growth of life on earth is important.

Although still in its infancy, the Convention on Biological Diversity is already making itself felt. The philosophy of sustainable development, the ecosystem approach, and the emphasis on building partnerships are all helping to shape global action on biodiversity.

The data and reports that governments are gathering and sharing with each other are providing a sound basis for understanding the challenges and collaborating on the solutions.
Much, much more needs to be done. The passage of the Earth's biodiversity through the coming century will be its most severe test. With human population expected to rise dramatically, particularly in developing countries, and the consumer revolution set for exponential expansion - not to mention the worsening stresses of climate change, ozone depletion, ecosystems will face even more serious threats.

Unless we take action now, children born today will live in an impoverished world. The Convention offers a comprehensive, global strategy for preventing such a tragedy. A richer future is possible. If governments and all sectors of society apply the concepts embodied in the Convention and make the conservation and sustainable use of biological diversity a real priority, we can ensure a new and sustainable relationship between humanity and the natural world for the generations to come.

Samanta
26/05/2022

GOKHALE MEMORIAL GIRLS' COLLEGE

- NAME: ALAKANANDA DHAR
- SUBJECT: ENVS
- PAPER CODE: AECC 2
- SEMESTER: 2ND
- CU ROLL NUMBER: 213013110031
- CU REGISTRATION NUMBER: 013-1211-0165-21
- TOPIC: GLOBAL WARMING

CONTENTS

CERTIFICATE

This is to certify that the project work entitled "**GLOBAL WARMING**" carried out by ALAKANANDA DHAR bearing CU Roll No : **213013110031** & CU Registration No. : **013-1211-0165-21** of MATHEMATICS Department of GOKHALE MEMORIAL GIRLS' COLLEGE carried by under my guidance and supervision .

Samanta

(SIGNATURE OF FACULTY)

25/05/2022

(DATE)

DECLARATION & ACKNOWLEDGEMENT

In the accomplishment of this project "GLOBAL WARMING" successfully, many people have best owned upon me their blessings and heart pledged support, this time I am utilizing to thank all the people who have been concerned with this project.

First of all, I would like to thank my Professor SANTANU SAMANTA , whose valuable guidance have been the ones that helped me patch this project and make it full proof success.

Then I would like to thank my parents and friends who have helped me with their valuable suggestions and guidance .

Alakananda Dhar

(SIGNATURE OF STUDENT)

24.5.2022

(DATE)

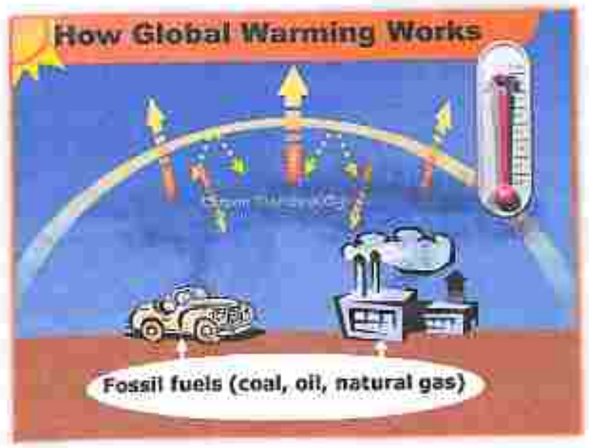
WHAT IS GLOBAL WARMING

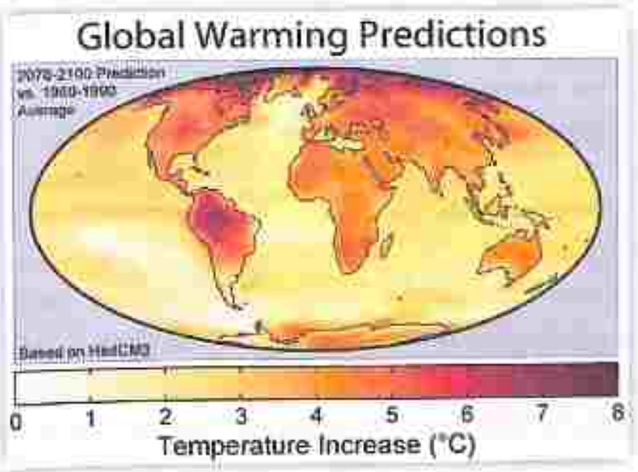
Since the Industrial Revolution, the global annual temperature has increased in total by a little more than 1 degree Celsius, or about 2 degrees Fahrenheit. Between 1880—the year that accurate recordkeeping began—and 1980, it rose on average by 0.07 degrees Celsius (0.13 degrees Fahrenheit) every 10 years. Since 1981, however, the rate of increase has more than doubled: For the last 40 years, we've seen the global annual temperature rise by 0.18 degrees Celsius, or 0.32 degrees Fahrenheit, per decade.

A planet that has never been hotter. Nine of the 10 warmest years since 1880 have occurred since 2005—and the 5 warmest years on record have all occurred since 2015. Climate change deniers have argued that there has been a "pause" or a "slowdown" in rising global temperatures, but numerous studies, including a 2018 paper published in the journal *Environmental Research Letters*, have disproved this claim. The impacts of global warming are already harming people around the world.

Now climate scientists have concluded that we must limit global warming to 1.5 degrees Celsius by 2040 if we are to avoid a future in which everyday life around the world is marked by its worst, most devastating effects: the extreme droughts, wildfires, floods, tropical storms, and other disasters that we refer to collectively as climate change. These effects are felt by all people in one way or another but are experienced most acutely by the underprivileged, the economically marginalized, and people of color, for whom climate change is often a key driver of poverty, displacement, hunger, and social unrest.

HOW GLOBAL WARMING WORKS





CAUSES OF GLOBAL WARMING

Global warming occurs when carbon dioxide (CO_2) and other air pollutants collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. Normally this radiation would escape into space, but these pollutants, which can last for years to centuries in the atmosphere, trap the heat and cause the planet to get hotter. These heat-trapping pollutants—specifically carbon dioxide, methane, nitrous oxide, water vapor, and synthetic fluorinated gases—are known as greenhouse gases, and their impact is called THE GREEN HOUSE EFFECT.

Though natural cycles and fluctuations have caused the earth's climate to change several times over the last 800,000 years, our current era of global warming is directly attributable to human activity—specifically to our burning of fossil fuels such as coal, oil, gasoline, and natural gas, which results in the greenhouse effect. In the United States, the largest source of greenhouse gases is transportation (29 percent), followed closely by electricity production (28 percent) and industrial activity (22 percent).

Curbing dangerous climate change requires very deep cuts in emissions, as well as the use of alternatives to fossil fuels worldwide. The good news is that countries around the globe have formally committed—as part of the 2015 Paris Climate Agreement—to lower their emissions by setting new standards and crafting new policies to meet or even exceed those standards. The not-so-good news is that we're not working fast enough. To avoid the worst impacts of climate change, scientists tell us that we need to reduce global carbon emissions by as much as 40 percent by 2030. For that to happen, the global community must take immediate, concrete steps: to decarbonize electricity generation by equitably transitioning from fossil fuel–based production to renewable energy sources like wind and solar; to electrify our cars and trucks; and to maximize energy efficiency in our buildings, appliances, and industries.

GREEN HOUSE EFFECT

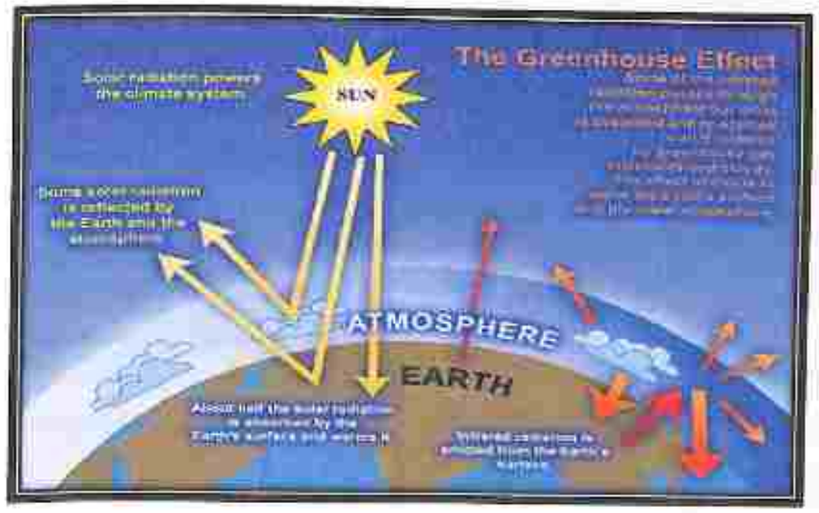
Some of the infrared radiation from the Sun passes through the atmosphere, but most is absorbed and re-emitted in all directions by greenhouse gas molecules and clouds. The effect of this is to warm the Earth's surface and the lower atmosphere. This is the Green House Effect.

A greenhouse gas is called that because it absorbs infrared radiation from the Sun in the form of heat, which is circulated in the atmosphere and eventually lost to space. Greenhouse gases also increase the rate at which the atmosphere can absorb short-wave radiation from the Sun, but this has a much weaker effect on global temperatures.

The CO_2 released from the burning of fossil fuels is accumulating as an insulating blanket around the Earth, trapping more of the Sun's heat in our atmosphere. Actions carried out by humans are called anthropogenic actions; the anthropogenic release of CO_2 contributes to the current enhanced greenhouse effect.

In descending order, the gases that contribute most to the Earth's greenhouse effect are:

- Water vapour (H_2O)
- Carbon dioxide (CO_2)
- Nitrous oxide(N_2O)
- Methane (CH_4)
- Ozone (O_3) etc.



EFFECTS OF GLOBAL WARMING

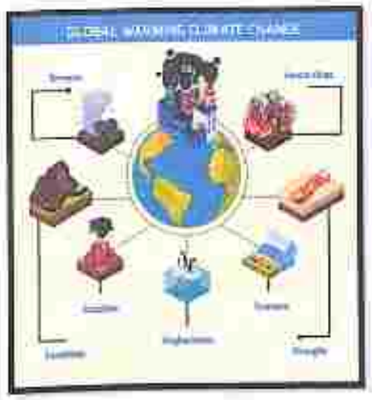
Each year scientists learn more about the consequences of global warming, and each year we also gain new evidence of its devastating impact on people and the planet. As the heat waves, droughts, and floods associated with climate change become more frequent and more intense, communities suffer and death tolls rise. If we're unable to reduce our emissions, scientists believe that climate change could lead to the deaths of more than 250,000 people around the globe every year and force 100 million people into poverty by 2030.

Global warming is already taking a toll on the United States. And if we aren't able to get a handle on our emissions, here's just a smattering of what we can look forward to:

- *Disappearing glaciers*, early snowmelt, and severe droughts will cause more dramatic water shortages and continue to increase the risk of wildfires in the American West.
- *Rising sea levels* will lead to even more coastal flooding on the Eastern Seaboard, especially in Florida, and in other areas such as the Gulf of Mexico.
- *Forests, farms, and cities* will face troublesome new pests, heat waves, heavy downpours, and increased flooding. All of these can damage or destroy agriculture and fisheries.
- *Disruption of habitats* such as coral reefs and alpine meadows could drive many plant and animal species to extinction.
- *Allergies, asthma, and infectious disease* outbreaks will become more common due to increased growth of pollen-producing ragweed, higher levels of air pollution, and the spread of conditions favorable to pathogens and mosquitoes.

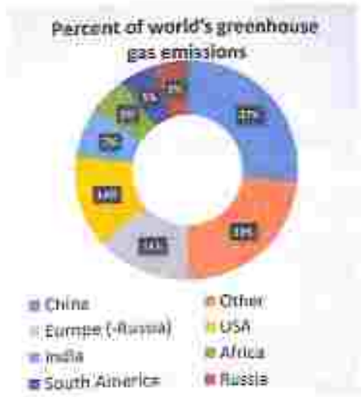
Though everyone is affected by climate change, not everyone is affected equally. Indigenous people, people of color, and the economically marginalized are typically hit the hardest. Inequities built into our housing, health care, and labor systems make these communities more vulnerable to the worst impacts of climate change—even though these same communities have done the least to contribute to it.

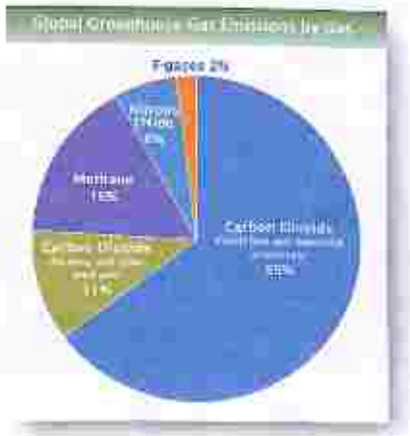
MAJOR EFFECTS OF GLOBAL WARMING



GLOBAL WARMING CONTRIBUTOR COUNTRIES

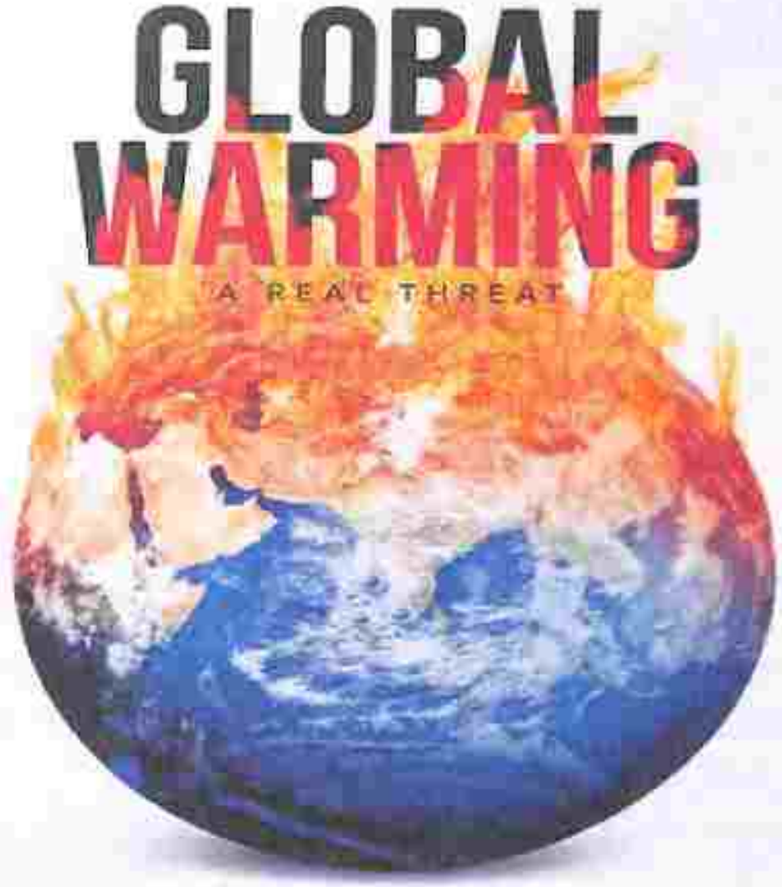
In recent years, China has taken the lead in global-warming pollution, producing about 26 percent of all CO2 emissions. The United States comes in second. Despite making up just 4 percent of the world's population, our nation produces a sobering 13 percent of all global CO2 emissions—nearly as much as the European Union and India (third and fourth place) combined. And America is still number one, by far, in cumulative emissions over the past 150 years. As a top contributor to global warming, the United States has an obligation to help propel the world to a cleaner, safer, and more equitable future. Our responsibility matters to other countries, and it should matter to us, too.





HOW TO PREVENT GLOBAL WARMING

HOW TO PREVENT GLOBAL WARMING



DUNCAN EWING

THANKING YOU

Samantha
25/05/2022

NAME — TRISHITA BHATTACHARJEE

SEMESTER. — 2

DEPARTMENT — MATHAMATICS

PROJECT — ENVS

TOPIC. — WATER POLLUTION

ROLL NO. — 21/BSCH/ 0157

Water pollution is the contamination of water in water bodies such as rivers, oceans, lakes and swamps. This means that one or more substances have built up in water to the extent of causing problems to people, animals and plants.

Addition of certain substances to the water such as organic, inorganic, biological, radiological, heat, which degrades the quality of water so that it becomes unfit for use. Water pollution is not only confined to surface water, but it has also spread to ground water, sea and ocean.

So, whether or not water is considered to be polluted will depend on what that water was going to be used for.

Causes of water pollution

There are numerous causes of water pollution. The main ones are listed below: Types of sources

1. **Point Sources**

- It is directly attributable to one influence. Here pollutant travels directly from source to water.
- Point sources are easy to regulate.

2. **Diffuse or non-point source.**

- It is from various ill-defined and diffuse sources. They vary spatially and temporally and are difficult to regulate.

The main sources of water pollution are as follows:

1. Community waste water: include discharges from houses, commercial and industrial establishments connected to public sewerage system. The sewage contains human and animal excreta, food residues, cleaning agents, detergents and other wastes.
2. Industrial Wastes: The industries discharge several inorganic and organic pollutants, which may prove highly toxic to the living beings.
3. Agricultural sources:

Fertilizers contain major plant nutrients such as nitrogen, phosphorus and potassium.

Excess fertilizers may reach the ground water by leaching or may be mixed with surface water of rivers, lakes and ponds by runoff and drainage.

Pesticides include insecticides, fungicides, herbicides, nematicides, rodenticides and soil fumigants. They contain a wide range of chemicals such as chlorinated hydrocarbons, organophosphates, metallic salts, carbonates, thiocarbonates, derivatives of acetic acid etc. Many of the pesticides are non-degradable and their residues have long life.

The animal excreta such as dung, wastes from poultry farms, piggeries and slaughter houses etc. reach the water though run off and surface leaching during rainy season.

4. Thermal Pollution

- The main sources are the thermal and nuclear power plants.
- The power plants use water as coolant and release hot waters to the original source.
- Sudden rise in temperature kills fishes and other aquatic animals.

5. Underground water pollution:

- In India at many places, the ground water is threatened with contamination due to seepage from industrial and municipal wastes and effluents, sewage channels and agricultural runoff.

6. Marine pollution:

- Oceans are the ultimate sink of all natural and manmade pollutants.
- Rivers discharge their pollutants into the sea. The sewerage and garbage of coastal cities are also dumped into the sea.
- The other sources of oceanic pollution are navigational discharge of oil, grease, detergents, sewage, garbage and radioactive wastes, off shore oil mining, oil spills.

7. Untreated sewage from households:

- Dye, lotion, soap, hair oil, shampoo, powder, deodorant, moisturizer and many other such products also contribute in water pollution. These products go to the sewage without any treatment.
- Untreated sewage from households can contaminate different water bodies in the process.
- When sewage pipes break, there is a chance that the wastes will contaminate drinking water. Sometimes, poorly treated sewage is released into water bodies. Domestic cleaning products can be very dangerous pollutants.

8. Garbage: Plastics are non-biodegradable. Mass plastics clog water bodies and contaminate water.

9. Urbanization: Urbanization is a key factor in increasing the amounts of water pollution.

10. Dumping solid waste: Humans often carelessly dump their trash in the sea or near rivers.

11. Oil spills: Accidental oil spills have a devastating effect on seas.

12. Dissolved gases: Polluting gases in the air can dissolve into salt and fresh water and pollute it.

13. Boat fuels: Fossil fuels used in the shipping industry are one of the largest causes of both air and water pollution.

Effects of water pollution

Water pollution damages human health makes our living conditions precarious and threatens life on the planet.

1. ***Effects on aquatic ecosystem:***

- Polluted water reduces Dissolved Oxygen (DO) content, thereby, eliminates sensitive organisms like plankton, molluscs and fish etc.
- Biocides, polychlorinated biphenyls (PCBs) and heavy metals directly eliminate sensitive aquatic organisms.
- Hot waters discharged from industries, when added to water bodies, lowers its DO content.

2. ***Effects on human health:***

- The polluted water usually contains pathogens like virus, bacteria, parasitic protozoa and worms; therefore, it is a source of water borne diseases like jaundice, cholera, typhoid, arnoebiasis etc.
- Mercury compounds in waste water are converted by bacterial action into extremely toxic methyl mercury, which can cause numbness of limbs, lips and tongue, deafness, blurring of vision and mental derangement.
- Water contaminated with cadmium can cause itai itai disease also called ouch-ouch disease (a painful disease of bones and joints) and cancer of lungs and liver.
- The compounds of lead cause anaemia, headache, loss of muscle power and bluish line around the gum.
- A crippling deformity called Minamata disease due to consumption of fish captured from mercury contaminated Minamata Bay in Japan was detected in 1952.

3. ***Hazards of ground water pollution:***

- Presence of excess nitrate in drinking water is dangerous for human health and may be fatal for infants.

o Excess nitrate in drinking water reacts with haemoglobin to form non-functional methaemoglobin, and impairs oxygen transport. This condition is called methaemoglobinemia or blue baby syndrome.

• Excess fluoride in drinking water causes neuro- muscular disorders, gastro-intestinal problems, teeth deformity, hardening of bones and stiff and painful joints (skeletal fluorosis).

o High concentration of fluoride ions is present in drinking water in 13 states of India. The maximum level of fluoride, which the human body can tolerate is 1.5 parts per million (mg/l of water). Long term ingestion of fluoride ions causes fluorosis.

• Over exploitation of ground water may lead to leaching of arsenic from soil and rock sources and contaminate ground water. Chronic exposure to arsenic causes lack foot disease. It also causes. Diarrhoea, Peripheral neuritis, hyperkeratosis and also lung and skin cancer.

o Arsenic contamination is a serious problem (in tube well dug areas) in the Ganges Delta, west Bengal causing serious arsenic poisoning to large numbers of people. A 2007 study found that over 137 million people in more than 70 countries are probably affected by arsenic poisoning of drinking water.

4. ***Biological Magnification***

5. ***Eutrophication***

Control Measures

1) Riparian buffers

2) Recycle

3) Treatment of sewage water and the industrial effluents should be done before releasing it water bodies.

4) Hot water should be cooled before release from the power plants

5) Domestic cleaning in tanks, streams and rivers, which supply drinking water, should be prohibited.

6) Excessive use of fertilizers and pesticides should be avoided.

7) Organic farming and efficient use of animal residues as fertilizers.

8) Water hyacinth (an aquatic weed) can purify water by taking some toxic materials and a number of heavy metals from water.

9) Oil spills in water can be cleaned with the help of bregoli a by-product of paper industry resembling saw dust, oil zapper, organisms.

Groundwater Pollution

Any addition of undesirable substances to groundwater caused by human activities is considered to be contamination. It has often been assumed that contaminants left on or under the ground will stay there. This has been shown to be wishful thinking. Groundwater often spreads the effects of dumps and spills far beyond the site of the original contamination. Groundwater contamination is extremely difficult, and sometimes impossible, to clean up.

Groundwater contaminants come from two categories of sources: point sources and distributed, or non-point sources. Landfills, leaking gasoline storage tanks, leaking septic tanks, and accidental spills are examples of point sources. Infiltration from farm land treated with pesticides and fertilizers is an example of a non-point source.

Sources of ground water pollution:

Most concern over groundwater contamination has centred on pollution associated with human activities.

Human groundwater contamination can be related to waste disposal (private sewage disposal systems, land disposal of solid waste, municipal wastewater, wastewater impoundments, land spreading of sludge, brine disposal from the petroleum industry, mine wastes, deep-well disposal of liquid wastes, animal feedlot wastes,

- Drinking contaminated groundwater can have serious health effects.
- Diseases such as hepatitis and dysentery may be caused by contamination from septic tank waste.
- Poisoning may be caused by toxins that have leached into well water supplies.
- Wildlife can also be harmed by contaminated groundwater.
- Other long term effects such as certain types of cancer may also result from exposure to polluted water.

On economy:-

When groundwater becomes contaminated, the economy can also easily suffer:

- Depreciating value of land - When groundwater becomes more contaminated in a given area, that area becomes less capable of sustaining human, animal, and plant life. If the area is known for its natural beauty and that nature begins to suffer the effects of pollution, the chances of people wanting to live there decrease even more. Although it might not be an immediate result of groundwater pollution, the depreciation of land value is definitely a potential side effect.
- Less stable industry - Many industries rely on groundwater to help produce their products and keep their factories running smoothly. Since the pH and quality of groundwater from a given area rarely changes, it becomes a vital part of many industries that rely on water they don't have to constantly test.

On Environment: -

Last but certainly not least, the environment can be seriously altered when groundwater is polluted. Here are just some of the ways in which this occurs.

- Nutrient pollution - Groundwater pollution can cause certain types of nutrients that are necessary in small amounts to become far too abundant to sustain normal life in a given ecosystem. Fish might start dying off quickly because they are no longer able to process the water in their water supplies, and other animals might become sick from too much of certain types of nutrients in the water they drink.
- Toxic water in ecosystems - When groundwater that supplies lakes, rivers, streams, ponds, and swamps becomes contaminated, this slowly leads to more and more contamination of the surface water as well.

Conclusion: Groundwater is one of our most important sources of water for irrigation. Groundwater contamination is a serious problem. Water scarcity puts lives at risk. In addition, many industries rely on water as a resource, which means water contamination threatens their

supply chains. Governments, business and communities should all take necessary action to protect this valuable resource.

Marine Pollution

Marine pollution refers to the contamination or presence of pollutants in oceans and seas. The word 'marine' comes from the Latin word for 'sea' and it is related to similar words, such as 'mariner'. Ocean pollution is become ever more of a problem in the present day.

Marine pollution can be defined as anything that contaminates the sea. Common marine pollutants include chemicals, small plastic beads in exfoliants and also toxic bio-matter (such as sewage). But, noise – due to excessive traffic around the ocean – can also be defined as pollution if it disrupts marine life.

Pollution can vary depending on the context and the purpose for which seawater is being used. For example, normal seawater has some small particles of plants or sand in, and when the sea is considered as the habitat of marine animals, one would not think of these particles as pollutants whereas one would definitely define toxic chemicals as pollutants. However if somebody wanted to use this brine for cooking in, they might see the sand and plants as polluting our cooking water.

Causes/Sources of Marine Pollution

1. Toxic chemicals in water.

Chemical runoff from industry can really endanger marine life. Industrial waste pumped into the sea, household cleaners poured down the sink, and even chemicals in the atmosphere (for instance due to the discharge of industrial wastes through factory chimneys) that dissolve into the sea can pollute our oceans significantly.

2. Oil spillages.

This is usually an accidental form of industrial dumping, whereby leaks in oil tankers cause vast quantities of oil to pour into the ocean. Accidental oil spills can devastate marine life.

3. Small particles.

The tiny plastic beads in exfoliating creams and other small particles that we pour down the drain without thinking wind up polluting the ocean.

4. Plastic, Litter, and human waste.

Plastic bags, aluminum cans, trash and other human waste constitute a major pollutant of the world's oceans. A huge 'island' of trash roughly the size of Texas was recently found in the Pacific ocean for instance, demonstrating the vast scale of this problem.

5. Sewage.

Whether or not it is treated with toxic chemicals, sewage pollutes the clear, clean water of the oceans. This is another type of industrial dumping. Sometimes, sewage is not pumped directly into the sea but into rivers, and then the untreated water of rivers carries it into the sea.

6. The shipping industry.

Gases (which dissolve in the sea), chemicals and sewage from container ships are major pollutants.

7. Dissolved greenhouse gases.

Greenhouse gases from human fossil fuel consumption are making the sea more acidic.

Effects of Marine Pollution

1. Oxygen depletion.

Seawater is full of dissolved oxygen, however decomposing sewage and other biomatter in oceans can result in a condition known as 'hypoxia' or oxygen depletion. This makes it hard for oxygen loving marine life – plants, fish and animals – to survive in the oceans.

2. Higher acidity.

Toxic chemicals make our oceans more acidic. Again, this makes them poisonous to marine life and causes harm to fish and marine mammals as well as marine plants and corals.

3. Choking marine life.

Small pieces of plastic and other litter are increasingly being found in the stomach of fish, turtles and other marine animals. These pieces of trash choke marine animals and hamper their digestion, with an often fatal result.

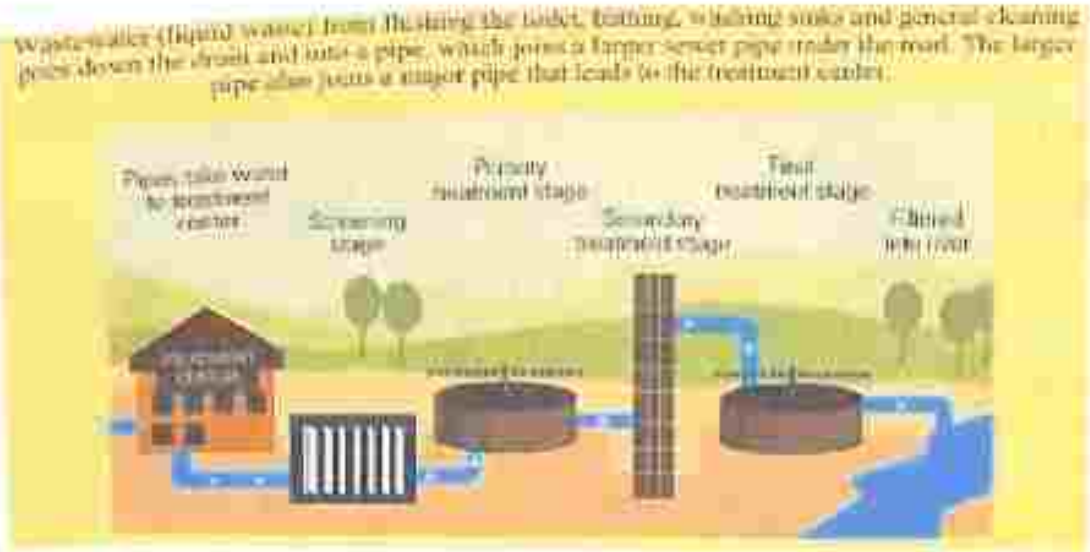
4. Spoiling birds' feathers.

Oil spills coat the feathers of marine birds and strip them of the natural oils that birds use to keep their feathers waterproof and to maintain their own body temperatures. As a result, marine

Rid your local beach of litter by getting together with the rest of the community to pick up the trash left behind by careless picnickers, boat crews and more. Joining together as a community to care for the natural world is a wonderful way to remind everyone how intimately we are connected to nature, and how much we depend on it. Working together with other people also helps to keep us motivated and reminds us that we are not alone in our quest to care for the environment.

6. Ensuring no debris is released into the ocean.

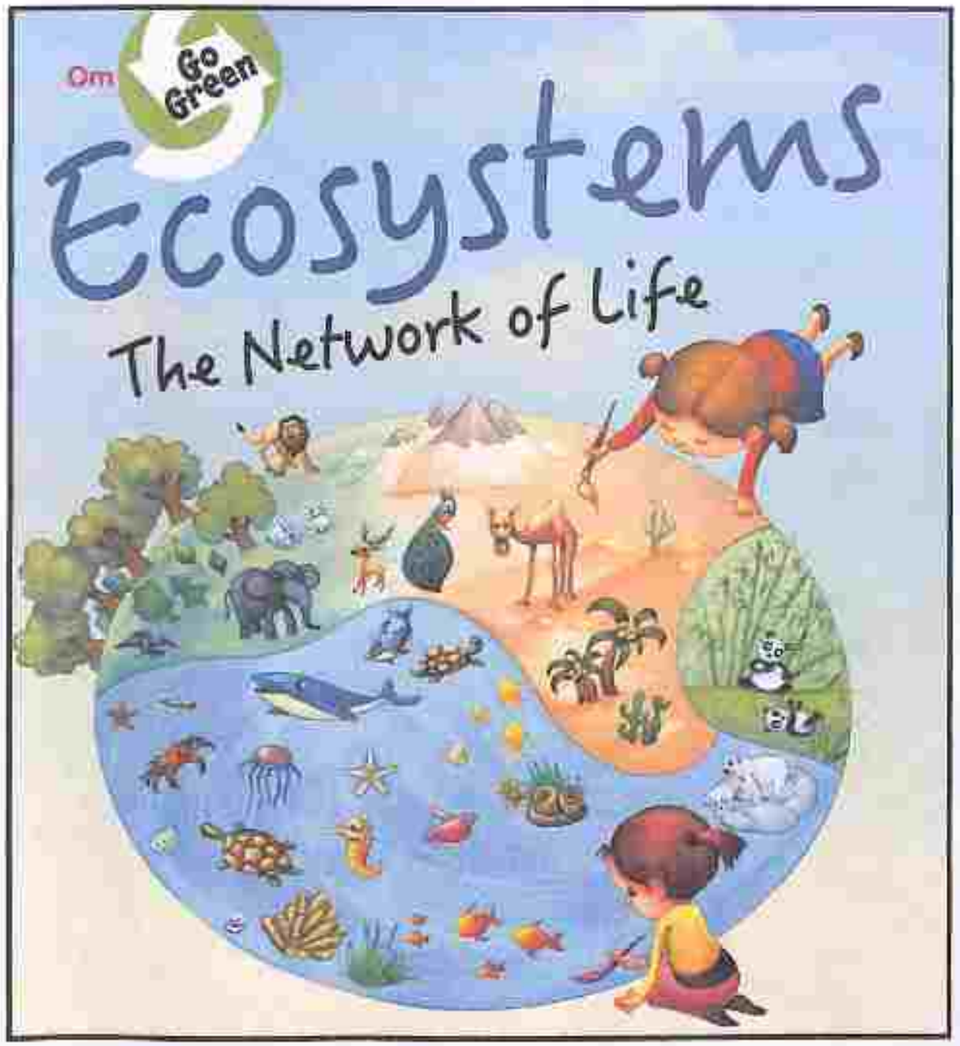
Recycling our plastics and other recyclable, and disposing of our waste responsibly is key here. Wastewater treatment before discharge into water bodies



CONCLUSION

Water pollution stems from many sources and causes, only a few of which are discussed here. Rivers and streams demonstrate some capacity to recover from the effects of certain pollutants, but lakes, bays, ponds, sluggish rivers, and oceans have little resistance to the effects of water pollution. We have a long history of introducing pollutants into aquatic environments, and have had only partial success at repairing the damage that has already been done and curbing the activities that result in environmental degradation. Nonpoint source pollution continues to be a serious threat to receiving waters, as does the continued release of sewage and industrial effluents throughout the world. As we have seen with mercury contamination in fishes, environmental pollution can have widespread and lasting consequences.

Samantha
26/05/2022



Name: Sucheta Ghosh
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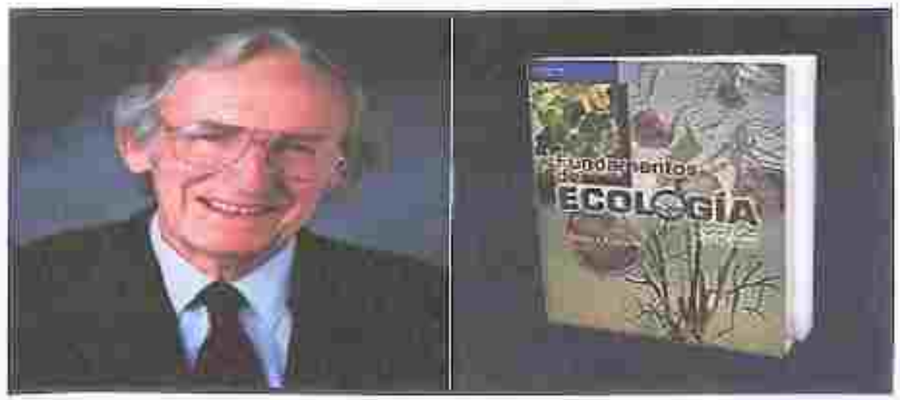
Topic: Ecology and Ecosystems
Semester: II
Paper Code: AECC-2

Definition Of Ecosystem:

An ecosystem refers to a geographic area where plants,animals,and other organisms as well as weather and landscape work together to form a bubble of life.Ecosystem contains biotic as well as abiotic parts. It is a self-regulating group of biotic communities of species interacting with one another and with their non-living environment exchanging energy and matter.Now ecology is often defined as the '**study of ecosystems**'.



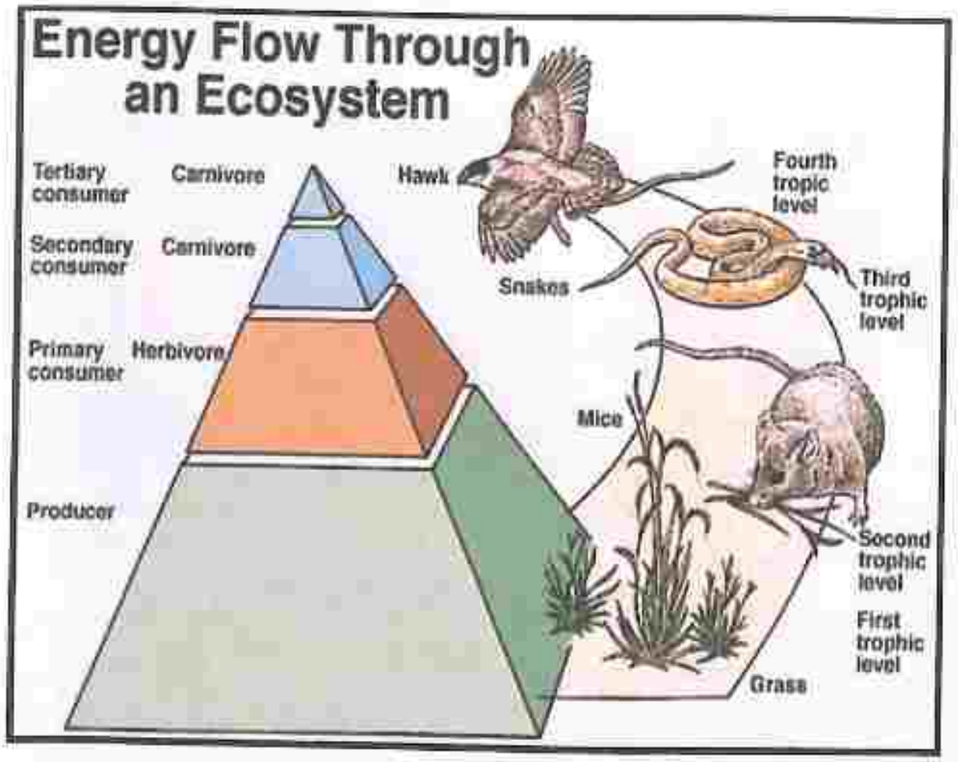
Eugene Odum,an American biologist, pioneered the concept of ecosystem-the holistic understanding of the environment as a system of interlocking biotic communities.

A Prussian botanist,geographer, and naturalist **Alexander von Humbolt** is considered the father of ecology. He was the first to study and present the relationship between organisms and their environment.

Tansley coined the term "ecosystem" to recognize the integcommunity and its physical environment ration of the biotic community and its physical environment .

Energy flow in an ecosystem:

The energy flow is the amount of energy that moves along the food chain.This energy flow is also known as calorific flow.

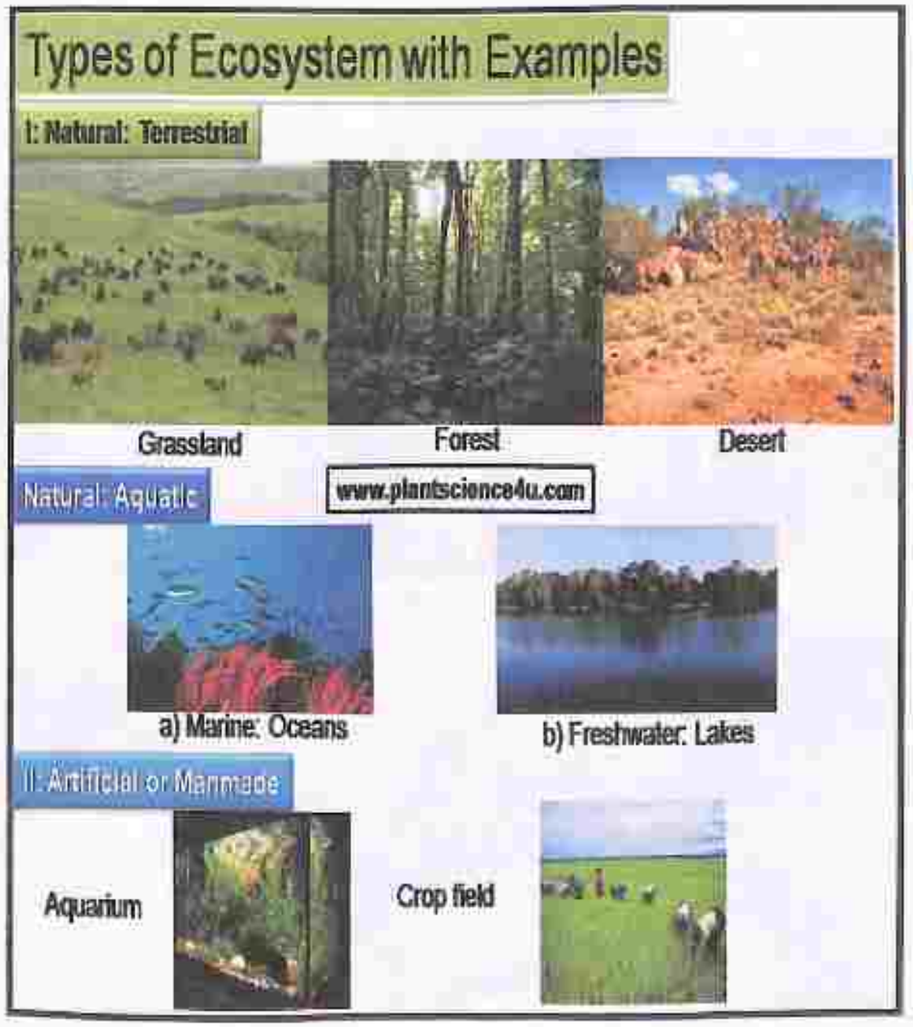


Importance of energy level in ecosystem:

- The energy flow in the ecosystem is important to maintain ecological balance. The producers synthesise food by the process of photosynthesis.A part of energy is stored within the plants.The remaining energy is utilised by the plants in their growth and development.This stored energy is transferred to the primary consumers when they feed on the producers.This energy is further passed on to the secondary consumers when they feed on primary consumers and so on.
- The flow of energy is unidirectional because some energy is lost in the form of heat when moving from one trophic level to the next for the maintenance of homeostasis of an organism.

Classification of Ecosystem:

- Forest Ecosystem
- Grassland Ecosystem
- Desert Ecosystem
- Aquatic Ecosystem (ponds,streams,lakes,wetlands,rivers,oceans)



Grassland Ecosystem:

Grasslands are areas where vegetation is dominated by grasses.However, sedge and and rush can also be found along with variable proportions of legumes ,like clover and other herbs.

Grasslands occur naturally on all continents except Antartica and are found in most ecoregions of the earth.

→ Characteristics Of Grassland Ecosystem:

- ❖ Found in a semi-arid climate.
- ❖ Mostly common at mid-latitudes and near the interiors of continents
- ❖ Rainfall and soil is insufficient to support significant tree growth.
- ❖ Grasslands are often exploited for agricultural use.

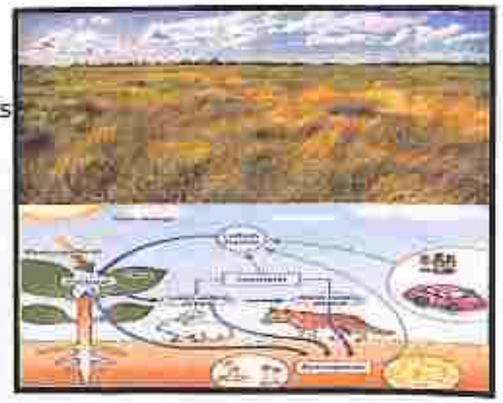


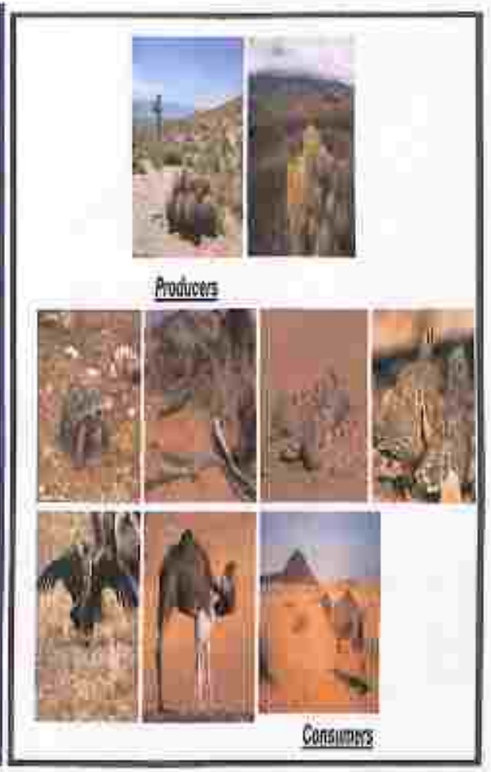
Fig.1.5 Grassland Ecosystem

Importance Of Grassland Ecosystem:

Grasslands provide important services and roles such as water catchments,biodiversity reserves,for cultural needs,and potentially a carbon sink to alleviate greenhouse gas emissions.

Desert Ecosystem:

A desert ecosystem is defined by interactions between organisms,the climate in which they live ,and any other non-living influences on the habitat.



Characteristics of desert ecosystem:

- ☐ Little rainfall(less than 50 cm per year).
- ☐ Temperature variation between day and night.
- ☐ High evaporation rate.
- ☐ Coarse-textured soils.
- ☐ Drought-resistant vegetation.

Importance of desert ecosystem:

- ➢ The desert biome is one of the most important.Ther are 15 mineral deposit types in our planet and 13 of them are found in deserts. This makes the desert an important place for mineral resources and for the local and global economy.

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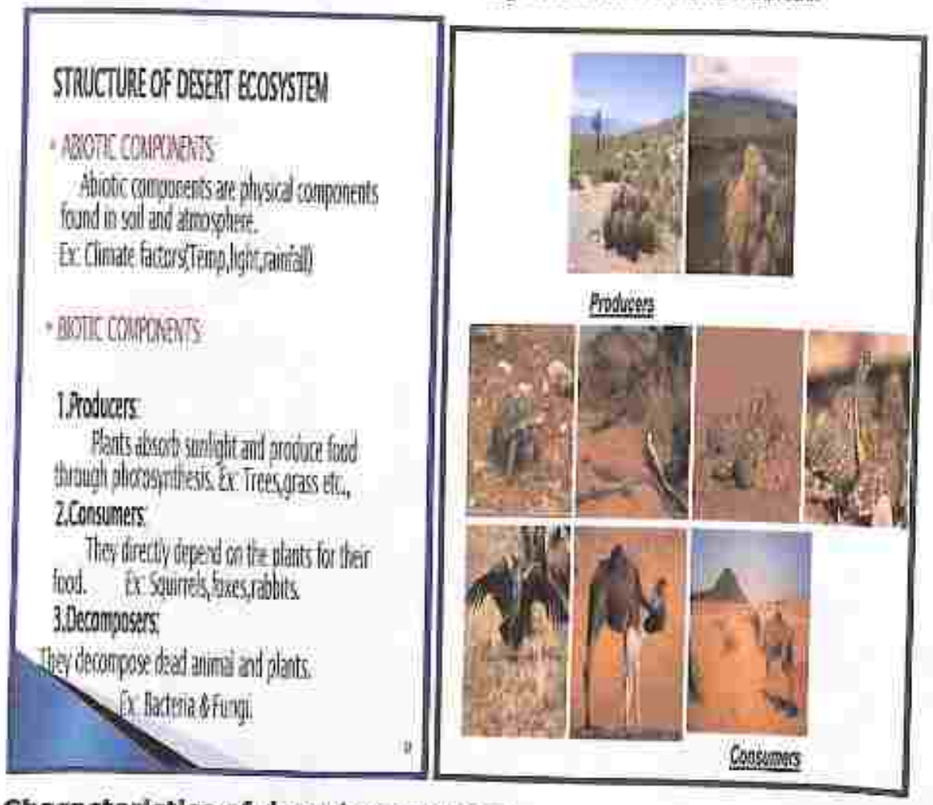

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ACKNOWLEDGEMENT:-

I would like to express my special thanks to all my professors as well as our Principal Madam who gave me the golden opportunity to do this wonderful project on the topic "Ecology and Ecosystems" which helped me in doing a lot of research work and I came to know about so many other things. Secondly, I would also like to thank my parents and friends who helped me in completing this project within a stipulated time.

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- Wikipedia.

Samanta
25/05/2022

GOKHALE MEMORIAL GIRLS' COLLEGE

University of Calcutta

Semester-2

Topic- Water Pollution

Student Name- Rinku Show.
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Department- Mathematics

Subject- ENVS

Date of summission- 25/05/2022

CONTENTS

INTRODUCTION :-

British poet W.H. Auden once noted, "Thousands have lived without love, not one without water". Yet while we all know water is crucial for life, we trash it anyway. Some 80 percent of the world's wastewater is dumped – largely untreated – back into the environment, polluting rivers, lakes, and oceans.

This widespread problem of water pollution is jeopardizing our health. Unsafe water kills more people each year than war and all other forms of violence combined. Meanwhile, our drinkable water sources are finite: Less than 1 percent of the earth's freshwater is actually accessible to us. Without action, the challenges will only increase by 2050, when global demand for freshwater is expected to be one-third greater than it is now.

Sip a glass of cool, clear water as you read this, and you may think water pollution is a problem ... somewhere else. But while most Americans have access to safe drinking water, potentially harmful contaminants -from arsenic to copper to lead – have been found in the tap water of every single state in the nation.

What is Water pollution ?

Water pollution occurs when harmful substances - often chemicals or microorganisms - contaminate a stream, river, lake, ocean, aquifer, or other body of water, degrading water quality and rendering it toxic to humans or the environment.

What are the causes of water pollution ?

Water is uniquely vulnerable to pollution. know as a "Universal solvent", water is able to dissolve more substances than any other liquid on earth. It's the reason we have poolaid and brilliant blue waterfalls. It's also why water is so easily polluted. Toxic substances from farms, towns, and factories readily dissolve into and mix with it, causing water pollution.

Types of water pollution :-

• Groundwater :-

When rain falls and seeps deep into the earth, filling the cracks, crevices, and porous spaces of an aquifer (basically an underground storehouse of water), it becomes ground water - one of our least visible but most important natural resources. Nearly 40% of Americans rely on groundwater, pumped to earth's surface, for drinking water. For some folks in rural areas, it's their only freshwater source. Groundwater gets polluted when contaminants - from pesticides and fertilizers to waste leached from landfills and septic systems - make their way into an aquifer, rendering it unsafe for human use. Ridding groundwater of contaminants can be difficult to impossible, as well as costly. Once polluted, an aquifer may be unusable for decades, or even thousands of years. Ground water can also spread contamination far from the original polluting source as it seeps into streams, lakes and oceans.

• Surface Water :-

Covering about 70% of the earth, surface water is what fills our oceans, lakes, rivers, and all those other blue bits on the world map. Surface water from freshwater sources accounts for more than 60% of the water delivered to American homes. But a significant pool of that water is in peril. According to the most recent surveys on national water quality from the U.S. Environmental protection Agency, nearly half of our rivers and streams and more than one third of our lakes are polluted and unfit for swimming, fishing and drinking. Nutrient pollution, which includes nitrates and phosphates, is the leading type of contamination in these freshwater sources. While plants and animals needs these p nutrients to grow, they become a major pollutant due to farm waste and fertilizer runoff. Municipal and industrial waste discharges contribute their fair share of toxins as well. There's also all the random junk that industry and individuals dump directly into waterways.

What are the effects of water pollution?

✡ On human health:-

Waterborne pathogens, in the form of disease-causing bacteria and viruses from human and animal waste, are a major cause of illness from contaminated drinking water. Deseases spread by unsafe water include cholera, giardia and typhoid.

✡ On the environment:-

In order to thrive, healthy ecosystems rely on a complex web of animals, plants, bacteria, and fungi- all of which interact, directly or indirectly, with each other. Harm to any of these organisms can create a chain effect, imperilling entire aquatic environments.

What can we do to prevent Water pollution?

✡ With our actions:-

We are all accountable to some degree for today's water pollution problem. Fortunately, there are some simple ways ~~you~~ we can prevent water contamination or at least limit your contribution to it:

- Learn about the unique qualities of water where we live. Where do our water come from? Is the wastewater from our home treated? Where does stormwater flow to? Is our area in a drought? Start building a picture of situation so we can discover where our actions will have the most impact- and see if your neighbors would be interested in joining in!

» With our Voice :-

One of the most effective ways to stand up for our waters is to speak out in support of the Clean Water Act, which has helped hold polluters accountable for five decades - despite attempts by destructive industries to gut its authority. But we need regulations that keep pace with modern-day challenges, ~~indl~~ including micro-plastics, PFAS, pharmaceuticals, and other contaminants our wastewater treatment plants weren't built to handle, not to mention polluted water that's dumped untreated.

CONCLUSION :-

Water pollution stems from many sources and causes, only a few of which are discussed here. Rivers and streams demonstrate some capacity to recover from the effects of certain pollutants, but lakes, bays, ponds, sluggish rivers, and oceans have little resistance to the effects of water pollution. Drinking water is a very important thing to our bodies' health. Not only human, but also all of the organisms need water to survive.

TOPIC : ENVIRONMENTAL POLLUTION

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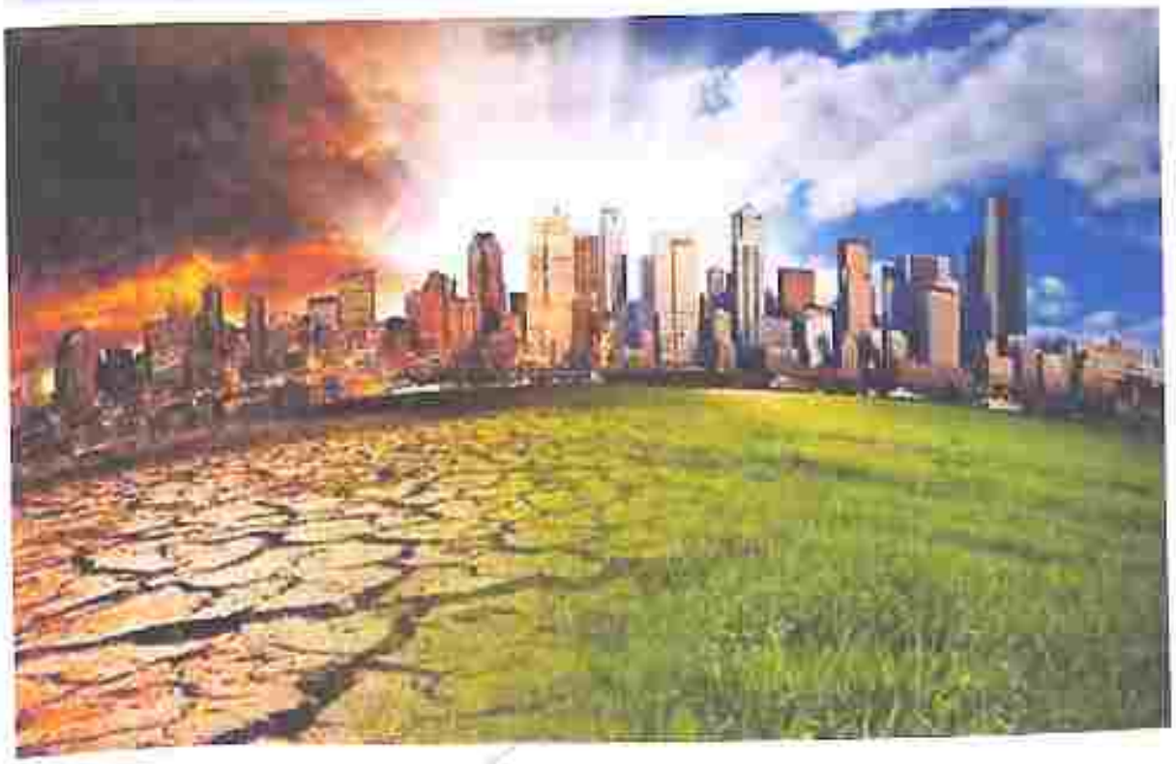
I would like to express my gratitude towards my parents who helped me a lot in finalizing this project within the limited time frame.

My thanks and appreciation also goes to my friends in developing the project and to the people who have willingly helped me out with their abilities.

Thank you

-Smritirekha Barman



INTRODUCTION

The concept of Environment is as old as the concept of the nature itself. It is a composite term referring to conditions in which organisms consisting of air, water, food, sunlight etc., thrive and become living sources of life for all the living and non-living beings including plant life. The term also includes atmospheric temperature, wind and its velocity.

Before understanding what "Environmental Pollution" is , It is equally necessary to know what "pollution" is.

The Royal Commission on Environmental Pollution in U.K. in its third report gave the following definition to the term "Pollution", namely:

The introduction by man into the environment of substances or energy liable to cause hazards to human health, harm to living resources and ecological systems, damage to structure or amenity or interference with legitimate uses of the environment.

According to Section 1(3) of the U.K. Environment Protection Act, 1990, the term "Pollution" means:

The release (into any environmental medium) from any process of substances which are capable of causing harm to man or any other living organisms supported by the environment.

Pollution occurs when there is the potential for harm. Harm of man is not confined to physical injury but encompasses offence caused to any of his senses or harm to his property, therefore smells and noise which may not cause injury can constitute pollution.

Harm to living organisms can include harm to their health or interference with the ecological systems of which they form a part.

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1. Introduction to Environmental Pollution

The systematic pollution of our environment is one of the biggest hazards that humanity faces today. People are becoming increasingly aware of the threat posed by pollution and governments are enacting legislations aimed at protecting the environment.

During the last few decades, the global environment has gone through serious challenges and changes. Population pressure has escaped rapidly consequently resources have dwindled.

Pollution is an undesirable change in the physical and biological operations of our air, land and water. They may be or will be harmful to human life, species our industries process; living condition and culture assets or deteriorate our material resources.

Human being can be exposed to pollutant in many ways through the air they breathe, the water they drink, the food they eat and the cosmetics, drugs and other products they use. The continuing discovery of previously unsuspected hazards from various chemicals and other substances underscore the point. The environmental and human health effect of even those substances identified for priority consideration.

Scientific developments have been a growing concern about the links between the health and environment and worldwide industrial, land and resources management practices. Today there is a growing concern for global scale environmental degradation brought by combinations of all people on earth.

Manufacturing plants, agriculture production and other sources release pollutants into the air, water and soil, pollutants are intentionally moved away through the management of waste including residues removed from the air and water by pollution control equipment.

Pollutants also move among the media by changing into more or less hazardous substances as they move through environment. They may accumulate in sinks for long period of time and people often are exposed to the same pollutant through the one medium by breathing air, drinking water, eating food or absorbing it through skin.

Generally new industrial plants reduce less waste than older ones. One report estimates that new factories cut the amount of hazardous waste to half. Dilution which increases the volume of waste, is now more common than segregations.

Firms dilute waste to lower pollutant concentration for discharge into a sewage treatment plant or directly into air or water, or to inject them more easily into deep wells. To save money, small electroplating firms after mix their organic waste with those containing metals and cyanide before dumping them in the sewer rather than treating them independently.

The sewage treatment plant can degrade the organic waste but the metal of cyanide accumulates in the plants sludge. Across media approach designed to avoid this problem might require the discharger to segregate and treat separately the heavy metals and cyanide to prevent their release. Once wastes are segregated, they are easy to recycle or treat. As a better understanding of nature and extent of Cross media problem is gained, society will also find better ways to improve both the effectiveness and efficiency of pollution control policies.

2. Meaning of Environmental Pollution

Ecosystem is a natural unit of living community (plants and animals) and non-living environment. The biotic and abiotic community are constantly interacting and exchanging materials and energy between themselves.

The life in an ecosystem depends upon the environment which provides energy in the form of sunlight and nutrients for the living components of the ecosystem. Waste matter and energy produced by human beings through their irresponsible and wanting activities cause disturbance in the natural environment or in the ecosystem is called Environment Pollution.

Environment Pollution is the result of increased production of waste products by the industries, rapid urbanization, wanting and irresponsible. Harnessing of the natural resources as well as unplanned sewage and waste disposal from industries and cities etc. Thus presence of any environment poliutant called Environment Pollution.

Nature has provided the basic ingredients for living in abundance and whatever is used up during normal course of living is recaptured through natural cycle. Any effort to disturb this process is termed as Environment Pollution.

In a homeostatic ecosystem there is a balance between the living organisms and the environment. Disturbance in any component of the environment is likely to have a harmful effect on the ecosystem. Any change in the environment which contributes to its deterioration is called pollution of the environment and the agent which causes the pollution is called the pollutant.

This change in the physical, chemical or biological characteristics of our physical environment (air, water and land) is undesirable and harms human life, other living organisms and cultural assets. The resulting impact on the environment has been so massive with far-reaching consequences that the very existence of life is threatened.

The word environment connotes the whole gamat of physical surroundings i.e. land, air and water along with the biotic components (all living forms) which are responsible for the plant and animal kingdom to survive and proferaterate Environmental segments are atmosphere, hydrosphere, lithosphere and biosphere. Man is the main agent for polluting the environment.

3. Factors Affecting Environmental Pollution

Some of the factors which are affecting environment and causes pollution are described below:

- **Consequences of Population Growth:-**

Population growth is one of the prominent factors that affect the degradation of the environment. Earlier, pestilence and famine kept the population under control, but with the development of chemical compounds to restore and enhance the soil fertility, and with reduction in the death rate, there has been an explosive growth in population with inevitable consequences.

This dramatic growth coupled with the development of cheap sources of energy like coal, petroleum, natural gas etc., and industrial revolution has posed a grave threat to the environment because earth is a finite system in which any further increase will be restricted by environmental constraints.

Pollution increases not only because of the people multiply and the space available to each person becomes smaller but also because the demands per person are continuously increasing and each throws away more and more every year. Pollutants are the residues of the things we make, use and throw away.

An intimate relationship is found between human number (population) and environment. The impact of any human group in environment can be conceptually resolved into three factors; Pollution, Affluence i.e. material aspects of per capita consumption of goods and resources and technology of production.

Of the factors responsible for environmental crisis, the increasing population growth is considered to be a key factor.

- **Pollution of Indian Lakes:-**

Among the surface water bodies, lakes and reservoirs are considered to be most valuable water resources. These surface water bodies are currently under serious pollution threat not only in India but also globally considered to be an important issue.

Over past couple of decades national and international programs on lake water quality assessment and their management in the perspective of conservation were attempted.

Considerable studies were made in Himalayan lakes of J & K (Dal & Nagin Lake), Kumaun (Naimtal and Bhimtal Lake), Madhya Pradesh (Bhopal Lake) and so on. In almost all cases lake water is highly polluted with silts, agrochemicals, fertilizer, organic wastes and industrial

discharges etc.

As a result, considerable biotic changes along with loss of productivity is noticed. In most of limnological studies of the lake system thus revealed the fact that most of the lakes slowly transformed into swampy marsh without any proper management for conservation.

- **Pollutants:-**

According to "The Indian Environment Protection Act 1980" a pollutant has been defined as any solid, liquid or gaseous substances present in such concentration as may be or tend to be injurious to environment.

Any substance present in the environment in such concentration which adversely effects the environment by damaging the growth rate of a species and by interfering with the food chains, and affects the health, comfort and property etc. is considered as a pollutant.

Smoke from industries and automobiles, domestic and commercial sewage, radioactive substances from nuclear plants and discarded household articles (tins, bottles, broken crockery etc.) come under the category of pollutants.

Classification of Pollutants:

The classification of pollutants is done from different points of view.

Depending upon their existence in nature pollutants are of two types, namely:

(i) Quantitative Pollutants

(ii) Qualitative Pollutants

i) Quantitative Pollutants:

These are those substances normally occurring in the environment, who acquire the status of apollutant when their concentration gets increased due to the un-mindful activities of man. For example, carbon dioxide, if present in the atmosphere in concentration greater than normal due to automobiles and industries, causes measurable effects on humans, animals, plants or property, then it is classified as a quantitative pollutant.

ii) Qualitative Pollutants:

These are those substances which do not normally occur in nature but are added by man. For example- insecticides. Depending upon the form in which they persist after being released into the environment, the pollutants are categorized into two types, namely

(a) Primary pollutants.

(b) Secondary pollutants.

(a)Primary Pollutants:

These are those which are emitted directly from the source and persist in the form in which they were added to the environment.

(b)Secondary Pollutants:

These are those which are formed from the primary pollutants by chemical interaction with some constituent present in the atmosphere.

4. Types of Environmental Pollution

Pollution is of five main types:

(a) Air Pollution

(b) Water Pollution

(c) Land and Soil Pollution

(d) Noise Pollution

(e) Radioactive Pollution

(a)Air Pollution:

It is an atmospheric condition in which certain substances (including the normal constituents in excess) are present in concentrations which can cause undesirable effects on man and his environment. These substances include gases, particulate matter, radioactive substances etc.

(b)Water Pollution:

Water is one of the most important biological components that sustain life. Its great solvent power makes the creation of absolute pure water a theoretical rather than a practical goal. Human pollution has the habit of dumping their wastes into water. This has the effect of diluting the waste and getting it dispersed if it is a running water system.

(c)Land and Soil Pollution:

Soil is the loose mineral material and is the most important component of the earth's surface (lithosphere). It is the growth medium for many microbes, plants and

animals. The formation of soil is the result of chemical, physical and biological weathering. Like air and water, soil is also subjected to pollution. Soil contains many microbes.

(d)Noise Pollution:

We hear various types of sounds every day. Sound is mechanical energy from a vibrating source. A type of sound may be pleasant to someone and at the same time unpleasant to others. The unpleasant and unwanted sound is called noise. Sound can propagate through a medium like air, liquid or solid. Sound wave is a pressure perturbation in the medium through which sound travels.

(e)Radioactive Pollution:

The elements such as uranium, thorium etc. having unstable nuclei emit radiations such as alpha, beta and gamma in nature to acquire stability. These elements are called radioactive elements. Some ordinary elements like zinc, calcium, chlorine etc. can be converted into radioactive by bombardment with neutron or other particles. This bombardment is called disintegration and the disintegration rate is measured in curie (Ci) named on the discoverer of radioactive elements.

5. Sources of Environmental Pollution

There are two main sources of environmental pollution:

I. Natural Sources

II. Man Made Sources

i. Natural Sources of Environmental Pollution:

(a)Volcanic eruptions release gases and volcanic ash.

(b)Forest fires produce smoke and trace gases.

(c)Dust storms increase the wind-blown dust into the environment.

(d)Bacteria, spores, cysts and pollens are all natural pollutants.

(e)Decay of organic matter in marshy places releases marsh gas (methane-CH_4) which is a light, colourless, inflammable hydrocarbon.

ii. Man-Made Sources of Environmental Pollution:

Anthropogenic source cover a wide spectrum of types as man has aggravated the problem of pollution by his innumerable activities like,

1. Domestic sources
2. Industries
3. Agriculture activities
4. Radioactive waste
5. Thermal power stations:

a. Industrialization.

b. Invention of automobiles.

c. Over population.

d. Deforestation: Destruction of natural habitat.

e. Nuclear explosions.

f. Over-exploitation of natural resources.

g. Construction of buildings, roads and dams.

h. Explosives used in wars.

i. Use of fertilizers and pesticides.

j. Quarrying and mining.

6. Effect of Pollution on the Environment

The term "environment" refers to the immediate surroundings in which man lives. It comprises of living and non-living constituents that support life and sustain various human activities. Pollution affects both the living as well as the non-living components of the environment.

It brings about drastic changes in the physical environment causing community wide problems by polluting the air, water and land; adversely affecting the health of humans and animals, and damaging plants and property. Besides there are effects of noise pollution and the hazards associated with radiation pollution.

As environment stress on the human body increases, many medical scientists fear a terminal increase in infectious disorders not only because of lower body resistance but because viruses and other disease organisms will increasingly slip through water treatment and food processing plants as the quality of water and food at the intake deteriorates.

Effect on plants, the adverse effects range from reduction in growth rate to death of the plant. The damage caused to plants by pollution includes necrosis (dead areas on a leaf structure), chlorosis (loss or reduction of chlorophyll Leading to yellowing of leaf), epinasty (downward curvature of the leaf due to higher rate of growth on the upper surface) and abscission of leaves (premature fall). Pollution also causes deterioration of structural materials such as marble and lime stone.

Pollution has been changed the atmospheric conditions. An average temperature has been increased due to increase in pollution. Effects of pollution at international level are depletion of ozone layer, global warming, acid rain, rising sea level etc.

7. Environmental Protection and Control of Pollution

Over population and pollution are potent ecological forces impinging upon man by affecting the quality of the environment. All efforts aimed at bringing more and more people above the poverty line actually increase the pressure on natural resources.

Careless management of natural resources is disrupting the ecological processes so much so that earth's life supporting capacity is being substantially threatened. Unmindful exploitation of the finite resources of the biosphere has a severe ecological backlash because no development is sustainable unless it is environmentally compatible.

Pollution is the burning of the day at the global level. A combined effort to control pollution has to be made by all government agencies, technologists, industrialists, agriculturists and last but not the least the common man.

Several measures were recommended by the scientists participating in the conference, e.g.

I. The first step should be to identify those causes of pollution that have global implications, and to devise protective measures to be adopted.

ii. The second step should be to find out the carrying capacity of the environment and reduce the emission of the major sources of pollution.

iii. The third step should be to find a neutralizer for each type of pollutant.

Iv. The fourth step should be to ensure that anti-pollution measures are adopted by all industries.

v. The fifth step should be the identification of areas where the cause of pollution is poverty and lack of environmental education. Contamination of food and water are the basic causes of pollution in such areas.

Environmental monitoring is urgently required for controlling pollution.

This involves:

i. Careful scrutinisation of the environmental characteristics.

ii. Laying down the standards of environmental quality.

iii. Regular assessment of the above mentioned environmental characteristics.

iv. Keeping track of the changes in the environmental characteristics and educating people about the changes due to these changes.

v. Devising measures to combat the menace of pollution.

vi. Enacting environmental laws and taking legal action against environmental offenders.

Efforts are required to be made by each individual to control pollution.

These efforts include:

i. Installation of proper sewage disposal methods.

ii. Dumping of non-biodegradable wastes in low lying areas.

iii. Installation of Gober gas plants in areas of high availability of cow dung.

iv. Reduction of smoke emission and treatment of chimney smoke to remove solid carbon particles.

8. Environmental Pollution Prevention

Pollution is the creation of imbalances between nature and environment life cycle by human beings and other living inhabitants on the earth due to their day to day input output activities carrying unhealthy surrounding, deforestation, ecological degradation, soil erosion, depletion of natural resources creation of industries slumps and ugly dwellings.

a. Maximum feasibility reduction of all wastes generated at production sites.

b. Source reduction, energy efficiency, reuse of input materials during production and reduced water consumption.

c. Change products and production processes to reduce pollution at the source.

CONCLUSION

On the basis of coordinating with other related planning and analyzing the current challenges in the environment, the present environmental planning has proposed the planning vision and objectives, together with a preliminary scheme for environmental functional districts and environmental functional district management. Under the three principal themes of "Optimizing the Environment Suitable for Living and Tourism", "Promoting a Conservation and Recyclingoriented Society" and "Integrating into the Green and Quality Region", this planning has also established 11 green indicators for the Environmental Planning, proposed 15 areas of concern and their strategic direction, formulated various major actions, and established the implementation and supervision mechanisms, in order to enhance the environmental management capability of the Macao SAR Government and guarantee the execution of the planning.

However, since the environment is a complex, variable and extensive system, protecting the environment is a hard and enduring task. It is impossible that all the existing pollution problems in the environmental can completely be resolved in the next decade. A wonderful and quality environment must be achieved by continuous planning, governmental policies, efforts of the enterprises and public participation.

It is the responsibility of everyone to protect our environment. Let us fulfill our responsibilities in environmental protection, creating a quality ecological environment and sharing wonderful green living together.

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Samanta 26/05/2022

AIR POLLUTION

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POLLUTED CITY

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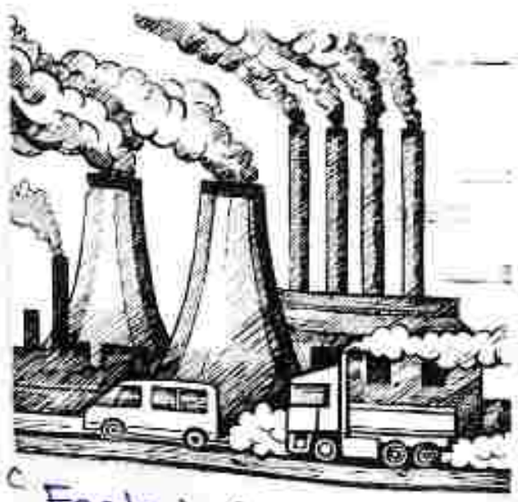
AIR POLLUTION

INTRODUCTION

Air pollution is the introduction into the atmos-phere of chemicals, particulates or biological materials that cause discomfort, disease or death to humans, damage other living organisms such as food crops, or damage the natural environment or built environment.

Air pollution occurs due to the presence of undesirable solid or gaseous particles in the air in quantities that are harmful to health of human and the environment. Air may get polluted by natural causes such as volcanoes, which release ash, dust, Sulphurs and other gases, or by forest fire that are occasionally naturally caused by lightning. However, unlike pollutants from human activity, naturally occurring pollutants tend to remain in the atmosphere for a short time and donot lead to permanent atmospheric change.



Factories & Vehicles are increasing day by day.

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Pollutants that are emitted directly from identifiable sources are produced both by natural events (like dust storms and volcanic eruptions) and human activities (emission from vehicles, industries etc). These are called **primary pollutants**. There are five primary pollutants that together contribute about 90% of the global air pollution. These are carbon oxides, nitrogen oxides, volatile organic compounds. Pollutents that are produced in the atmosphere when certain chemical reactions take place among the primary pollutants are called **secondary pollutants**. Eg:- sulfuric acid, nitric acid, carbonic acid etc.

SOURCES OF AIR POLLUTION

Sulphur oxides - Since coal and petroleum often contain sulphur compounds, their combustion generates sulfur dioxide. Further oxidation of SO_2, usually in the presence of a catalyst such as NO_2, forms H_2SO_4 and thus **acid rain**.

Nitrogen oxides - especially nitrogen dioxide are expelled from high temperature combustion, and are also produced naturally during thunderstorms by electric discharge. Nitrogen oxides are found in vehicular exhausts.

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Carbon monoxide – is a colourless, odourless, but very poisonous gas. It is a product by incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhausts are the single largest source of carbon monoxide. The no. of vehicles has been increasing over the years all over the world. Vehicles are also poorly maintained and several have inadequate pollution control equipment resulting in release of greater amounts of carbon monoxide.

Particulates, alternatively referred to as particulate matter (PM), atmospheric particulate matter or fine particles, are tiny particles of solid or liquid suspended in a gas. In contrast, aerosol refers to particles and gas together. Sources of particulates can be manmade or natural. Some particulates occur naturally, originating from volcanoes, dust storms, forest and grassland fires.

Persistent free radicals connected to airborne fine pasticles could cause cardiopulmonary disease.

Chlorofluorocarbons (CFCs) – harmful to the ozone layer emitted from products currently banned from use.

'Smog'

SECONDARY POLLUTANTS include:

Particulates created from gaseous primary pollutants and compounds in photochemical smog. **Smog** is a kind of air pollution, the word "Smog" is a portmanteau of smoke and fog. **Classic smog** results from large amounts of coal burning in an area caused by a mixture of smoke and sulphur dioxide. **Modern smog** does not usually come from coal but from vehicular and industrial emissions.

Ground level ozone (O_3) formed from NOx and VOCs. Ozone (O_3) is a key constituent of the troposphere. It is also an important constituent of certain regions of the stratosphere known as **Ozone layer**. Photochemical and chemical reactions involving it drive many of the chemical processes that occur in the atmosphere by day and by night.

EFFECTS OF AIR POLLUTION

1. Health effects

Air pollution is a significant risk factor for multiple health conditions including respiratory infections, heart diseases and lung cancer, according

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to WHO. The health effects caused by air pollution may include difficulty in breathing, wheezing, coughing, asthma and aggravation of existing respiratory and cardiac conditions. These effects can result in increased medication use, increased doctor or emergency room visits, more hospital admissions and premature death.

Both indoor and outdoor air pollution have caused approximately 3.3 million deaths worldwide. Children aged less than five years that live in developing countries are the most vulnerable populations in terms of total deaths attributable to indoor and outdoor air pollution.

The World Health Organization states that 2.4 million people die each year from causes directly attributable to air pollution, with 1.5 million of these deaths attributable to indoor air pollution.

2. Environmental Effects

Poisonous air pollutants can form acid rain. It can also form dangerous ground level ozone. These destroy trees, crops, farms, animals and continue to make water bodies harmful to humans and animals that live and depend on water.

3. Global Warming

Another direct effect is the immediate alternations that the world is witnessing due to global warming. With increased temperatures worldwide, an increase in sea levels and melting of ice from colder regions and icebergs, displacement, and loss of habitat have already signaled an impending disaster if actions for preservations and normalization aren't undertaken soon.

4. Economical Effects

The economy thrives when people are healthy, and business that depends on cultivated raw materials and natural resources are running at full efficiency. Air pollution reduces agricultural crop and commercial forest yields by billions of money each years.

5. Eutrophication

It is a condition where a large amount of nitrogen present in some pollutants gets developed on the sea surface and turns itself into algae and adversely affects fish, plants, and animal species.

Health is effected"

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GREEN HOUSE EFFECT

Atmospheric changes induced by pollution contribute to global warming, a phenomenon which is caused due to the increase in concentration of certain gases like carbon dioxide, nitrogen oxides, methane and CFCs. Observations of the earth have shown beyond doubt that atmospheric constituents such as water vapour, carbon dioxide, methane, nitrogen oxides and Chloro Fluro Carbons trap heat in the form of infra-red radiation near the earth's surface. This is known as "Greenhouse Effect". The phenomenon is similar to what happens in a greenhouse. The glass in a greenhouse allows solar radiation to enter which is absorbed by the objects inside. These objects radiate heat in the form of terrestrial radiation, which does not pass through the glass. The heat is therefore trapped in the greenhouse increasing the temperature inside and ensuring the luxuriant growth of plants.

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CONTROL MEASURES FOR AIR POLLUTION

Solution efforts on pollution are always a big problem. This is why prevention interventions are always a better way of controlling air pollution. These prevention methods can either come from government (laws) or by individual actions.

Air pollution can be controlled by two fundamental approaches - **preventive techniques** and **effluent control**. Some ways are

1. Use the Public Mode of Transportation

Encourage people to use more and more public modes of transportation to reduce pollution. This saves both energy and money.

2. Better Household Practices

Discard fireplaces and/or wooden stoves used for heating homes. Use gas logs in place of wood. Also, eliminate the use of gas powered lawn and gardening equipment. Avoid setting fire to garbage, dry leaves and lighting bonfires in the open.

3. Understand the concept of Reduce, Reuse and Recycle

Do not throw away items that are of no use to you. Instead reuse them for some other purpose. For example, you can use old jars to store cereals or pulses.

4. Conserve Energy

Switch off fans and lights when you are going out. A large number of fossil fuels are burnt to produce electricity. You can save the environment from degradation by reducing the number of fossil fuels to be burned.

5. To have proper equipment in place.

This is one of the effective ways of controlling air pollution. This includes devices for removal of pollutants from the flue gases through scrubbers, closed collection recovery systems through which it is possible to collect the pollutants before they escape, use of dry and wet collectors, filters, electrostatic precipitators etc.

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AIR POLLUTION IN INDIA

The World Health Organization (WHO) which rates only mega cities of the world has rated Delhi, the fourth most polluted city in the world. However, compared to other cities in India, Delhi is not at the top of the list of polluted cities. Our country has several pollution hotspots.

The recent release from the Central Pollution Control Board (CPCB), Parivesh, January 2003 states that Ahmedabad's air is most noxious followed by Kanpur, Solapur and Lucknow with small particulate levels (PM10) 3-4 times the standard of 60 microgram per cubic meter (mg/m^3). The report has ranked 29 cities according to Respirable Particulate Matter (RSPM). The report has ranked 29 cities during the year 2000. This report thus confirms the fact that Indian cities show high particulate pollution with 12 cities hitting critical levels.

Nitrogen dioxide levels in most cities are generally close to the acceptable manual Standard of 60 mg/m^3. However, sharp increases have been noticed in a few cities with heavy vehicular traffic and density as in few locations in Kolkata and Delhi indicating

stronger impact of traffic. The CPCB indicates vehicles as one of the predominant sources of air pollution.

• ROLE OF THE SUPREME COURT

It is alarming that the residential locations in India are fast outpacing industrial locations in air pollution implying that vehicular fumes are responsible for this trend. The Supreme Court's order of April 5, 2002 has directed the Central Government for an action plan for other polluted cities. Absence of any local initiatives for action and delay in air pollution control measures will only make the situation worse.

TAJ MAHAL PROTECTION

The Supreme Court played a vital role protecting the Taj Mahal. Being exposed to sulphur dioxide and suspended particulate matter, the Taj had contracted 'marble cancer', a fungal growth that corroded its surface giving it a yellowish tinge. The SPM deposits blackened it. Shri MC Mehta, an environmental lawyer, filed a public interest

litigation in 1984 expressing concern over the havoc the polluting units in Agra were wreaking on the Taj Mahal. Twelve years later, the Supreme Court ordered 292 industries in the vicinity to either adopt pollution control measures or shut down. It also made it mandatory for these units to either switch over to eco-friendly fuels like natural gas or shift out of the area.

AIR QUALITY MONITORING

India does not presently have a well established system of monitoring air pollution. When air quality monitoring began in India in the late 1960s, planners focused only on a few pollutants namely sulphur dioxide, nitrogen oxides and suspended particulate matter. Other pollutants such as carbon monoxide and lead were monitored only on a limited scale. The threat from other air toxins such as benzene, ozone, other small particulates is not known as these are not monitored at all.

The Central Pollution Control Board (CPCB) initiated its own national Ambient Air Quality Monitoring (NAAQM) program in 1985.

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CONCLUSION

Air pollution is a complicated issue and negatively impacts the health of citizens as well as the economy of the country. Both indoor and outdoor air pollution have emerged as one of the leading causes of deaths in India and while recent reports highlight the worsening outdoor and air pollution in urban centres, indoor air pollution due to biomass burning and 'inefficient 'Chulhas' is also an area of concern. The Government of India and the State governments have recognized the adverse effects of air pollution and there is increased seriousness about addressing the air quality issue among all the stakeholders.

DATE

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Acknowledgement

I, Ayushi Paul, a student of first year, sem-2, Economics department of Gokhale Memorial Girls' College, would like to express my special thanks of gratitude to our principal, Dr. Alashi Karpha and our AECC professor Mr. Santanu Samanta, who gave me this golden opportunity to do this wonderful project on the topic Environmental Pollution. It also helped me in doing a lot of research and I came to know about so many new things. I am extremely thankful to them.

While doing the research, I observed that,

- Environmental pollution has a profound adverse impact on the Earth today.
- To protect our mother Earth, we need to be very conscious about our daily activities, because the adverse impact on the environment is caused by them.

I am very grateful to our teachers and the staff members who take an effort to keep our college campus clean and encourage the students to do the same.

Last but not the least, I would like to thank my parents and my friends who helped me with the contents of the project and in finalizing this project within the limited time-frame.

Contents

Introduction

An Environment is everything that is around us, which includes both living and non living things such as soil, water, animals and plants, which adapt themselves to their surroundings. Healthy ecosystems clean our water, purify our air, maintain our soil, regulate the climate, recycle nutrients and provide us with food. They provide raw materials and resources for medicines and other purposes. Pollution is the introduction of contaminants into the natural environment that causes adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light. Pollutants, the components of pollution, can be either foreign substances or energies or naturally occuring contaminants. Environmental pollution is one of the most serious problems facing humanity and other life forms on our planet today. "Environmental pollution is defined as "the contamination of the physical and biological components of the earth/ atmosphere system to such an extent that normal environment processes are adversely affected." Pollution can be naturally occuring substances or energies, but they are considered contaminants when in excess of natural levels. Any use of natural resources at a rate higher than nature's capacity to restore itself can result in pollution of air, water, and land. Environmental pollution is of different types namely, air, water, soil, noise and light-weight. These cause damage to the living system. How pollution interacts with public health, environmental medicine and the environment has undergone dramatic change.

Air Pollution

Air pollution refers to the release of pollutants into the air – pollutants which are detrimental to human health and the planet as a whole. According to the World Health Organization (WHO), each year air pollution is responsible for nearly seven million deaths around the globe.

What causes Air pollution?

"Most air pollution comes from energy use and production," says John Walke, director of the Clean Air Project, part of the Climate and Clean Energy program at NRDC. "Burning fossil fuels releases gases and chemicals into the air." In an especially destructive feedback loop, air pollution not only contributes to climate change but is also exacerbated by it. "Air pollution in the form of carbon dioxide and methane raises the earth's temperature," Walke says. "Another type of air pollution, smog, is then worsened by that increased heat, forming when the weather is warmer and there's more ultraviolet radiation." Climate change also increases the production of allergenic air pollutants, including mold (thanks to damp conditions increased by extreme weather and increased flooding) and pollen (due to longer pollen season).

"We've made progress over the last 50 years improving air quality in the United States thanks to the Clean Air Act," says Kim Knowlton, senior scientist and deputy director of the NRDC Science Center. "But climate change will make it harder in the future to meet pollution standards, which are designed to protect health."

Effects :

- **DISEASES** – Air pollution has resulted in several respiratory disorders and heart diseases among humans. The causes of air pollution have increased the cases of lung cancer in the past few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

- **GLOBAL WARMING** – Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as global warming. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged underwater.

- **ACID RAIN** – The burning of fossil fuels releases harmful gases such as nitrogen oxides and sulphur oxides in the air. The water droplets combine with these pollutants, become acidic and fall as acid rain which damages human, animal and plant life.

- **OZONE LAYER DEPLETION** – The release of chlorofluorocarbons, halons, and hydrochlorofluorocarbons in the atmosphere is the major cause of depletion of the ozone layer. The depleting ozone layer does not prevent the harmful ultraviolet rays coming from the sun and causes skin diseases and eye problems among individuals.

- **EFFECT ON ANIMALS** – The air pollutants suspend in the water bodies and affect aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This hinders them to stay and has also led to the extinction of a large number of animal species.

Conclusion

Environmental pollution has become a great concern to save our planet. We need to adopt various measures to reduce environmental pollution. Some of them includes planting trees, reducing the use of non-renewable resources, proper disposal of waste etc. It is the responsibility of every individual to save our Environment from getting polluted. Our earth is moving on the way to unhealthy future for every living being. So, we must become aware of the factors that pollute our environment and take some necessary steps to keep our future safe and healthy. Population overgrowth and technology advancements have all led to the increase in demand for resources for optimum survival. However, we must not forget that the environment has been forced to pay a huge price for the same and we all should be responsible enough to do our bit in order to curb the ever-increasing environmental pollution or else, it may be difficult for future generations to even survive on this planet. Better methods such as the use of solar energy, wind energy and other ecologically safe technologies can surely be considered an alternative in order to live in a healthy and pollution free environment.

Samanta
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CONTENTS:

GLOBAL WARMING

INTRODUCTION:

Fossils fuels (i.e. coal, oil, natural gas) provide about 85% of the world's energy, sustaining the world's standard of living and providing much of the power for transportation, generation of electricity, home heating and food production. Compared to other sources of energy, fossil fuels are relatively inexpensive, transportable, safe and abundant. At the same time their use contributes to environmental problems such as air pollution, acid rain, which are being addressed through various control effects, and to long term climate change, which governments have begun to address through the adoption of the UN Framework Convention on Climate Change negotiated on 1992.

Drawing primarily from international assessment reports, the paper summarizes six key elements of the science of climate change (often referred to simply as "Global Warming" although the projected changes involve changes in many variables in addition to a rise in global; average temperature). These results are presented as context for considering the challenges of both limiting long term warming and adapting to the warming that occurs as a result of past use of the fossil fuels and the inevitable future use over coming decades.

DEFINATION:

Global Warming is the phenomenon of a gradual increase in the temperature near the earth's surface. This phenomenon has been observed over the past one or two centuries. This change has disturbed the climatic pattern of the earth. However, the concept of global warming is quite controversial but the scientists have provided relevant data in support of the fact that the temperature of the earth is rising constantly.

There are several causes of global warming, which

have a negative effect on humans, plants and animals. These causes may be natural or might be the outcome of human activities. In order to curb the issues, it is very important to understand the negative impacts of global warming.

CAUSES OF GLOBAL WARMING:

There are many reasons behind the Global Warming which consists of natural causes and man-made causes. These are as follow:

NATURAL CAUSES:

- **VOLCANOES:** Volcanic eruptions discharge carbon dioxide (CO_2), but they may also emit aerosols, such as volcanic ash or dust, and sulphur dioxide (SO_2). Aerosols are liquids and solids that float around in the air. They may also include soot, dust, salt crystals, bacteria and viruses. Aerosols scatter incoming solar radiation causing a slight cooling effect. Volcanic aerosols can block a percentage of sunlight and cause a cooling that may last for 1 -2 years. But the volcanoes eruptions discharge a higher an amount of carbon dioxide (CO_2) and sulphur dioxide (SO_2) which causes Global Warming.

- **Water Vapour:** Water vapour is the most abundant greenhouse gas in the atmosphere, both by weight and volume. Water vapour is an also effective greenhouse gas, as it absorbs long-wave radiation and radiates it back to the surface, thus contributing to Global Warming.

When compared to other greenhouse gases, water vapour stays in the atmosphere for a much shorter period of time. Water vapour will generally stay in the atmosphere for days while other greenhouse gases, such as carbon dioxide (CO_2) or Methane (CH_3) will stay in atmosphere

for a much longer time thus contributing to warming for an extended period of time.

- **Melting Permafrost:** Large scale of permafrost melting in the North and South can contribute substantially to Global Warming. In these areas, large amount of Carbons are frozen and stored in the form of permafrost.

Disturbances, such as changes in the solar activity, natural forest fires and volcanic eruptions etc. to these natural carbons storage areas may result in the large scale melting of permafrost, in term leading to the large scale release to the greenhouse gas into the atmosphere. As the carbon in permafrost have been out of the atmosphere for thousands of years, the sudden release of these sequestered carbons into the atmosphere will definitely results imbalances in the carbon cycle and other natural processes.

- **Natural Forest Fires:** Natural forest fires, especially large scales ones over long periods, can have an impact on the global temperature. When the vegetations burn, there is release of stored carbon and increase in greenhouse gases like carbon dioxide into the atmosphere. These greenhouse gases then trap solar energy, invariably leading to the warming in the atmosphere. The soot and harmful gases produced also cause air pollution.

MAN-MADE CAUSE:

- **OIL AND GAS:** Oil and Gas is used all the time in almost every industry. It is used the most in vehicles, buildings, production and to produce

electricity. When we burn coal, oil and gases it largely adds to the climate problem. The use of fossil fuels is also a threat to wildlife and the surrounding environments, because of the toxicity it kills off plant life and leaves areas uninhabitable.

Oil releases a huge amount of carbon when burned –approximately a third of the world's total carbon emissions. There have also been oil spills in recent years that have a devastating impact on our ecosystem.

❖ **DEFORESTATION:** The trees of tropical forests, like all green plants, take up carbon dioxide from the atmosphere and release oxygen during photosynthesis. They also carry out the opposite process—known as respiration—but when forests are growing, photosynthesis exceeds respiration, and the surplus carbon is stored in tree trunks and roots and in the soil. This is called "sequestration."

When forests are cut down, much of that stored carbon is released into the atmosphere again as CO2. This is how deforestation and forest degradation contribute to global warming.

The consensus among climate scientists is that CO2 from tropical deforestation now makes up less than 10 percent of global warming pollution.

❖ **Chlorofluorocarbon:** With the excessive use of air conditioners and refrigerators, humans have been adding CFCs into the environment which affects the atmospheric ozone layer. The ozone layer protects the earth surface from the harmful ultraviolet rays emitted by the sun. The

CFCs have led to ozone layer depletion making way for the ultraviolet rays, thereby increasing the temperature of the earth.

- **WASTE:** The disposal and treatment of waste can produce emissions of several greenhouse gases (GHGs), which contribute to global climate change. The most significant GHG gas produced from waste is methane. It is released during the breakdown of organic matter in landfills. Other forms of waste disposal also produce GHGs but these are mainly in the form of carbon dioxide (a less powerful GHG). Even the recycling of waste produces some emissions (although these are offset by the reduction in fossil fuels that would be required to obtain new raw materials). Waste prevention and recycling help address global climate change by decreasing the amount of greenhouse gas emissions and saving energy.

- **OIL DRILLING:** Oil drilling is responsible for 30% of the methane population and around 8% carbon dioxide pollution. Oil drilling is used to collect petroleum oil hydrocarbons in this process other gases are released into the atmosphere, which contribute to climate change; it is also toxic to the wildlife and environment it surrounds.

- **TRANSPOTATION AND VEHICLES:** The large amount of transportation is done through cars, planes, boats and trains, almost all of which rely on fossil fuels to run. Burning fossil fuels releases carbon Dioxide (CO_2), Sulphur Dioxide (SO2) and other types of pollutants into the atmosphere This makes transportation partly responsible for the greenhouse gases. This is the one of the main cause of Global Warming.

- **CONSUMERISM:** Due to the innovations in technology and manufacturing customers are able to purchase any product at any time. This means we are producing more and more products every year, and

over producing them. Most items we purchase aren't very sustainable, and because of the reduced lifetime of electronics and clothing items, we are creating more waste than ever.

- **FARMING:** Farming takes up a lot of green space meaning local environments can be destroyed to create space for farming. These animals produce a lot of greenhouse gases for example methane, as well as this they also produce an extreme amount of waste. Factory farming is responsible for even more climate issues because of the extra pollution it produces and the more animals it can hold.

- **Industrial Development:** With the advent of industrialization, the temperature of the earth has been increasing rapidly. The harmful emissions from the factories add to the increasing temperature of the earth.

In 2013, the Intergovernmental Panel for Climate Change reported that the increase in the global temperature between 1880 and 2012 has been 0.9 degrees Celsius. The increase is 1.1 degrees Celsius when compared to the pre-industrial mean temperature.

- **OVERFISHING:** Fish is one of human main sources of protein and a lot of the world now relies on this industry. Due to the amount of people buying and consuming fish, there is now a reduced amount of marine life. Overfishing has also caused a lack of diversity within the ocean.

- **Overpopulation:** An increase in population means more people breathing. This leads to an increase in the level of carbon dioxide, the primary gas causing global warming, in the atmosphere.

EFFECT OF GLOBAL WARMING:

Some devastating effects of Global Warming are as follows:

- **MELTING OF GLACIERS:** The melting of glaciers will create a plethora of problems for humankind and the animal living on the Earth. Due to increased global warming, the level of the sea will rise which will lead to flooding and this will, in turn, create havoc of human life. Apart from raising the sea levels, it will also endanger several species of animals and thus will hamper the balance of the ecosystem.

  Areas in the Arctic are diminishing away and flowing into major oceans. Rising temperature create a much accelerate threat to wildlife and the ecosystem in these regions. With glaciers melting at vast rates, a chain of events is being set into motion that cannot be reversed.

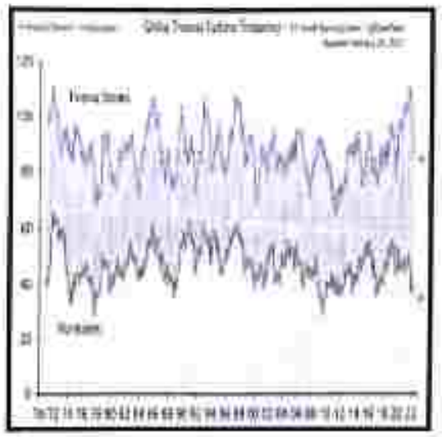
- **CLIMATE CHANGE:** Irregular weather patterns have already stated showing results. Increased precipitation n the form of rain has already been noticed in polar and sub-polar regions. More global warming will lead to evaporation which will cause more rains. Animals and plants cannot easily adapt to increased rainfall. Plants may die and animals may migrate to other areas, which can cause the entire ecosystem out of balance.

- **RISE IN DROUGHTS:** While it may be flooding in Savannah, severe drought is happening elsewhere in the World. As temperatures warm, the presence of drought has increased. Add on top of threat heat waves and precipitation, whole forest have begun to disappear including tens of millions of trees in Colorado's Rockies. Large scale evaporation will be

the major cause of drought in many places particularly Africa. Although it is reeling under the huge pressure of water crisis, increased global warming would further make the situation worse and will cause malnutrition.

❖ **DISEASES:** As the temperature becomes warmer, it can affect the health of human and the diseases they are exposed to. With the increase in the rainfall, water-borne diseases are likely to spread like Malaria , Dengue etc. The Earth will become warmer are likely to increase that can cause a major to the people.

❖ **HURRICANES FRECUENCY:** As the temperature of the oceans rises, hurricanes and other storms are likely to become stronger. With the increase in global warming, the water in the oceans warms up and it heats up the surrounding air, creating hurricanes.



❖ **THE RISE OF SEA LEVELS:** The melting of polar ice-caps and less water evaporating into the atmosphere are causing increased sea levels. Quaint coastal towns and cities near the U.S. east coast and Gulf of Mexico are just a few areas where devastating flood damage is starting to make its mark in history.

❖ **EFFECT ON AGRICULTURE:** Global warming can affect agriculture. Although the results are not visible yet, it may show the effects in years to come. As the global temperature will increase, plants will find it harder to survive and will die. Plants are the major source of food for human beings and as a result foods shortage may occur. The shortage of food may lead to war and conflict in some countries.

❖ **UNEXPECTED HEAT WAVES:** Because of the greenhouse gases and other causes, unexpected streaks of severe weather are just the tips of the iceberg in the global warming. Heat waves cause dangerously hot weather and in recent years, more deaths have occurred due to heat waves than in the last sixty years.

❖ **FREQUENT WILDFIRES**: While wildfires are a natural occurrence, with the added carbon dioxide in the air, and hotter summers, the evidence speaks for itself. More frequent wildfires continue to surface in vast amounts each year.

The rate at which they burn is longer than the last, and with the release of carbon dioxide into the air, not only are people's lives in danger, but wildlife severely suffers. Each time a wildfire burns, the less oxygen there is to combat the dangerous amounts of carbon dioxide being released into the atmosphere.

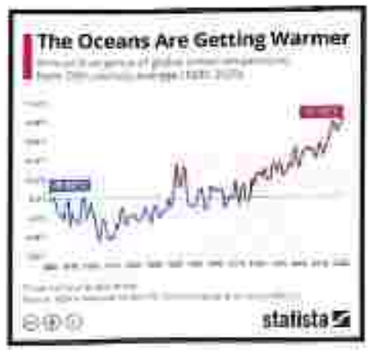
❖ **SEVERE PRECIPITATION:** Not only is there insurmountable scientific evidence that global warming is increasing, but certain types of events, including extreme precipitation, is also on the rise. Global warming also creates conditions that can lead to more powerful hurricanes and

summer storms. Cities and towns on the coast, where sea levels are already rising, face even more challenges as precipitation poses severe flooding.

- **LONGER/SHORTER SEASONS:** Global warming affects show spring is occurring 10 days sooner than it has in the past. While it may be nice to go from snow pants to shorts sooner, this could cause flooding from reservoirs filling too soon, and droughts were there is not provide adequate nourishment for crops.

- **EFFECT ON CROPS:** If seasons are changing, weather pattern are going berserk, and flooding is occurring due to rising sea levels, our crops are barely getting a fighting chance. Once the food processing industry goes haywire, the economy will really start getting interesting. The price of staple crops could skyrocket causing major inflation and more economic woes.

- **THE RISE IN OCEANS TEMPERATURE:** It's reported that coral reefs are continuing to see the diminished presence in the ocean due to global warming. Temperature changes affect more than what's happening on our lands. Once coral reefs are affected, entire ecosystems that thrive become obsolete.



- **DISRUPTION TO FOOD CHAIN:** Change the time and seasons and birds are flying south for winter sooner, hibernation takes longer, and a whole series of events is set in motion for a complete collapse of animal life. The entire food chain could be disrupted and enormous consequences could follow.

❖ **HEALTH RISKS:** As more carbon dioxide is trapped in the atmosphere, breathable air becomes harder to come by. If global warming continues, the U.S. is looking at 60 billions dollars to combat respiratory diseases and symptoms.

❖ **ANIMAL EXTINCTION:** Nature's best is beautifully displayed in every nook of planet earth the majestic lions, to the humble deer. Imagine whole populations where animals can no longer thrive. With such a vast eruption in the animal kingdom, our own world becomes in danger.

❖ **QUALITY OF LIFE:** If doing simple things like taking a walk outside or working in garden, become unenjoyable due to severe heat waves, think of the quality of life on a much larger scale. With rising global temperature, even the smallest things we took for granted will be sorely missed.

❖ **ECONOMIC COLLAPSE:** The economy could get collapse with decreased vitality of crops, production, and manufacturing food items. Without having nature on our side, the food industry will fall apart. Without the resources to feed the world, manufacturing will collapse. Hunger will be our biggest battle.

❖ **POOR AIR QUALITY:** As more chain of events is set in motion, air quality will continue to get worse. As bad as it is now in some areas in the world, multiply that by a million.

- **DECREASED POPULATION:** If global warming goes unchecked, it's estimated the world's human population would decrease by 75 percent. With the increasing severity of storms, flood, earthquake, and wildlife, natural disasters would diminish half of the earth's population. Another 25 percent would succumb to air- related illnesses, starvation, and poverty.

- **HUMAN EXTINCTION:** What little would remain of the earth as we know it, would be a silver. The rest of the human population would have to find and implement alternative energy on a consistent and regulated basis. It's hard to imagine, but each of these events affects another event.

- **GOING OFF THE GRID:** With the current threat of increasing storms and violent aftermaths of hurricanes and tropical storms, it would only take a few hits to crumble our electrical system.

- **DIMINISHING FRESH WATER SUPPLY:** Our fresh water supply will greatly diminish with global warming. With demise of coral reefs and the ecosystems therein, less fresh water will flow into lakes and tributaries.

- **DISAPPEARING COUNTRIES:** Countries like Greenland are deteriorating at a highly elevated rate. Beautiful cities, even continents could one day be a part of a vast sea.

SOLUTION OF GLOBAL WARMING:

- **USE OF FLUROCENT LIGHT BULBS:** We should immediately change incandescent light bulbs and use fluorescent light bulbs, because these fluorescent bulbs consume only 25 % energy comparable incandescent bulbs.

- **SWITCH OFF ELECTRIC APPLIENCES:** When electric appliances are not in our use, then plug them off, because they use some energy even in off position.

- **CHANGE OF MONITOR WITH LCD:** Try to get LCD instead of a monitor, because LCD takes about 56 percent energy than our monitor. Always keep our computer screen status off, when we are not working.

- **DON'T LEAVE FRIDGE DOOR OPEN FOR LONG TIME:** Take or put things in your Fridge quickly, because if keeping open fridge door for a minute, then its motor will remain operative for more than a half hour.

- **SAVE CLEAN WATER:** We should not waste clean water, because clean water has become less, experts see the water crisis in the future. We need more energy for the processing of clean water.

- **USE ELECTRIC OR HYBRID CAR:** Considering purchasing a hybrid or electric car, in place of gasoline car. Gasoline car covers 20 to 30 miles per gallon, whereas hybrid or eclectic gives 130 to 140 mg.

❖ **PLANT TREES AT HOME:** Placing at the front or back side of home, trees shading, can make home cold during summer. Since trees absorb carbon dioxide, so reduce the carbon dioxide in surroundings.

❖ **USE OF SOLAR ENERGY:** We should convert our heating system to the solar energy, in this way we can save electricity, money and your environment from global warming.

❖ **AVOID LIGHTING AT DAY TIMES:** The sun provides us light dawn to dusk; so we off light in the day time. Because this energy of light increases the temperature.

❖ **REDUCE WASTE:** Landfills are the major contributor of methane and other greenhouse gases. When the waste is brunt, it releases toxic gases in the atmosphere, which results in global warming. Reusing and recycling oil items can significantly reduce carbon footprints as it takes far less energy to recycle old items than to produce items from scratch.

❖ **BUY ENERGY EFFICIENT APPLIENCES:** Always buy products that are energy efficient as they can help to save a good amount of money on energy bill. Energy star certified products are more efficient that can help to save energy and reduce carbon footprints.

❖ **SAVE ENERGY:** When we consume less, less carbon dioxide is released into atmosphere. Setting thermostat using smartphone or changing the type of light bulb use is a great start.

❖ **CHECK TIRES OF VEHICLE:** Make sure that tires are properly inflated when we drive. If not, then vehicle might consume more fuel, which in

turn release more CO_2 in atmosphere. Keep engine properly tuned and drive less aggressively. Aggressive driving and frequent applying of brakes hamper the engine and can even lower the mileage of car.

❖ **BECOME PART OF GLOBAL WARMING COMMUNITY:** Connecting with others will help you become more conscious of the impact we all have. The Climate Change National Forum and Global Humanitarian Forum are great avenues to know the latest facts, statistics, and efforts in making a difference.

❖ **CELEBRATE EARTH DAY:** Although most of us hear about these days in passing, see what the buzz is all about. Plant a tree, pick up trash, or join a forum.

❖ **SPREAD AWARENESS:** Always try your best to educate people about global warming and its causes and after-effects. Tell them how they can contribute their part by saving energy that will be good for the environment. Gather opportunities and establish programs that will help you to share information with friends, relatives, and neighbours.

By being just a little more mindful, we all can play our part in combating global warming. These easy tips will help preserve the planet for future generations. Scientists won't have to defy the space-time continuum to keep life on planet earth from continuing.

CONCLUSION:

Because impacts of Global warming are already being observed in the world and because of the impacts will increase in severity even if greenhouse gas (GHG) emissions are reduced substantially in the near term, the world must improve its ability to adapt to impacts of climate change. Concerns about these impacts are generating increasing interest in adaption. A wide variety of potential actions that might be taken by individuals, sector, cities and states are being discussed-in some cases without sufficient information about the options that are available.

Impacts of climate change have the potential to affect all sectors of human and natural system, depending on the geographic region, as changes in climate conditions interact with other factors that shape vulnerability. The magnitude and rate of future impacts will be shaped significantly and global actions to limit emissions, as well as how the natural Earth system reacts to the resulting emissions trajectory. This means that the magnitude of risk from impacts of climate change involves a great deal of uncertainty. But the certainty of future impacts, and the high likelihood that some of the impacts have a potential to be disruptive to valued human and natural system, tells us that the adaptive responses are unavoidable. The fundamental question is whether we should, as a nation, act proactively to anticipate the impacts of climate change and mobilize to reduce their effects or simply prepare ourselves to react as the impacts arrive.

It is the judgement of this panel that anticipatory adaption to climate change is a highly desirable risk-management strategy for the world. Such a strategy offers potentials to reduce cost of current and future global warming impacts by realizing and supporting adaptation capacities across different levels of government, different sectors of economy, and different populations and environments, and by providing resources, coordination, and assistance in ensuring that a wide range of distributed actions are mutually supportive. Placed in a larger context of sustainable development, climate change adaption can contribute to a coherent and efficient national response to

climate change that encourages linkages and partnerships across boundaries between different types of institutions in our society.

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While doing the research on the project, I observed some details as; Global Warming has an adverse impact on our environment and also on the human beings. To protect our Earth we need to very conscious about our activities.

I am very grateful to our teachers and also the stuff members who take an effort to keep our college campus clean and encourage the students for doing the same.

Last but not least, I would like to express thank to my parents and friends who helped me to do this project within the time frame.

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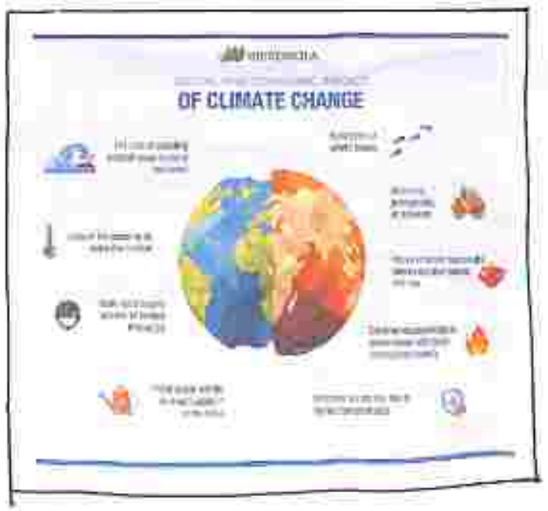
PROJECT ON

GLOBAL WARMING & CLIMATE CHANGE



-: Content :-

Certificate :-

I do hereby certified that this project titled "Global Warming and Climate Change" is done by "Anushree Bera" of "Gokhale Memorial Girls' College" is an original work and have been submitted under by supervision and guidance.

Acknowledgement and believe, this project work is completed from every aspect, which can help the study in verious ways.

Samanta

Teacher's signature

Date : 25/05/2022

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No creation in this world is a solo effort. Neither this project. It would not have been possible without the kind support and help of many individuals and organisations. I take this opportunity to express my gratitude to all of them.

I would like to thank my ENVS teacher Sri Santanu Samanta, whose valuable guidance have been the ones that helped me patch this project and make it full proof success. His suggestion and instructions have served as the major contributor towards the completion of the project.

My sincere thanks to my friends and tutor who have been instrumental in this successful completion of the project.

24/5/22
Date

Anushree Bera.
Signature of student

Introduction

This continuous rise in temparature of the planet is really upsetting. The root cause for this is global warming. Global Warming begins when sunlight reaches the earth. The clouds, atmospheric particles, reflective ground surfaces and surface of oceans then send back about 30% of sunlight back into space, whilst the remaining is absorbed by oceans, air, and land. This consequently heats up the surface of the oceans planet and atmosphere, making life feasible. As the earth warms up the solar energy is readiated by thermal radiation and infrared rays, propagating directly out to space thereby cooling the earth. However some of the outgoing radiation is re-absorbed by carbon-bioxide, water vapours, ozone, methane and other gases in the atmosphere and it radiated back to surface of Earth. This gases are commonly known as greenhouse gases due to their heat-traping capacity. The delemma began when the concentration of greenhouse gases in the atmosphere was artificially increased by humankind at an alarming rate since the past two centuries. Recent

observing regarding global warming have sustantiated the theory that is indeed a human enhanced greenhouse effects that is causing the planet to heat up. Millions of pounds of methane gas are generated in landstills and agriculture decomposition of biomass and animal manure. Nitrous Oxide is realsed into the atmosphere by nerious nitrogen based fertilizer. Once realeased, these greenhouse gases stays in the atmosphere for decades or even longar. According to Intergovernmental Panel of Climate change (IPCC), carbon dioxide and methane levels has increased by 35% and 148% since the industrial revolution of 1750.

Greenhouse Effect :-

While other planets in the solar system of the Earth enjoys either roasting hot or bitterly cold, Earth's surface has relatively mind, steady temparatures. Earth enjoys its temparature because of its atmosphere, which is thin layer of gases that cover and protact the planet. However, 97% of climate scientists and researchers agree that humans are changed the earth's atmosphere in dramatic way over the past two centuries, resulting global warming. To understand global warming, it is first neccessary to become familior with the greenhouse effect. The natural greenhouse effect normally traps some portion of heat in such a way that our planet is safe from reaching freezing temparatures while human enhanced greenhouse effect leads to global warming. This is due to burning of fossil fuels which increase the amount of greenhouse gases present in the atmosphere.

The trade of incoming and outgoing radiation that heats up the Earth is often refered to as the greenhouse effect because a green house works in a similarly way. Incoming

ultraviolate radiation easily passes through the glass walls of a greenhouse and is absorbed by the plants and hard surfaces inside. Weaker infrared radiation, however, has difficulty passing through the glass walls and is trapped inside, therefore, warming the greenhouse. This effects lets tropical plants inside a green house, even during the cold season.

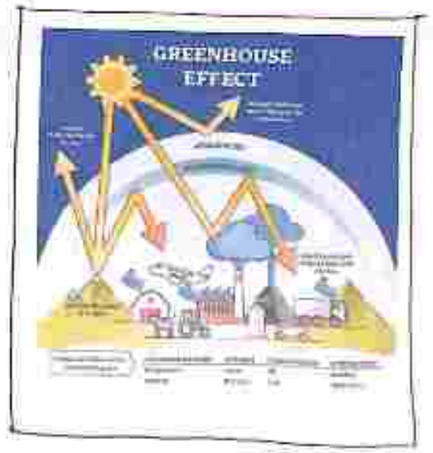
Carbon dioxide and other greenhouse gases act like mantle, absorbing infrared radiation and preventing it from escapting into the outer space. The net effect is the regular heating of the earth's atmosphere and surface.

The greenhouse effect, combined with increasing level of greenhouse gases and then resulting global warming, is expected to have philosophical implications. If global warming continues unrestrained and nothing effective is done to limit this evil, it will cause significant climate change, a rise in sea levels, extreeme weather events and other ruthless natural, environmental and social impacts.

Cause of Global Warming :-

The major cause of global warming is the greenhouse gases. They include — Carbon dioxide, methane, nitrous oxide and in some cases chlorine and bromine containing compounds. The build up of these gases in the atmosphere changes the radiative equilibrium in the atmosphere. Their overall effect is to warm the earth's surface and the lower atmosphere becauses greenhouse gases absorb some of the outgoing radiation of Earth and re-radiated it back towards the surface.

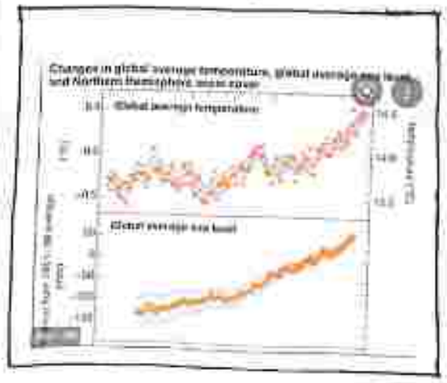
The net warming from 1850 to the end of the 20th century was equivalent to nearly 2.5 W/m^2 with carbon dioxide contribution



about 60% to this figure, methane about 25%, with nitrous oxide and halocarbons providing the remainder. In 1985, Joe Farman, of the Brithish Antractic Survey, published an articles showing the decrease in Ozone levels over antartica during the early 80s. The response was striking : large scale international sceentific programmes were mounted to prove that CFC's were the cause of the problem. Even more important was abrupt international action to curb the emissions of CFCs. The second mejor cause of global warming is the depletion of ozone layer. This happens mainly due to the presence of chlorine containing source gases. Many industrial Process produce a wide diversity of aerosols depending on what is being burned or generated in the manufacturing process. Moreover, exhaust emissions of verious transports produce a rich mixture of pollution that are either aerosols from the outset or are transformed by chemical reactions in the atmosphere to from aerosols.

The Effect of Climate Change

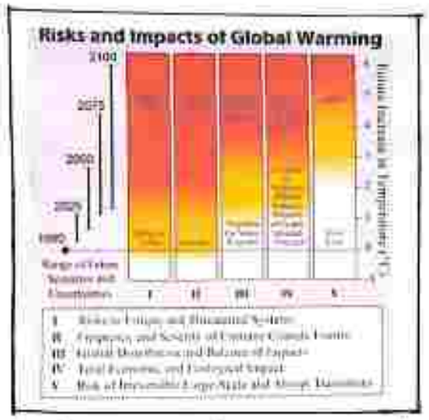
Predicting the consequences of global warming is one of the most difficult task faced by the climate researcher. This is due to the effect that natural process that causes rain, snowfall, hailstroms rise in sea levels is reliant on many diverse factors. Moreover, it is very hard to predict the size of emission of greenhouse gases in the future years as this is determined majorly through technological advancements and political decisions.



Global Warming produced many negative effect some of which are described here.

Firstly, water vapour which is present the atmosphere falls again as rain which leads to floods in verious regions of the world. The warmer climate will likely cause more heat waves, Rising the sea level is the most deadly effect of global warming. The rise in temparature is causing the ice to melt rapidly.

Elaborates the risk and impact of global warming in years to come. As can be inferred from figure, we are currently experiencing severity of extreme climate events in the form of thunderstorms, floods and earthquaks. This destruction will take a sharp hike if nothing is doen to stop the menace. Depicts global means temparature in the recent years according to NASA.



Temparatures anomalies are projected to increase in coming years. After 20th century, the situation started to worsen. This was all due to increase in global warming majorly due to the fact that new industries and power houses started operation and emitted harmful gases which cause the planet to heat up.

Effect on Living Beings :-

Global Warming can severely effect the health of living beings. Excess heat can cause stress which may lead to blood pressure and heart diseases. Crop failures and famines, which are direct consequnce of heating up of earth, can cause a decline in human body resistance to viruses and infections. Global warming may also transfers verious diseases to other regions as people will shift from regions of higher temparature to regions of comparetively lower temparatures. Warmer oceans and other surface water may lead to severe cholera outbreak and harmful infections in some type of sea food.

Climate Change : Acid Rain

Acid rain means the presence of excessive acids in rain water. The sulphur and nitrogen of coal or petroleum when they are burnt in the presence of oxygen are converted into SO_2 and NO_2 respectively. During rain these oxides react with water vapour to form sulphuric acid and nitric acid respectively. This acids when get precipitated as rain or show create acid rain.

The common pollutants sulphur dioxide and nitrogen oxide are changed in the atmosphere into sulphuric and nitric acid respectively by reacting with oxygen and water.

$$2SO_2 + O_2 \longrightarrow 2SO_3 \,,\; SO_3 + H_2O \longrightarrow H_2SO_4$$

$$2NO + [O] \longrightarrow N_2O_5 \,,\; N_2O_5 + H_2O \rightarrow 2HNO_3$$

Acid rain tends to increase acidity in the soil, threatens human and aquatic life, destroys forest and crops reducing agriculture productivity.

Acid rain also corrode buildings, monuments, bridges, fences etc.

It create serious threat to human health also. It can play havoc with the human nervous system. This happens because highly toxic compounds of rain contaminate the potable water and enter our body.

Acid rain has eliminated fishes in hundreds and thousands at lakes of various countries like USA, Canada etc.

In coming days the developing countries like India will soon have to cope up with the problem of acid rain. It is repoted that the pH value of rain at industrial areas of Delhi, Nagpur, Kolkata is below or close to the critical value.

Solution :-

As elaborated earlier, toxic emmissions are a major cause of global warming. A likely solution to reduce harmful emmissions is to cut the usage of vehicles which produced them. Some people have started to use bycycle and public transport, whereas some other prefer to work. People should share the ride with friend to reduce the total number of vehicles on the road. Print and Social media can play an effective role in curbing the problem. They are very useful way to demonstrate that global warming is not good for the planet. Reeycling is also a good way to reduce global warming. People should use reseachergeble batteries instead of disposable one. Quality product should be bought that have a long life. Forest degradation and deforestation must be discouraged at government level. Nuclear power is also a possible solution as this power results in fewer emissions but this method should be used with care as it can lead to serne accidents therefore, the major hurdle is to overcome the security, propagration waste disposable and high cost of nuclearpower.

Conclusion :-

The scientific and environmental community is on the same page regarding the bitter reality on global warming and the involvement of human factor in it. The paper discussed here has only deted the surface of what is a very intricate line of scientific and engineering exploration. Global warming is a big hazard and appropriate measures must be taken to tackle this serious problem. This problem is not causing trable to human beings but also to nature environment and plants. Meting the polar ice caps will lead to floods which can cause maythem everywhere. Rise of sea levels will divastate agriculture and fishing activities. To embark upon this

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problems, some remedial steps must be timely taken which include but are not limited to use the of renewable sources of energy and stopping deforestation. Innovative solutions must be brought forward to end this hazard once and forever.

Samanta
25/05/2022

DATE

EXPT. NO.

PAGE

NATURAL RESOURCES

— Land resources, Water resources, Soil resources, Forest resources, Energy resources.

ENVS PROJECT (AECC2)

Presented by :-
ANKINI DAS
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ECONOMICS DEPARTMENT (HONS)
CU Roll No : 213013-11-0068
CU Registration No : 013-1211-0212-21
College Roll No : 21/BSCH/0200

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PAGE NO.

ACKNOWLEDGEMENT

I would really like to thank the Principal of the college 'Dr. Atashi Karpha' to provide us with the opportunity to have this wonderful project on the subject. Next I would like to thank my professor 'Mr. Santanu Samanta' to help us with the the subject and to topic of the project.

I would also like to thank some of my fellow mates, namely 'Rupsa' to help me make up my mind about the topic and 'Swastieka' to supply me with all the necessary sources of information. I would also thank my parents for their immense support.

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OVERVIEW

"Natural resources can be defined as the resources that exist (on the planet) independent of human actions"

These are the resources that are found in the environment and are developed without the intervention of humans. Common examples of natural resources include air, sunlight, water, soil, stone, plants, animals and fossil fuels.

the natural resources are naturally occurring material that are useful to man or could be useful under conceivable technological, economic or social circumstances or supplies drawn from the earth supplies such as food, building and clothing materials, fertilizers, metals, water and geothermal power. For a long time, natural resources were the domain of the natural sciences.

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INTRODUCTION

Our environment provides us with a variety of goods and services necessary for our day to day lives. These natural resources include, air, water, soil, minerals, along with the climate and solar energy, which from the non-living or 'abiotic' part of nature. The biotic or living parts of nature consists of plants and animals, including microbes. Plants and animals can only survive as communities of different organisms, all closely linked to each in their own habitat, and requiring specific abiotic conditions. Thus, forests, grasslands, deserts, mountains, rivers, lakes and the marine environment all form habitats for specialised communities of plants and animals to live in. Interactions between the abiotic aspects of nature and specific living organisms together form ecosystems of various types. Many of these living organisms are used as

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our food resources. Others are linked to our food less directly, such as pollinators and dispersers of plants, soil animals like worms, which recycle nutrients for plant growth, and fungi and termites that break up dead plant material so that micro-organisms can act on the detritus to reform soil nutrients.

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CONCEPT OF RENEWABLE AND NON: RENEWABLE ENERGY

Renewable:

Renewable resources are the one that are consistently available regardless of their use. They can be fairly recovered or replaced after utilization. Examples include vegetation, water, and air. Animals can also be categorized as renewable resources because they can be reared and bred to reproduce offspring to substitute the older animals.

As much as these resources are renewable, it may take tens to hundreds of years to replace them. the renewable raw materials that come from living things namely animals and trees are termed as organic renewable resources while those that come from non-living things such as sun, water and wind are termed as inorganic

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renewable resources.

Non - Renewable.

Non - renewable resources are the ones that cannot simply be substituted or recovered once they have been utilized or destroyed. Examples of such natural resources include fossils fuels and minerals. Minerals are categorized as non - renewable because, even though they take shape naturally through the rock cycle, their formation period take thousands of years. Some animals mostly the endangered species are similarly regarded as non renewable because they are at the verge of extinction.

It brings about the many reasons the endangered species have to be protected by all means. The non - renewable materials that come from living things such as fossil fuels are known as organic non - renewable resources while those that come from non - living things such as rocks and soil are referred to as inorganic non renewable resources.

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Problems Related

1. Fossil fuel:
   - Global warming
   - Acid rain
   - Danger posed by leaded fuels, Oil spills
   - Water pollution caused by poorly managed coal mines
   - Air pollution.

2. Alternative energy resources.
   - The initial cost of establishment of alternate energy generation is costlier than conventional resources.
   - Maintenance of these structures is difficult.
   - It requires more space.
   - Energy supply is unpredictable during natural calamities.

Samanta
25/05/2022

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ENVS PROJECT

TOPIC : POLLUTION

NAME : SHINJINI SARKAR

CLASS : SEMESTER 2

DEPARTMENT : ECONOMICS

SUBJECT : B.Sc. (Honours) Economics

COLLEGE ROLL NO. : 21/BSCH/0199

REGISTRATION NO. : 013-1211-0213-21

NAME OF COLLEGE : GOKHALE MEMORIAL GIRLS' COLLEGE

ACKNOWLEDGEMENT

I, Shinjini Sarkar, student of Semester 2 Economics, Gokhale Memorial Girls' College would like to express my gratitude to my ENVS Professor at College without whose guidance and help I would not have been able to undertake and complete this project.

CONTENT

Pollution

Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of any substance (solid, liquid, or gas) or energy (such as radioactivity, heat, sound, or light). Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Although environmental pollution can be caused by natural events, the word pollution generally implies that the contaminants have an anthropogenic source – that is, a source created by human activities. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9 million people worldwide.

Major forms of pollution include air pollution, light pollution, litter, noise pollution, plastic pollution, soil contamination, radioactive contamination, thermal pollution, visual pollution, and water pollution.

The major forms of pollution are listed below along with the particular contaminants relevant to each of them:

- Air pollution: the release of chemicals and particulates into the atmosphere. Common gaseous pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides produced by industry and motor vehicles. Photochemical ozone and smog are created as nitrogen oxides and hydrocarbons react to sunlight. Particulate matter, or fine dust is characterized by their micrometre size PM_{10} to $PM_{2.5}$.
- Electromagnetic pollution: the overabundance of electromagnetic radiation in their non-ionizing form, such as radio and television transmissions, Wi-fi etc. Although there is no demonstrable effect on humans there can be interference with radio-astronomy and effects on safety systems of aircraft and cars.
- Light pollution: includes light trespass, over-illumination and astronomical interference.
- Littering: the criminal throwing of inappropriate man-made objects, unremoved, onto public and private properties.
- Noise pollution: which encompasses roadway noise, aircraft noise, industrial noise as well as high-intensity sonar.

- Plastic pollution: involves the accumulation of plastic products and microplastics in the environment that adversely affects wildlife, wildlife habitat, or humans.
- Soil contamination occurs when chemicals are released by spill or underground leakage. Among the most significant soil contaminants are hydrocarbons, heavy metals, MTBE, herbicides, pesticides and chlorinated hydrocarbons.
- Radioactive contamination, resulting from 20th century activities in atomic physics, such as nuclear power generation and nuclear weapons research, manufacture and deployment.
- Thermal pollution, is a temperature change in natural water bodies caused by human influence, such as use of water as coolant in a power plant.
- Visual pollution, which can refer to the presence of overhead power lines, motorway billboards, scarred landforms (as from strip mining), open storage of trash, municipal solid waste or space debris.
- Water pollution, by the discharge of industrial wastewater from commercial and industrial waste (intentionally or through spills) into surface waters; discharges of untreated sewage, and chemical contaminants, such as chlorine, from treated sewage; release of waste and contaminants into surface runoff flowing to surface waters (including urban runoff and agricultural runoff, which may contain chemical fertilizers and pesticides; also including human feces from open defecation – still a major problem in many developing countries); groundwater pollution from waste disposal and leaching into the ground, including from pit latrines and septic tanks; eutrophication and littering.

Pollutants

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

Sources and Causes

Natural pollution

One of the most significant natural sources of pollution are volcanoes, which during eruptions release large quantities of harmful gases into the atmosphere. Volcanic gases include carbon dioxide, which can be fatal in large concentrations and contributes to climate change, hydrogen

halides which can cause acid rain, sulfur dioxides, which are harmful to animals and damage the ozone layer, and hydrogen sulfides, which are capable of killing humans at concentrations of less than 1 part per thousand. Volcanic emissions also include fine and ultrafine particles which may contain toxic chemicals and substances such as arsenic, lead, and mercury.

Wildfires, which can be caused naturally by lightning strikes, are also a significant source of air pollution. Wildfire smoke contains significant quantities of both carbon dioxide and carbon monoxide, which can cause suffocation. Large quantities of fine particulates are found within wildfire smoke as well, which pose a health risk to animals.

Human-generated pollution

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

About 400 million metric tons of hazardous wastes are generated each year. The United States alone produces about 250 million metric tons. Americans constitute less than 5% of the world's population, but produce roughly 25% of the world's CO_2, and generate approximately 30% of world's waste. In 2007, China overtook the United States as the world's biggest producer of CO_2, while still far behind based on per capita pollution (ranked 78th among the world's nations). Some of the more common soil contaminants are chlorinated hydrocarbons (CFH), heavy metals (such as chromium, cadmium – found in rechargeable batteries, and lead – found in lead paint, aviation fuel and still in some countries, gasoline), MTBE, zinc, arsenic and benzene. In 2001 a series of press reports culminating in a book called *Fateful Harvest* unveiled a widespread practice of recycling industrial byproducts into fertilizer, resulting in the contamination of the soil with various metals. Ordinary municipal landfills are the source of many chemical substances entering the soil environment (and often groundwater), emanating

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from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have been subject to little control in the U.S. or EU. There have also been some unusual releases of polychlorinated dibenzodioxins, commonly called *dioxins* for simplicity, such as TCDD.

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

Greenhouse gases emissions

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

In February 2007, a report by the Intergovernmental Panel on Climate Change (IPCC), representing the work of 2,500 scientists, economists, and policymakers from more than 120 countries, confirmed that humans have been the primary cause of global warming since 1950. Humans have ways to cut greenhouse gas emissions and avoid the consequences of global warming, a major climate report concluded. But to change the climate, the transition from fossil fuels like coal and oil needs to occur within decades, according to the final report this year from the UN's Intergovernmental Panel on Climate Change (IPCC).

Types of Pollution

Air Pollution

Air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or cause damage to the climate or to materials. There are many different types of air pollutants, such as gases (including ammonia, carbon monoxide, sulfur dioxide, nitrous oxides, methane, carbon dioxide and chlorofluorocarbons), particulates (both organic and inorganic), and biological molecules. Air pollution can cause diseases, allergies, and even death to humans; it can also cause harm to other living organisms such as animals and food crops, and may damage the natural environment (for example, climate change, ozone depletion or habitat degradation) or built environment (for example, acid rain). Both human activity and natural processes can generate air pollution.

Sources of Air Pollution

Anthropogenic (human-made) sources

These are mostly related to the burning of fuel.

- Stationary sources include:
  - smoke stacks of fossil fuels and biomass power stations
  - burning of traditional biomass such as wood, crop waste and dung.
  - waste incineration (incinerators as well as open and uncontrolled fires of mismanaged waste, making up about a fourth of municipal solid terrestrial waste)
  - furnaces and other types of fuel-burning heating devices
- Mobile sources include motor vehicles, trains (particularly diesel locomotives and DMUs), marine vessels and aircraft.
- Controlled burn practices in agriculture and forest management. Controlled or prescribed burning is a technique sometimes used in forest management, farming, prairie restoration or greenhouse gas abatement. Fire is a natural part of both forest and grassland ecology and

controlled fire can be a tool for foresters. Controlled burning stimulates the germination of some desirable forest trees, thus renewing the forest.

There are also sources from processes other than combustion:

- Waste deposition in landfills, which generate methane. Methane is highly flammable and may form explosive mixtures with air. Methane is also an asphyxiant and may displace oxygen in an enclosed space. Asphyxia or suffocation may result if the oxygen concentration is reduced to below 19.5% by displacement.
- Military resources, such as nuclear weapons, toxic gases, germ warfare and rocketry.
  - Agricultural emissions contribute substantially to air pollution
  - Fertilized farmland may be a major source of nitrogen oxides

Natural sources

- Dust from natural sources, usually large areas of land with little vegetation or no vegetation
- Methane, emitted by the digestion of food by animals, for example cattle
- Radon gas from radioactive decay within the Earth's crust. Radon is a colorless, odorless, naturally occurring, radioactive noble gas that is formed from the decay of radium. It is considered to be a health hazard. Radon gas from natural sources can accumulate in buildings, especially in confined areas such as the basement and it is the second most frequent cause of lung cancer, after cigarette smoking.
- Smoke and carbon monoxide from wildfires. During periods of active wildfires, smoke from uncontrolled biomass combustion can make up almost 75% of all air pollution by concentration.
- Vegetation, in some regions, emits environmentally significant amounts of volatile organic compounds (VOCs) on warmer days. These VOCs react with primary anthropogenic pollutants – specifically, NO_x, SO_2, and anthropogenic organic carbon compounds – to produce a seasonal haze of secondary pollutants. Black gum, poplar, oak and willow are some examples of vegetation that can produce abundant VOCs. The VOC production from these species result in ozone levels up to eight times higher than the low-impact tree species.
- Volcanic activity, which produces sulfur, chlorine, and ash particulate

Water Pollution

Water pollution (or **aquatic pollution**) is the contamination of water bodies, usually as a result of human activities, so that it negatively affects its uses. Water bodies include lakes, rivers, oceans, aquifers, reservoirs and groundwater. Water pollution results when contaminants are introduced into these water bodies. Water pollution can be attributed to one of four sources: sewage discharges, industrial activities, agricultural activities, and urban runoff including stormwater. It can be grouped into surface water pollution (either fresh water pollution or marine pollution) or groundwater pollution. For example, releasing inadequately treated wastewater into natural waters can lead to degradation of these aquatic ecosystems. Water pollution can also lead to water-borne diseases for people using polluted water for drinking, bathing, washing or irrigation. Water pollution reduces the ability of the body of water to provide the ecosystem services (such as drinking water) that it would otherwise provide.

Sources of water pollution are either point sources or non-point sources. Point sources have one identifiable cause, such as a storm drain, a wastewater treatment plant or an oil spill. Non-point sources are more diffuse, such as agricultural runoff. Pollution is the result of the cumulative effect over time. Pollution may take the form of toxic substances (e.g., oil, metals, plastics, pesticides, persistent organic pollutants, industrial waste products), stressful conditions (e.g., changes of pH, hypoxia or anoxia, increased temperatures, excessive turbidity, unpleasant taste or odor, and changes of salinity), or pathogenic organisms. Contaminants may include organic and inorganic substances. Heat can also be a pollutant, and this is called thermal pollution. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers.

Control of water pollution requires appropriate infrastructure and management plans as well as legislation. Technology solutions can include improving sanitation, sewage treatment, industrial wastewater treatment, agricultural wastewater treatment, erosion control, sediment control and control of urban runoff (including stormwater management). Effective control of urban runoff includes reducing speed and quantity of flow.

Sources of Water Pollution

Pollution from Point Sources

Point source water pollution refers to contaminants that enter a waterway from a single, identifiable source, such as a pipe or ditch. Examples of sources in this category include discharges from a sewage treatment plant, a factory, or a city storm drain.

The U.S. Clean Water Act (CWA) defines point source for regulatory enforcement purposes The CWA definition of point source was amended in 1987 to include municipal storm sewer systems, as well as industrial storm water, such as from construction sites.

Sewage

Sewage typically consists of 99.9% water and 0.1% solids. Sewage contributes many classes of nutrients that lead to eutrophication. It is a major source of phosphate for example. Sewage is often contaminated with diverse compounds found in personal hygiene, cosmetics, pharmaceutical drugs and their metabolites. Water pollution due to environmental persistent pharmaceutical pollutants can have wide-ranging consequences. When sewers overflow during storm events this can lead to water pollution from untreated sewage. Such events are called sanitary sewer overflows or combined sewer overflows.

Industrial wastewater

Perfluorooctanesulfonic acid (PFOS) is a global pollutant that has been found in drinking water. It appears not to biodegrade.

Industrial processes that use water also produce wastewater. This is called industrial wastewater. Using the US as an example, the main industrial consumers of water (using over 60% of the total consumption) are power plants, petroleum refineries, iron and steel mills, pulp and paper mills, and food processing industries. Some industries discharge chemical wastes, including solvents and heavy metals (which are toxic) and other harmful pollutants.

Industrial wastewater could add the following pollutants to receiving water bodies if the wastewater is not treated and managed properly:

- Heavy metals, including mercury, lead, and chromium

- Organic matter and nutrients such as food waste: Certain industries (e.g. food processing, slaughterhouse waste, paper fibers, plant material, etc.) discharge high concentrations of biochemical oxygen demand (BOD), ammonia nitrogen and oil and grease.
- Inorganic particles such as sand, grit, metal particles, rubber residues from tires, ceramics, etc.;
- Toxins such as pesticides, poisons, herbicides, etc.
- Pharmaceuticals, endocrine disrupting compounds, hormones, perfluorinated compounds, siloxanes, drugs of abuse and other hazardous substances
- Microplastics such as polyethylene and polypropylene beads, polyester and polyamide
- Thermal pollution from power stations and industrial manufacturers
- Radionuclides from uranium mining, processing nuclear fuel, operating nuclear reactors, or disposal of radioactive waste.
- Some industrial discharges include persistent organic pollutants such as per- and polyfluoroalkyl substances (PFAS).

Oil spills

An oil spill is the release of a liquid petroleum hydrocarbon into the environment, especially the marine ecosystem, due to human activity, and is a form of pollution. The term is usually given to marine oil spills, where oil is released into the ocean or coastal waters, but spills may also occur on land. Oil spills may be due to releases of crude oil from tankers, offshore platforms, drilling rigs and wells, as well as spills of refined petroleum products (such as gasoline, diesel) and their by-products, heavier fuels used by large ships such as bunker fuel, or the spill of any oily refuse or waste oil.

Pollution from Non-Point Sources

Nonpoint source (NPS) pollution refers to diffuse contamination (or pollution) of water or air that does not originate from a single discrete source. This type of pollution is often the cumulative effect of small amounts of contaminants gathered from a large area. It is in contrast to point source pollution which results from a single source. Nonpoint source pollution generally results from land runoff, precipitation, atmospheric deposition, drainage, seepage, or

hydrological modification (rainfall and snowmelt) where tracing pollution back to a single source is difficult. Nonpoint source water pollution affects a water body from sources such as polluted runoff from agricultural areas draining into a river, or wind-borne debris blowing out to sea. Nonpoint source air pollution affects air quality, from sources such as smokestacks or car tailpipes. Although these pollutants have originated from a point source, the long-range transport ability and multiple sources of the pollutant make it a nonpoint source of pollution; if the discharges were to occur to a body of water or into the atmosphere at a single location, the pollution would be single-point.

Agriculture

Agriculture is a major contributor to water pollution from nonpoint sources. The use of fertilizers as well as surface runoff from farm fields, pastures and feedlots leads to nutrient pollution. In addition to plant-focused agriculture, fish-farming is also a source of pollution. Additionally, agricultural runoff often contains high levels of pesticides.

Soil Pollution

Soil pollution is defined as the presence of toxic chemicals (pollutants or contaminants) in soil, in high enough concentrations to pose a risk to human health and/or the ecosystem.

The root cause of soil pollution is often one of the following:

- Agriculture (excessive/improper use of pesticides)
- Excessive industrial activity
- Poor management or inefficient disposal of waste

The challenges faced in soil remediation (decontamination of soil) are closely related to the extent of soil pollution. The greater the contamination, the greater the requirement for resources for remediation.

Sources of Soil Pollution

Heavy Metals

The presence of heavy metals (such as lead and mercury, in abnormally high concentrations) in soils can cause it to become highly toxic to human beings. Some metals that can be classified as soil pollutants are tabulated below.

These metals can originate from several sources such as mining activities, agricultural activities, and electronic waste (e-waste), and medical waste.

Polycyclic Aromatic Hydrocarbons

Polycyclic aromatic hydrocarbons (often abbreviated to PAHs) are organic compounds that

1. Contain only carbon and hydrogen atoms.
2. Contain more than one aromatic ring in their chemical structures.

Common examples of PAHs include naphthalene, anthracene, and phenalene. Exposure to polycyclic aromatic hydrocarbons has been linked to several forms of cancer. These organic compounds can also cause cardiovascular diseases in humans.

Soil pollution due to PAHs can be sourced to coke (coal) processing, vehicle emissions, cigarette smoke, and the extraction of shale oil.

Industrial Waste

The discharge of industrial waste into soils can result in soil pollution. Some common soil pollutants that can be sourced from industrial waste are listed below.

- Chlorinated industrial solvents
- Dioxins are produced from the manufacture of pesticides and the incineration of waste.
- Plasticizers/dispersants
- Polychlorinated biphenyls (PCBs)

The petroleum industry creates many petroleum hydrocarbon waste products. Some of these wastes, such as benzene and methylbenzene, are known to be carcinogenic in nature.

Pesticides

Pesticides are substances (or mixtures of substances) that are used to kill or inhibit the growth of pests. Common types of pesticides used in agriculture include

- Herbicides – used to kill/control weeds and other unwanted plants.

- Insecticides – used to kill insects.
- Fungicides – used to kill parasitic fungi or inhibit their growth.

Some important soil contaminants found in pesticides are listed below:

Herbicides

- Triazines
- Carbamates
- Amides
- Phenoxyalkyl acids
- Aliphatic acids

Insecticides

- Organophosphates
- Chlorinated hydrocarbons
- Arsenic-containing compounds
- Pyrethrum

Fungicides

- Mercury-containing compounds
- Thiocarbamates
- Copper sulfate

Effects of Pollution

Human health

Diverse air quality can kill many organisms, including humans. Ozone pollution can cause respiratory disease, cardiovascular disease, throat inflammation, chest pain, and congestion. Water pollution causes approximately 14,000 deaths per day, mostly due to contamination of drinking water by untreated sewage in developing countries. An estimated 500 million Indians have no access to a proper toilet, Over ten million people in India fell ill with waterborne illnesses in 2013, and 1,535 people died, most of them children. Nearly 500 million Chinese lack access to safe drinking water. A 2010 analysis estimated that 1.2 million people died prematurely each year in China because of air pollution. The high smog levels China has

been facing for a long time can do damage to humans' bodies and cause different diseases. The WHO estimated in 2007 that air pollution causes half a million deaths per year in India. Studies have estimated that the number of people killed annually in the United States could be over 50,000. Oil spills can cause skin irritations and rashes. Noise pollution induces hearing loss, high blood pressure, stress, and sleep disturbance. Mercury has been linked to developmental deficits in children and neurologic symptoms. Older people are majorly exposed to diseases induced by air pollution. Those with heart or lung disorders are at additional risk. Children and infants are also at serious risk. Lead and other heavy metals have been shown to cause neurological problems. Chemical and radioactive substances can cause cancer and as well as birth defects.

Environment

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

- Biomagnification describes situations where toxins (such as heavy metals) may pass through trophic levels, becoming exponentially more concentrated in the process.
- Carbon dioxide emissions cause ocean acidification, the ongoing decrease in the pH of the Earth's oceans as CO_2 becomes dissolved.
- The emission of greenhouse gases leads to global warming which affects ecosystems in many ways.
- Smog and haze can reduce the amount of sunlight received by plants to carry out photosynthesis and leads to the production of tropospheric ozone which damages plants.
- Soil can become infertile and unsuitable for plants. This will affect other organisms in the food web.
- Sulfur dioxide and nitrogen oxides can cause acid rain which lowers the pH value of soil.
- Organic pollution of watercourses can deplete oxygen levels and reduce species diversity.

Regulation and Monitoring

To protect the environment from the adverse effects of pollution, many nations worldwide have enacted legislation to regulate various types of pollution as well as to mitigate the adverse effects of pollution.

Pollution Control

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

Practices

- Recycling
- Reusing
- Waste minimisation
- Mitigating
- Pollution prevention
- Compost

Pollution control devices

- Air pollution control
  - Thermal oxidizer
- Dust collection systems
  - Baghouses
  - Cyclones
  - Electrostatic precipitators
- Scrubbers
  - Baffle spray scrubber
  - Cyclonic spray scrubber
  - Ejector venturi scrubber
  - Mechanically aided scrubber
  - Spray tower
  - Wet scrubber
- Sewage treatment
  - Sedimentation
  - Activated sludge biotreaters
  - Aerated lagoons
  - Constructed wetlands

- Industrial wastewater treatment
  - API oil-water separators
  - Biofilters
  - Dissolved air flotation (DAF)
  - Powdered activated carbon treatment
  - Ultrafiltration
- Vapor recovery systems
- Phytoremediation

Conclusion and Way Forward

All type of pollution has their kind of negative impact on our environment. The lives of humans and animals get impacted due to this. It is our responsibility to take various initiatives to protect nature. It is therefore essential that our population and economic growth are environmentally sustainable. Environmental laws play a huge part in protecting humans, animals, resources, and habitats. Environmental laws work to protect land, air, water, and soil. Public awareness and knowledge of environmental protection are also very crucial to avoid environmental pollutions. We need to fight against pollution to take steps towards a better tomorrow.

Samanta
25/05/2022

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I, Saini Chakraborty, a student of 1st year Economics (Honours) department having Environmental Science as an Ability Enhancement Compulsory Course-2 (AECC-2) of Gokhale Memorial Girls' College would like to express my special thanks of gratitude to our principal ma'am Dr. Arashi Karpha as well as our AECC-2 Prof. Santanu Samanta who gave me the golden opportunity to do this wonderful project on the topic 'BIODIVERSITY'.

Last but not the least, I would like to thank my parents and friends who helped me with the contents of the project and in finalizing this project within the limited time-frame.

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INTRODUCTION

Biodiversity is the biological variety and variability of life on Earth. Biodiversity is a measure of variation at the genetic, species and ecosystem level. Terrestrial biodiversity is usually greater near the equator which is the result of the warm climate and high primary productivity. Biodiversity is not distributed evenly on Earth and is richer in the tropics. These tropical forest ecosystems cover less than 10% of earth's surface and contain about 90% of the world's species. Marine biodiversity is usually higher along coasts in the Western Pacific, where sea surface temperature is highest, and in the mid-latitudinal band in all oceans. There are latitudinal gradients in species diversity. Biodiversity generally tends to cluster in hotspots and has been increasing through time but will be likely to slow in the future as a primary result of deforestation. It encompasses the evolutionary, ecological and cultural processes that sustain life.

Rapid environmental changes typically cause mass extinctions. More than 99.9% of all species that ever lived on Earth, amounting to over 5 billion species are estimated to be extinct. According to a 2019 Global Assessment Report on Biodiversity and Ecosystem Services by IPBES 25% of plant and animal species are threatened with extinction as the result of human activity.

An October 2020 IPBES report found the same human actions which drive biodiversity loss have also resulted in an increase in pandemics

On 2020, the 5th edition of the UN's Global Biodiversity Outlook report, which serves as a "final report card" for the Aichi Biodiversity Targets stated that none of the targets — which concern the safeguarding of ecosystems and the promotion of sustainability — have been fully met.

Estimates on the number of Earth's current species range from 10million to 14 million of which about 1-2 million have been documented and over 86% have not yet been described.

The October 2020 "Era of Pandemics" report by IPBES asserted that the human activities which are the underlying drivers of climate change and biodiversity loss are also the same drivers of pandemics, including the COVID-19 pandemic.

DEFINITIONS

Biologists most often define biodiversity as the "totality of genes, species and ecosystems of a region." An advantage of this definition is that it seems to describe most circumstances and presents a unified view of the traditional types of biological variety previously identified:

i) Taxonomic diversity (usually measured at the species diversity level)

ii) Ecological diversity (often viewed from the perspective of ecosystem diversity).

iii) Morphological diversity (which stems from genetic diversity and molecular diversity)

iv) Functional diversity (which is a measure of the number of functionally disparate species within a population. [e.g., different feeding mechanism, different motility, predator vs prey, etc.]).

DISTRIBUTION

Biodiversity is not evenly distributed, rather it varies greatly across the globe as well as within regions. Among other factors, the diversity of all living things (biota) depends on temperature, precipitation, altitude, soils, geography and the presence of other species.

Diversity consistently measures higher in the tropics and in other localized regions such as the Cape Floristic Region and lower in polar regions generally. Rain forests that have had wet climates for a long time such as Yasuni National Park in Ecuador have particularly high biodiversity.

Terrestrial biodiversity is thought to be up to 25 times greater than ocean biodiversity. The conservation of the world's biodiversity is thus utterly dependent on the way in which we interact with and use the world's forests. Forests provide habitants for 80% of amphibian species, 75% of bird species and 68% of mammal species. About 60% of all vascular plants are found in tropical forests.

The biodiversity of forests varies considerably according to factors such as forest type, geography, climate and soils — in

addition to human use. Most forest habitants in temperate regions support relatively few animal and plant species and species that tend to have large geographical distributions, while the montane forests of Africa, South America and Southeast Asia and lowland forests of Australia, coastal Brazil, the Caribbean islands, Central America and insular southeast Asia have many species with small geographical distributions.

BIODIVERSITY HOTSPOT:

A biodiversity hotspot is a region with a high level of endemic species that have experienced great habitant loss. While hotspots are spread all over the world, the majority are forest areas and most are located in the Tropics.

Brazil's Atlantic Forest is considered one such hotspot containing roughly 20,000 plant species, 1350 vertebrates and millions of insects about half of which occur nowhere else. The island of Madagascar and India are also particularly notable. Colombia is characterized by high biodiversity, with the highest rate of species by area unit worldwide. Many regions of high biodiversity arise from specialized habitants which require unusual adaptations for e.g. alpine environments in high mountains.

ECOSYSTEM SERVICES

The balance of evidence:

Ecosystem services are the suite of benefits that ecosystems provide to humanity. The natural species are the caretakers of all ecosystems. These services come in three flavors:

1) Provisioning services which involve the production of renewable resources (e.g., food, wood, fresh water).
2) Regulating services which are those that lessen environmental change (e.g., climate regulation, pest/disease control).
3) Cultural services which represents human value and enjoyment (e.g., landscape aesthetics, cultural heritage, outdoor recreation and spiritual significance).

There have been many claims about biodiversity's effect on these ecosystem services, especially provisioning and regulation services. After an exhaustive survey through peer-reviewed literature to evaluate 36 different claims about biodiversity's effect on ecosystem services, 14 of those claims have been validated, 6 demonstrate mixed support or are unsupported, 3 are incorrect and 13 lack enough evidence to draw definitive conclusions.

Services enhanced:

Provisioning services: Greater species diversity:
- of plants increases fodder yield.
- of plants increases overall crop yield.
- of trees increases overall wood production.

Regulating services: Greater species diversity:
- of fish increases the stability of fisheries yield.
- of natural pest enemies decreases herbivorous pest populations.
- of plants decreases disease prevalence on plants.
- of plants increases resistance to plant invasion
- of plants increases carbon sequestration.
- of plants increases soil nutrient remineralization
- of plants increases soil organic matter.

Service with mixed evidence:

Regulating services: Greater species diversity:
- of plants may or may not decrease herbivorous pest populations.
- of animals may or may not decrease disease prevalence on those animals.
- of plants may or may not increase long term carbon storage.

Services hindered:

Provisioning services: Greater species diversity: • of plants reduces primary production.

Regulating services: Greater genetic and species diversity: of a number of organisms reduces freshwater purification.

Agriculture

Agricultural diversity can be divided into two parts:

i) Intraspecific diversity which includes the genetic variation within a single species like the potato that is composed of many different forms and types. E.g. in the U.S. they might compare russet potatoes with new potatoes or purple potatoes, all different, but all are part of the same species.)

ii) Interspecific diversity which refers to the number and types of different species. Many small vegetable farmers grow many different crops like potatoes and also carrots, peppers, lettuce, etc.

Agricultural diversity can also be divided by whether it is

i) Planned diversity which includes the crops which a farmer has encouraged, planted or raised. E.g. crops, covers, symbionts

and livestock among others.

ii) Associated diversity that arrives among the crops, uninvited. E.g., herbivores, weed species and pathogens, among others.

Associated biodiversity can be damaging or beneficial. Beneficial associated biodiversity occurs abundantly in crop fields and provide multiple ecosystem services such as pest control, nutrient cycling and pollination that support crop production. The control of damaging associated biodiversity is one of the great agricultural challenges that farmers face. On monoculture farms, the approach is generally to suppress damaging associated diversity using a suite of biologically destructive pesticides, mechanized tools and transgenic engineering techniques then to rotate crops.

Interspecific crop diversity is, in part, responsible for offering variety in what we eat.

Although about 80% of humans' food supply comes from just 20 kinds of plants, humans use at least 40,000 species. Earth's surviving biodiversity provides resources for increasing the range of food and other products suitable for human use, although the present extinction rate shrinks that potential.

Human health

Biodiversity's relevance to human health is becoming an international political issue as scientific evidence builds on the global health implications of biodiversity loss. This issue is closely linked with the issue of climate change, as many of the anticipated health risks of climate change are associated with changes in biodiversity. This is because the species which are most likely to disappear are those that buffer against infectious disease transmission, while surviving species tend to be the ones that increase disease transmission such as that of West Nile Virus, Lyme disease and Hantavirus.

The growing demand and lack of drinkable water on the planet presents an additional challenge to the future of human health. Partly, the problem lies in the success of water suppliers to increase supplies and failure of groups promoting the preservation of water resources.

Some of the health issues influenced by biodiversity includes dietary health and nutrition security, infectious disease, medical science and medical resources, social and psychological health. It provides critical support for drug discovery and the availability of medical resources.

Business & industry

Many industrial materials derive directly from biological sources. These include building materials, fibers, dyes, rubber and oil. Biodiversity is also important to the security of resources such as water, timber, paper, fiber and food. As a result, biodiversity loss is a significant risk factor in business development and a threat to long-term economic sustainability.

Leisure, cultural & aesthetic value

Biodiversity enriches leisure activities such as birdwatching or natural history study. Popular activities such as gardening and fishkeeping strongly depend on biodiversity.

Philosophically it could be argued that biodiversity has intrinsic aesthetic and spiritual value to mankind in and of itself. This idea can be used as a counterweight to the notion that tropical forests and other ecological realms are only worthy of conservation because of the services they provide.

Ecological services

It plays a part in regulating the chemistry of our atmosphere and water supply. Biodiversity is directly involved in water purification, recycling nutrients and providing fertile soils. Experiments with controlled environments have shown that humans cannot easily build ecosystems to support human needs. For e.g., insect pollination cannot be mimicked, though there have been attempts to create artificial pollinators using unmanned aerial vehicles. The economic activity of pollination alone represented between $2.1-14.6 billion in 2003.

Number of species

According to Mora and colleagues, the total number of terrestrial species is estimated to be around 8.7 million while the number of oceanic species is much lower, estimated at 2.2 million. Other estimates includes:

- 2,20,000 vascular plants
- 0.7 - 1 million marine species
- 10-30 million insects
- 5-10 million bacteria
- 1.5-3 million fungi
- 1 million mites
- The number of microbial species is not reliably known.

Species loss rates

During the last century, decreases in biodiversity have been increasingly observed. In 2007, German Federal Environment Minister Sigmar Gabriel cited estimates that up to 30% of all species will be extinct by 2050. Of these, about 1/8th of known plant species are threatened with extinction. Almost all scientists acknowledge that the rate of species loss is greater now than at any time in human history, with extinctions occurring at rates hundreds of times higher than background extinction rates and expected to still grow in the upcoming years.

A 2017 study published in PLOS One found that the biomass of insect life in Germany had declined by three-quarters in the last 25 years.

In 2020 the World Wildlife Foundation published a report saying that "biodiversity is being destroyed at a rate unprecedented in human history". The report claims that 68% of the population of the examined species were destroyed in the years 1970-2016.

There's a natural background rate to the timing and frequency of extinctions: 10% of species are lost every million years; 30% every 10 million years; and 65% every 100 million years.

PROTECTED AREAS

Protected areas, including forest reserves and biosphere reserves, serve many functions including for affording protection to wild animals and their habitat. Protected areas have been set up all over the world with the specific aim of protecting and conserving plants and animals.

Protected areas safeguard nature and cultural resources and contribute to livelihoods, particularly at local levels. There are over 238563 designated protected areas worldwide, equivalent to 14.9 % of the earth's land surface, varying in their extension, level of protection and type of management (IUCN, 2018).

The benefits of protected areas extend beyond their immediate environment and time. In addition to conserving nature, protected areas are crucial for securing the long-term delivery of ecosystem services. They provide numerous benefits including the conservation of genetic resources for food and agriculture, the provision of water, recreation and tourism and for acting as a buffer against disaster.

Forest protected areas in particular play many important roles including as a provider of habitat and shelter, food and genetic materials and as a buffer against disaster.

THREATS

By 2006, many species were formally classified as rare or endangered or threatened. About 40% of the 40,177 species assessed using the IUCN Red List criteria are now listed as threatened with extinction — a total of 16,119. The five main drivers to biodiversity loss are:

i) Habitat destruction has played a key role in extinctions, especially in relation to tropical forest destruction. Factors contributing to habitat loss include: overconsumption, overpopulation, land use change, deforestation, pollution (air pollution, water pollution, soil contamination) and global warming or climate change.

ii) Introduced and invasive species: Barriers such as large rivers, seas, oceans, mountains and deserts encourage diversity by enabling independent evolution on either side of the barrier. The term invasive species is applied to species that breach the natural barriers that would normally keep them constrained. Without barriers, such species occupy new territory, often supplanting native species by occupying their niches, or by using resources that would normally sustain naive species.

iii) Overexploitation occurs when a resource is consumed at an unsustainable rate. This occurs on land in the form of overhunting, excessive logging, poor soil conservation in agriculture and the illegal wildlife trade. It can lead to resource destruction, including extinction. Artificially developed projects can cause damage to the surrounding environment

iv) Hybridization, genetic pollution/erosion and food security: In agriculture and animal husbandry, the Green Revolution popularized the use of conventional hybridization to increase yield. Formerly huge gene pools of various wild and indigenous breeds have collapsed causing, widespread genetic erosion and generic pollution.

v) Climate change has proven to affect biodiversity and evidence supporting the altering effects is widespread. Increasing atmospheric carbon dioxide certainly affects plant morphology and is acidifying oceans and temperature affect species ranges.

According to the IUCN the main direct threats to conservation fall in 11 categories as mentioned below:

1) Residential and commercial development: • housing and urban areas
• commercial and industrial areas.
• tourism and recreational areas.

2) Farming activities: • agriculture
• aquaculture

3) Energy production and mining: • renewable energy production
• non-renewable energy production
• mining

4) Transportation and service corridors: • collisions with the vehicles using the corridors
• associated accidents and catastrophes.

5) Biological resource usages: • hunting

• logging or wood harvesting
• fishing

6) Human intrusions activities that disturbs habitants and species from exhibiting natural behaviours: • recreational activities
• war, civil unrest and military exercises
• illegal activities

7) Natural system modifications: • fire suppression or creation
• water management
• reducing human maintenance

8) Invasive and problematic species, pathogens and genes: • invasive species
• problematic native species
• pathogens and microbes

9) Pollution: • sewage
• air-borne pollution
• garbage and solid waste

10) Catastrophic geological events: • earthquakes
• tsunamis
• landslides

11) Climate changes: • changes in temparature regimes
• ecosystem encroachment
• changes in geochemical regimes
• changes in precipitation and hydrological regimes
• severe weather events

MEASUREMENTS OF BIODIVERSITY

For measuring biodiversity three types of indices can be distinguished:

i) Species richness indices which measure for the total number of the species in a community.

ii) Evenness indices which expresses how evenly the individuals in a community are distributed among the different species.

iii) Taxonomic indices which takes into account the taxonomic relation between different organisms in a community.

However, biodiversity may be measured in other ways as well.

i) Biodiversity may be measured as genetic diversity.

ii) Biodiversity may be measured as the diversity of a region's endemic species

iii) Biodiversity may be measured as ecosystem diversity.

CONCLUSIONS

It is imperative that the phenomenon of biodiversity is very vast, complex and interdependent and there is no single over-arching effect of diversity on either productivity or stability. The realized effects will depend heavily on environmental context and the time scale over which the effects are studied. However, it has become obvious that biodiversity is indeed important for both managed and natural ecosystems, though the relative contributions of diversity and composition remain unclear. It is therefore necessary for legislators to understand the basic science in order to maintain diversity at its current levels.

Human is only one more of natural creatures and should not be a Lien to the other life-forms. We have no moral right to destroy nature and other beings that dwell on earth. We should treat all animals and plants with compassion. Every individual can make a small and yet significant effort in the race to save our planet and conserve biodiversity.

Samanta
25/05/2022

TOPIC: FIVE MAJOR TYPES OF POLLUTION

INDEX

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I would like to express my special thanks of gratitude to my AECC Teacher and our principal Dr A Karpha who gave me the golden opportunity to do this project on the topic Pollution it helped me in doing a lot of Research and I came to know about a lot of things related to this topic.

Finally, I would also like to thank my parents and friends who helped me a lot in finalizing this project within the limited time frame.

UMAIRA HAFEEZ

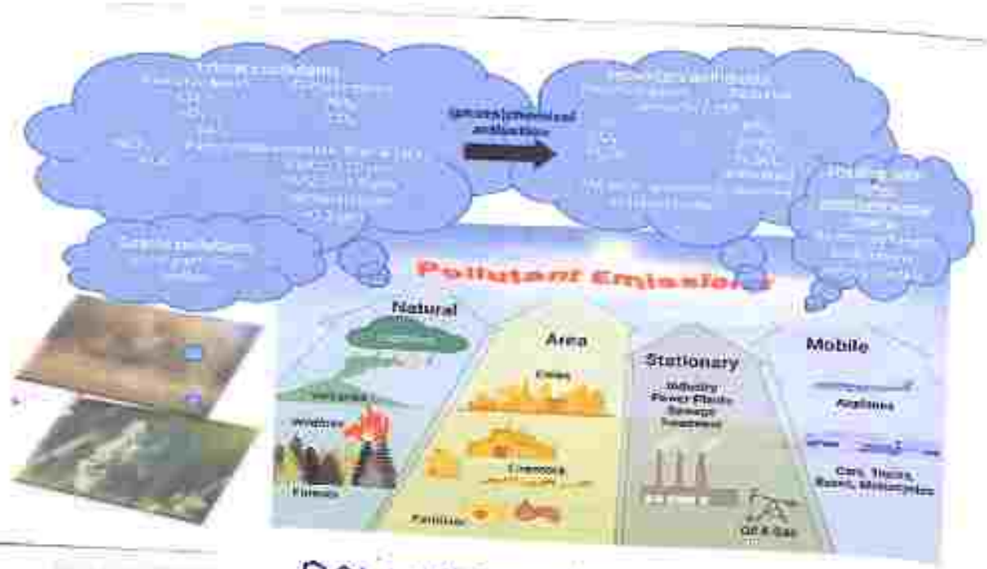
SEMESTER 2

ECONOMICS DEPARTMENT

EFFECT OF POLLUTION

INTRODUCTION

Pollution is a term which even kids are aware of these days. It has become so common that almost everyone acknowledges the fact that pollution is rising continuously. The term 'pollution' means the manifestation of any unsolicited foreign substance in something. When we talk about pollution on earth, we refer to the contamination that is happening of the natural resources by various pollutants. All this is mainly caused by human activities which harm the environment in ways more than one. Therefore, an urgent need has arisen to tackle this issue straightaway. That is to say, pollution is damaging our earth severely and we need to realize its effects and prevent this damage. Pollution has become a very common yet serious issue in today's world. It has been there in different forms since a long time even before human evolution such as volcanic eruptions, wildfire which lead to various photochemical reactions in the atmosphere. The current concern is that it is rising day by day due to various resources of pollutants. And, one of the main pollutants are humans and man-made machines. It is right to say that pollution is damaging the mother earth severely and we, humans, should play our part to prevent it from happening



POLLUTANTS

TYPES OF POLLUTANTS AND THEIR ILL-EFFECTS

Modernization and progress have led to our world getting more and more polluted over the years. Industries, vehicles, increase in the population, and urbanization are some of the major factors responsible for this pollution. The following industries are among those that emit a great deal of pollutants into the air: thermal power plants, cement, steel, refineries, petro chemicals, and mines.

Listed below are the major industrial pollutants, their sources and effects:

Carbon monoxide (CO)

Is a colorless, odorless gas that is produced by the incomplete burning of carbon-based fuels including petrol, diesel, and wood. It is also produced from the combustion of natural and synthetic products such as cigarettes. It lowers the amount of oxygen that enters our blood. It can slow our reflexes and make us confused and sleepy.

Chlorofluorocarbons (CFC)

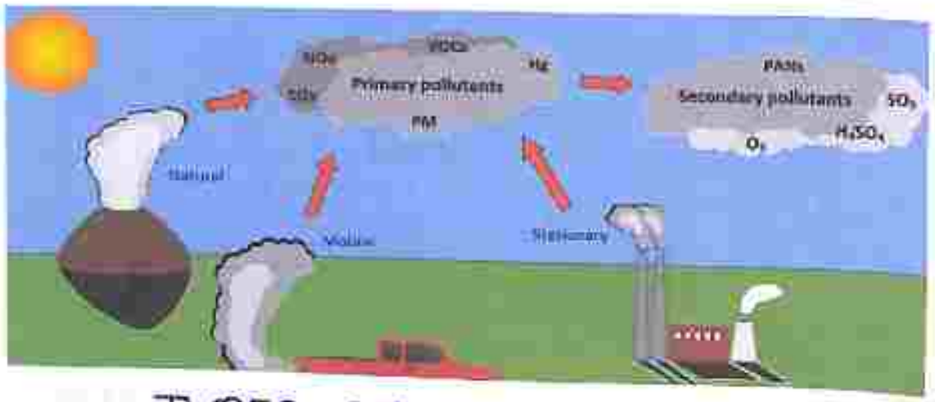
Are gases that are released mainly from air-conditioning systems and refrigeration. When released into the air, CFCs rise to the stratosphere, where they come in contact with few other gases, which lead to a reduction of the ozone layer that protects the earth from the harmful ultraviolet rays of the sun.

Carbon dioxide (CO_2)

Is the principle greenhouse gas emitted as a result of human activities such as the burning of coal, oil, and natural gases.

Lead

Is present in petrol, diesel, lead batteries, paints, hair dye products, etc. Lead affects children in particular. It can cause nervous system damage and digestive problems and, in some cases, cause cancer



TYPES OF POLLUTANTS

Ozone

Occurs naturally in the upper layers of the atmosphere. This important gas shields the earth from the harmful ultraviolet rays of the sun. However, at the ground level, it is a pollutant with highly toxic effects. Vehicles and industries are the major source of ground-level ozone emissions. Ozone makes our eyes itch, burn, and water. It lowers our resistance to colds and pneumonia.

Nitrogen oxide

Causes smog and acid rain. It is produced from burning fuels including petrol, diesel, and coal. Nitrogen oxides can make children susceptible to respiratory diseases in winters.

Suspended particulate matter (SPM)

Consists of solids in the air in the form of smoke, dust, and vapor that can remain suspended for extended periods and is also the main source of haze which reduces visibility. The finer of these particles, when breathed in can lodge in our lungs and cause lung damage and respiratory problems.

Sculpture dioxide (SO_2)

Is a gas produced from burning coal, mainly in thermal power plants. Some industrial processes, such as production of paper and smelting of metals, produce sculpture dioxide. It is a major contributor to smog and acid rain. Sulfur dioxide can lead to lung disease

TYPES OF POLLUTION

Some of the major types of pollution are:

- *Air Pollution*
- *Water Pollution*
- *Soil Pollution*
- *Noise Pollution*
- *Thermal Pollution*

Let us discuss these in details.

AIR POLLUTION

AIR POLLUTION

What is Air Pollution?

Air pollution refers to any physical, chemical or biological change in the air. It is the contamination of air by harmful gases, dust and smoke which affects plants, animals and humans drastically. This can be in the form of particulate matter such as dust or excessive gases like carbon dioxide or other vapors that cannot be effectively removed through natural cycles.

- CAUSES OF AIR POLLUTION

Burning of Fossil Fuels

The combustion of fossil fuels emits a large amount of sulphur dioxide. Carbon monoxide released by incomplete combustion of fossil fuels also results in air pollution.

Automobiles

The gases emitted from vehicles such as jeeps, trucks, cars, buses, etc. pollute the environment. These are the major sources of greenhouse gases and also result in diseases among individuals.

Agricultural Activities

Ammonia is one of the most hazardous gases emitted during agricultural activities. The insecticides, pesticides and fertilizers emit harmful chemicals in the atmosphere and contaminate it.

Factories and Industries

Factories and industries are the main source of carbon monoxide, organic compounds, hydrocarbons and chemicals. These are released into the air, degrading its quality.

Mining Activities

In the mining process, the minerals below the earth are extracted using large pieces of equipment. The dust and chemicals released during the process not only pollute the air, but also deteriorate the health of the workers and people living in the nearby areas.

- **EFFECTS OF AIR POLLUTION**

The hazardous effects of air pollution on the environment include:

Diseases

Air pollution has resulted in several respiratory disorders and heart diseases among humans. The cases of lung cancer have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

Global Warming

Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as global warming. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged underwater.

Acid Rain

The burning of fossil fuels releases harmful gases such as nitrogen oxides and sulphur oxides in the air. The water droplets combine with these pollutants, become acidic and fall as acid rain which damages human, animal and plant life.

Ozone Layer Depletion

The release of chlorofluorocarbons, halons, and hydro chlorofluorocarbons in the atmosphere is the major cause of depletion of the ozone layer. The depleting ozone layer

does not prevent the harmful ultraviolet rays coming from the sun and causes skin diseases and eye problems among individuals.

Effect on Animals

The air pollutants suspend in the water bodies and affect aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This renders them stray and has also led to the extinction of a large number of animal species.

- AIR POLLUTION CONTROL

Following are the measures one should adopt, to control air pollution:

Avoid Using Vehicles

People should avoid using vehicles for shorter distances. Rather, they should prefer public modes of transport to travel from one place to another. This not only prevents pollution, but also conserves energy.

Energy Conservation

A large number of fossil fuels are burnt to generate electricity. Therefore, do not forget to switch off the electrical appliances when not in use. Thus, you can save the environment at the individual level. Use of energy-efficient devices such as CFLs also controls pollution to a greater level.

Use of Clean Energy Resources

The use of solar, wind and geothermal energies reduce air pollution at a larger level. Various countries, including India, have implemented the use of these resources as a step towards a cleaner environment.

Other air pollution control measures include:

By minimizing and reducing the use of fire and fire products.

Since industrial emissions are one of the major causes of air pollution, the pollutants can be controlled or treated at the source itself to reduce its effects

Fuel substitution is another way of controlling air pollution. In many parts of India, petrol and diesel are being replaced by CNG – Compressed Natural Gas fueled vehicles. These are mostly adopted by vehicles that aren't fully operating with ideal emission engines.

Although there are many practices in India, which focus on repairing the quality of air, most of them are either forgotten or not being enforced properly. There are still a lot of vehicles on roads which haven't been tested for vehicle emissions.

Another way of controlling air pollution caused by industries is to modify and maintain existing pieces of equipment so that the emission of pollutants is minimised.

A very effective way of controlling air pollution is by diluting the air pollutants.

The last and the best way of reducing the ill effects of air pollution is tree plantation. Plants and trees reduce a large number of pollutants in the air. Ideally, planting trees in areas of high pollution levels will be extremely effective.

WATER POLLUTION

What is Water Pollution?

Water pollution can be defined as the contamination of water bodies. Water pollution is caused when water bodies such as rivers, lakes, oceans, groundwater and aquifers get contaminated with industrial and agricultural effluents. When water gets polluted, it adversely affects all lifeforms that directly or indirectly depend on this source. The effects of water contamination can be felt for years to come.

- CAUSES OF WATER POLLUTION

Rapid Urban Development

Anytime there are massive numbers of people conglomerated in one dense area, a physical disturbance of the land follows. The building of new roads, houses, and industries affect the cleanliness of the water through the use of detergents, chemicals, and exhaust emissions. When it rains, these chemicals are washed into the rivers and streams, and eventually into the drinking water supply.

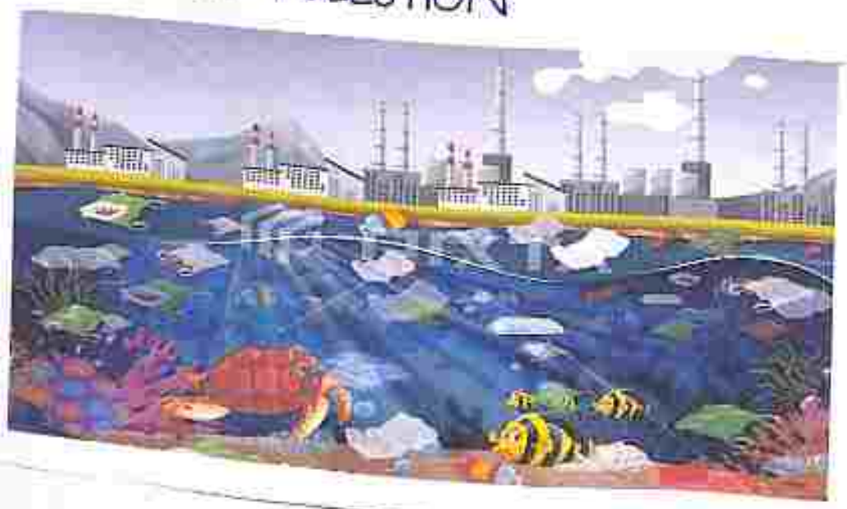
Improper Sewage Disposal

More and more, improper sewage disposal is becoming a major world issue. Every time you flush, the waste goes somewhere...either to a sewage treatment facility and from there, remaining sewage is dumped into the oceans.

Fertilizer Run-Off

Between people attempting to keep their yards vibrant green and weed-free, and farmers coping with the growing population, fertilizers play a large roll in the cause of water pollution on this planet. The result is dangerous algae blooms which eventually lead to the extinction of many underwater plants, as well as fish.

WATER POLLUTION



Oil Spills

Oil Spills do cause water to become polluted, oil leaks from vehicles and mechanic trades are another main cause of water pollution. The spilled oil mixes with groundwater and makes its way into streams and rivers.

Chemical Waste Dumping

Big factories are notorious for dumping chemicals into the ocean. Highly toxic substances such as detergents, polychlorinated biphenyls, and lead are discharged into our environment every day.

Radioactive Waste Discharge

There are nuclear power plants all around our country, and the government allows "permissible levels" of radioactive water to be released into the environment every day. And, while it's permissible–it doesn't mean it's safe. Likewise, accidents have been known to occur, releasing horribly high amounts of harmful radioactive chemicals to be released into the air, water, and soil.

- EFFECTS OF WATER POLLUTION

Effects on Human Beings

Humans are affected by water pollution and can contract diseases such as Hepatitis through faecal matter in water sources. Poor drinking water treatment and unfit water can always cause an outbreak of infectious diseases such as Cholera etc

Effects on Aquatic Life

Water pollution drastically affects aquatic life. It affects their metabolism, behavior, causes illness and eventual death. Dioxin is a chemical that causes a lot of problems from reproduction to uncontrolled cell growth or cancer

Destruction of Ecosystem

The introduction or elimination of certain microorganisms distorts the ecosystem. Nutrient pollution, for example, leads to an increase in algae, which depletes the water of oxygen, thereby leading to the death of fish and other aquatic life.

Economic Effects

Managing and restoring polluted water bodies is expensive. In normal conditions, it costs more to purify drinking water, not to mention the health cost of treating diseases resulting from contaminated water.

• WATER POLLUTION CONTROL

Water pollution, to a larger extent, can be controlled by a variety of methods. Rather than releasing sewage waste into water bodies, it is better to treat them before discharge. Practising this can reduce the initial toxicity and the remaining substances can be degraded and rendered harmless by the water body itself. If the secondary treatment of water has been carried out, then this can be reused in sanitary systems and agricultural fields.

A very special plant, the Water Hyacinth can absorb dissolved toxic chemicals such as cadmium and other such elements. Establishing these in regions prone to such kinds of pollutants will reduce the adverse effects to a large extent.

Some chemical methods that help in the control of water pollution are precipitation, the ion exchange process, **reverse osmosis**, and coagulation. As an individual, reusing, reducing, and recycling wherever possible will advance a long way in overcoming the effects of water pollution.

SOIL POLLUTION

SOIL POLLUTION

What is Soil Pollution?

Soil, or land pollution, is contamination of the soil that prevents natural growth and balance in the land whether it is used for cultivation, habitation, or a wildlife preserve. Some soil pollution, such as the creation of landfills, is deliberate, while much more is accidental and can have widespread effects.

- CAUSES OF SOIL POLLUTION

- **Accidental spills and leaks** during storage, transport or use of chemicals (e.g. leaks and spills of gasoline and diesel at gas stations);
- **Foundry activities** and manufacturing processes that involve furnaces or other processes resulting in the possible dispersion of contaminants in the environment;
- **Mining activities** involving the crushing and processing of raw materials, for instance heavy metals, emitting toxic substances;
- **Construction activities**
- **Agricultural activities** involving the diffusion of herbicides, pesticides and/or insecticides and fertilizers;
- **Transportation activities**, releasing toxic vehicle emissions
- **Chemical waste dumping**, whether accidental or deliberate – such as illegal dumping;
- **The storage of waste in landfills**, as the waste products may leak into groundwater or generate polluted vapors
- **Cracked paint chips** falling from building walls, especially lead-based paint.

- SOIL POLLUTION CONTROL

Proper management of agricultural land and the practice of organic farming:

Poor utilization of land is a major concern in the prevention and control of soil pollution. Agricultural land pollution usually causes the loss of soil fertility as it involves the loss of organic matter, topsoil and nutrients, and the soil's ability to retain water. In agricultural land management, ideal soil conservation methods include mechanical and biological control techniques.

Proper Solid Waste Treatment :

It is important to dispose of solid waste properly by treated it before it's released into the environment. Acidic and alkaline waste, for example, can be neutralized before they are disposed of to avoid soil contamination.

Ensure proper investigation of reclaimed land :

When dealing with land that is expected to be reclaimed and used for other purposes such as the construction of residential homes or social amenities like schools as it is in the case of mining, there is need to conduct soil investigation and evaluation. The mandate of testing the contamination levels of such lands should be given to the city or government unit in charge.

Strictly control the pollution of new soil :

It is cheaper to prevent soil pollution than it is to manage polluted soil and thus, the appropriate objective should be protecting new soil. Before any new land is used, thorough research should be conducted to ensure whether the land is suitable for the intended use. There should also be put in place stringent measures against those who dump harmful or poisonous substances to the mudflat, sand, swampland, and salt marshes as well as those who discharge pollutants illegally.

Transfer treatment and remediation costs to polluting companies :

The government should make an effort to improve the quality of soil through pollution treatment and remediation. To ensure the sustainability of the project, the individuals and companies that pollute the soil should be held responsible for the treatment and remediation costs.

NOISE POLLUTION

NOISE POLLUTION

What is Noise Pollution?

Noise pollution, also known as environmental noise or sound pollution, is the propagation of noise with ranging impacts on the activity of human or animal life, most of them harmful to a degree. The source of outdoor noise worldwide is mainly caused by machines, transport, and propagation systems

- CAUSES OF NOISE POLLUTION

Following are the causes and sources of noise pollution:

Industrialisation:

Industrialisation has led to an increase in noise pollution as the use of heavy machinery such as generators, mills, huge exhaust fans are used, resulting in the production of unwanted noise.

Vehicles:

Increased numbers of vehicles on the roads are the second reason for noise pollution.

Events:

Weddings, public gatherings involve loudspeakers to play music resulting in the production of unwanted noise in the neighbourhood.

Construction sites:

.Mining, construction of buildings, etc add to the noise pollution.

Catering and night life:

Bars, restaurants and terraces that spill outside when the weather is good can produce more than 100 dB. This includes noise from pubs and clubs.

- EFFECTS OF NOISE POLLUTION

- Physical

Respiratory agitation, racing pulse, high blood pressure, headaches and, in case of extremely loud, constant noise, gastritis, colitis and even heart attacks.

- Psychological

Noise can cause attacks of stress, fatigue, depression, anxiety and hysteria in both humans and animals.

- Sleep and behavioral disorders

Noise above 45 dB stops you from falling asleep or sleeping properly. Remember that according to the World Health Organization it should be no more than 30 dB. Loud noise can have latent effects on our behavior, causing aggressive behavior and irritability.

- Memory and concentration

Noise may affect people's ability to focus, which can lead to low performance over time. It is also bad for the memory, making it hard to study.

- NOISE POLLUTION CONTROL

Some noise pollution preventive measures are provided in the points below.

Honking in public places like teaching institutes, hospitals, etc. should be banned.

In commercial, hospital, and industrial buildings, adequate soundproof systems should be installed.

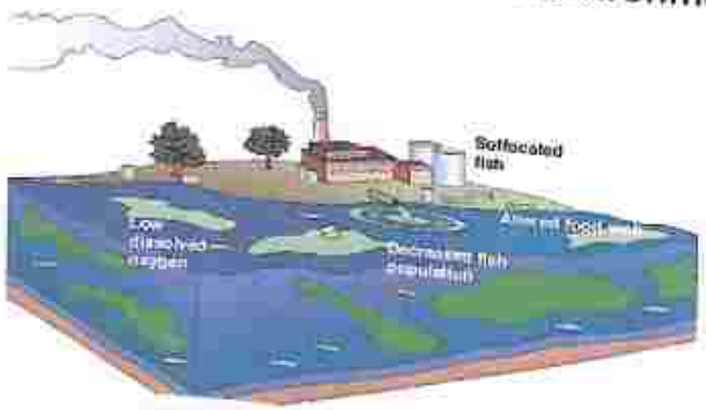
Musical instruments' sound should be controlled to desirable limits.

Dense tree cover is useful in noise pollution prevention.

Explosives should not be used in forest, mountainous and mining areas.

THERMAL POLLUTION

Impact of Thermal Pollution on Environment



THERMAL POLLUTION

What is Thermal Pollution?

Thermal pollution is excess heat that creates undesirable effects over long periods of time. Many types of thermal pollution are confined to areas near their source; but multiple sources can have wider impacts over a greater geographic area.

- **CAUSES OF THERMAL POLLUTION**

Water as a Cooling Agent in Power, Manufacturing and Industrial Plants

Production and Manufacturing plants are the biggest sources of thermal pollution. These plants draw water from a nearby source to keep machines cool and then release back to the source with higher temperatures. When heated water returns to the river or ocean, the water temperature rises sharply.

Natural Causes

Natural causes like volcanoes, geothermal vents and hot springs under the oceans and seas can trigger warm lava to raise the temperature of water bodies. Lightening can also introduce a massive amount of heat into the oceans.

Retention Ponds

Retention ponds can be another source of thermal shock because the water bodies that are relatively small and shallow can absorb quite a bit of heat energy from the sun.

Deforestation

Trees and plants prevent sunlight from falling directly on lakes, ponds or rivers. When deforestation takes place, these water bodies are directly exposed to sunlight, thus absorbing more heat and raising its temperature.

• EFFECTS OF THERMAL POLLUTION

1.Decrease in DO (Dissolved Oxygen) Levels

The warm temperature reduces the levels of DO (Dissolved Oxygen) in water. The warm water holds relatively less oxygen than cold water. The decrease in DO can create suffocation for plants and animals such as fish, amphibians and copepods, which may give rise to anaerobic conditions. Warmer water allows algae to flourish on the surface of the water, and over the long term, growing algae can decrease oxygen levels in the water.

2. Increase in Toxins

With the constant flow of high-temperature discharge from industries, there is a huge increase in toxins that are being regurgitated into the natural body of water. These toxins may contain chemicals or radiation that may have a harsh impact on the local ecology and make them susceptible to various diseases.

3. Loss of Biodiversity

A dent in the biological activity in the water may cause a significant loss of biodiversity. Changes in the environment may cause certain species of organisms to shift their base to some other place while there could be a significant number of species that may shift in because of warmer waters.

• THERMAL POLLUTION CONTROL

1. Cooling Ponds

In cooling ponds, heated effluents on the surface of water maximize the dissipation of heat to the atmosphere and minimize the area and volume of water.

2. Artificial Lake

Artificial lakes are man-made water bodies that offer a possible alternative.

3. Water Recycling

Industrially treated water can be recycled for domestic use or industrial heating that the problem of thermal pollution can be mitigated.

4. Other Applications

The thermal discharge (rejected heat) of power plants can be used in other purposes like:Industrial and space heating. Fish culture, livestock shelters and heating greenhouses etc.

CONCLUSION

- Nature's components such as air, water, soil, forest and fisheries are resources exploited by humans and their pollution are by-product of urbanization and industrialization.
- Pollution in effect is an undesirable byproduct of industrialization and urbanization.
- The agents directly or indirectly responsible for the pollution of the environment are known as pollutants.
- There are six types of pollutions: air pollution, water pollution, noise pollution, soil pollution, thermal pollution, radiation pollution etc.
- Air pollution is a result of industrial and certain domestic activity.
- Air pollutants are of two types (1) suspended particulate matter, and (2) gases like carbon dioxide CO_2, NOx etc.
- Use of cleaner fuels such as biogas, CNG and electricity prevent air pollution.
- Segregation of waste, pretreatment at source, sterilization of rooms will help in checking indoor pollution.
- Prevention and control of industrial pollution can be reduced by using cleaner fuels., filters, electrostatic precipitators, inertial collectors, scrubbers etc.
- Use of chlorofluorocarbons cause damage of ozone layer which has resulted in its thinning over the Arctic and Anctartic regions, is know as ozone hole.
- Increase in global temperature or heating effect by green house gases (CO_2, methane) is known as green house effect.
- Noise like other pollution is a by product of industrialization, urbanization and modern civilization.
- Indoor sources include noise produced by radio, television and outdoor source includes indiscriminate use of loudspeakers, industrial activities, automobile, rail traffic and aeroplanes etc.
- Addition of undesirable substances in water is called water pollution.
- Natural sources of water pollution are soil erosion, leaching of minerals from rocks and decaying of organic matter.
- Power plants and various industries used lot of water for cooling purposes and hot water is discharged into rivers, streams or oceans. This waste heat increases the temperature of the cooling water upto 10-15°C this is thermal pollution.

Samanta 25/05/2022