Gokhale Memorial Girls' College

Date:13/04/2023

To whom it may concern

Subject: Completion of ENVS Project by PSYA 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-PSYA -Gr. B with pdf link of their projects stated alongside.

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TOPIC: STUDY OF ECOSYSTEMS - RIVER.

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INTRODUCTION:

The ecology of the river refers to the relationships that living organisms have with each other and with their environment – the ecosystem. An ecosystem is the sum of interactions between plants, animals, microorganisms and non-living physical and chemical components in a particular natural environment. It is a geographic area where plants, animals, and other organisms, as well as other factors such as weather and landscape, work together to form a bubble of life. Additionally, ecosystems contain biotic or living parts, as well as abiotic factors, or nonliving parts. Biotic factors include plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.

An ecosystem can be categorised into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other nonliving elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem and the cycling of nutrients within the ecosystem. Ecosystems vary in size: some are small enough to be contained within single water droplets while others are large enough to encompass entire landscapes and regions. The fundamental energy source in almost all ecosystems is radiant energy from the Sun. The energy of sunlight is used by the ecosystem's autotrophic, or self-sustaining, organisms (that is, those that can make their own food).

{SOURCE: Taken from google images, "river ecosystem".}

TEMPERATURE: Water temperature in rivers varies with the environment. Water can be heated or cooled through radiation at the surface and conduction to or from the air and surrounding substrate. Temperature differences can be significant between the surface and the bottom of deep, slow-moving rivers. Climate, shading and elevation all affect water temperature. Species living in these environments are called poikilotherms – their internal temperature varies to suit their environmental conditions.

BACTERIA: Bacteria are present in large numbers in river waters. They play a significant role in energy recycling. Bacteria decompose organic material into inorganic compounds that can be used by plants and by other microbes.

PLANTS: Plants photosynthesise – converting light energy from the Sun into chemical energy that can be used to fuel organisms' activities. Algae are the most significant source of primary food in most rivers or streams. Most float freely and are therefore unable to maintain large populations in fast-flowing water. They build up large numbers in slow-moving rivers or backwaters. Some algae species attach themselves to objects to avoid being washed away.

{SOURCE: Taken from google images, "river ecosystem".}

IMPACT OF MODERNIZATION AND HUMAN POPULATION ON RIVERS

River ecosystems may be considered as one of the most dynamic ecosystems in the world. These are also vulnerable to pollution due to natural and anthropogenic interference resulting in a lot of stress on the biota and river ecology, which is infected beyond their assimilation and regeneration capacity. Streams and rivers had been used even by the earliest civilizations, which flourished around them.

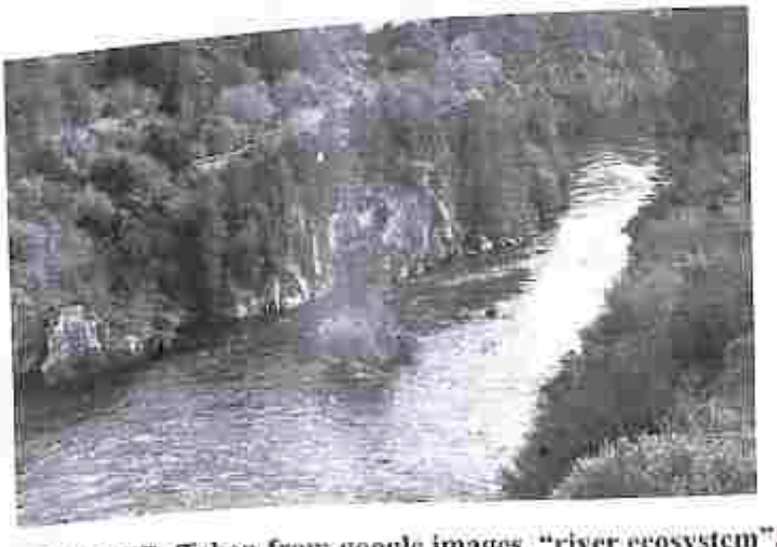
Human activities pose threats to river ecosystems, including placing land from forests, grasslands, and wetlands into urban or agricultural uses, dams, pollutant loadings, alteration of natural drainage characteristics, introduced species, overharvesting, and climate change.

Rivers and lake ecosystems are affected by changing hydrologic conditions (e.g., due to melting mountain glaciers) as well as by increasing temperatures. For many lakes, this may imply reductions in oxygen concentrations and subsequent changes in species composition and water quality.

The river ecosystem is one of the ecosystems which remains one of the most stressed and altered ecosystems on the earth. Himalayan rivers are an important source of freshwater to the people of the mountains as well as all along the way down streams. They nourish and nurture various forms of plants and animals or we simply say they are the home to unique and significant floral and faunal species. But with the changing scenario and ever-increasing population of over seven billion, the rivers are the most pressed and stressed sources of water. The people are dependent on the rivers for a range of purposes ranging from drinking, cleaning, irrigation, industrial cooling, movement of man and material from one area to another and many more can be listed here. Huge human settlements are found along the rivers. All the waste generated from the daily activities is directly or indirectly thrown into the rivers. The industries are situated near and along the rivers as huge amounts of water are required for cooling purposes. Such activities lead to thermal pollution of the water bodies thereby affecting the biodiversity contained in them. Many species go extinct as they cannot tolerate the high temperature. Many religious activities lead to one or the other kind of stress on the river ecosystem. River Ganges is one of the prominent cases in this direction.

CONCLUSION

River ecosystems are influenced by natural processes and anthropogenic impacts at different spatial and temporal scales. Understanding these complex interactions for current conditions is the first requirement to be able to simulate the impact of changes in a catchment on river ecosystems. Climate change causes alterations in hydrologic patterns such as seasonal flow and extreme flows. Knowing the magnitude and frequency of these alterations is the second requirement for simulating climate change implications in river ecosystems. The third requirement is an appropriate implementation of these multiple processes in a model cascade: for example, ranging from hydrological via hydraulic models to biological predictions.



SOURCE: Taken from google images, "river ecosystem".

BIBLIOGRAPHY

- https://www.britannica.com/science/ecosystem
- https://www.sciencedirect.com/topics/earth-and-planetary-sciences/river-ecosystem
- https://www.researchgate.net/publication/309461971_River_as_an_Ecosystem
- https://education.nationalgeographic.org/resource/ecosystem

NB
20/6/2022

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Subject code: AECC-2

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ECOSYSTEM: RIVER

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my teacher Namrata Basu, who gave me the golden opportunity to work on this wonderful topic of "Ecosystem of the river", who also helped me complete my project on time. I gained knowledge of so many new things and interesting facts.

Secondly, I would also like to thank my parents and my friends who helped me with the resources and ideas to complete my project within the limited time frame.

Afifa Sadaf

21/BAH/0244

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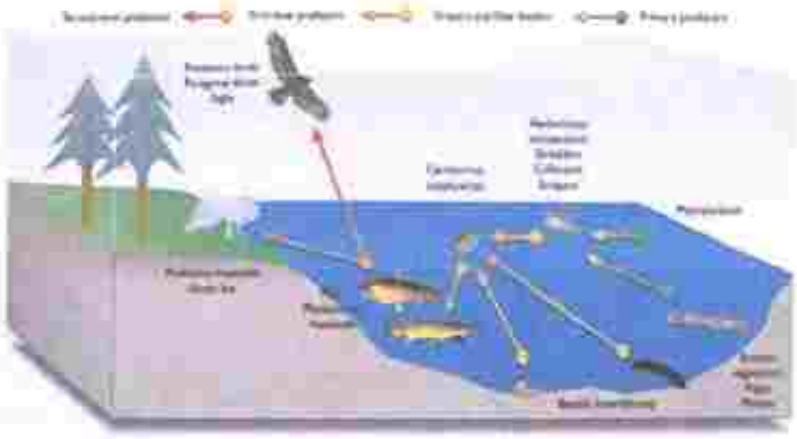
INTRODUCTION

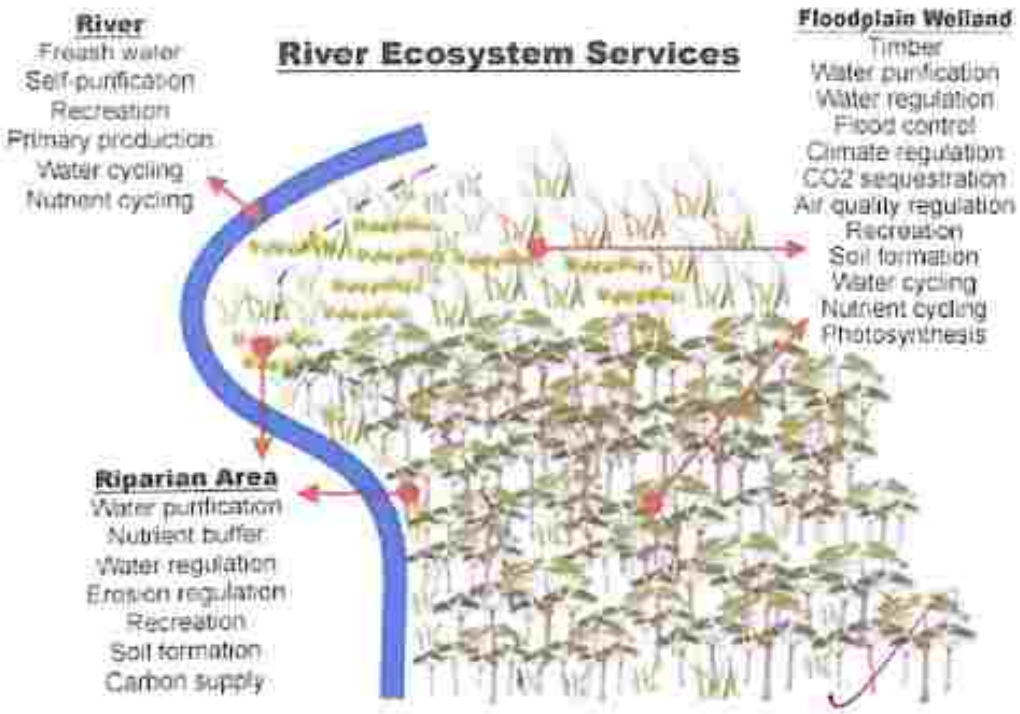
Ecosystems are classified into aquatic and terrestrial ecosystems. The aquatic ecosystems are water-borne and the terrestrial ecosystems are land-based. Based on the quality of water involved, the aquatic ecosystems are further classified into fresh water and marine types. Being potable and pure, fresh water is mostly used for domestic, agricultural and industrial consumption. In addition to natural water bodies, artificial reservoirs and Dams are constructed to preserve the freshwater, without letting them into seas or natural lakes. Freshwater ecosystems deal with both running and standing water bodies and their life. Lentic ecosystems and lotic ecosystems are the names given to standing and flowing water bodies, respectively. Almost all ecological factors like temperature, light, pH, dissolved gases and salts of water, turbidity, alkalinity, salinity, depth and areal distribution play an active role in controlling the habitat of these ecosystems.

Water is an essential component of life. Surface water resources are the mostly preferred locations for life settlements. Most of the human civilizations were also originated near water courses, especially along the major rivers. A River is a large natural course of flowing water obtained from precipitation. The surface water moves down along the slopes due to the action of gravity



A river ecosystem consists of inter-related living & non-living parts. The river ecosystem provides us with free ecosystem services. For this reason, there is a noticeable difference between the environment and the living communities of rivers with those of the ponds.

In the river there are different types of algae fishes like Hilsha, Pungas, Chital, Boal etc. live in the rivers. The bodies of these fishes are laterally compressed. For this feature of their body shape, they are capable of moving easily in the strong current. Near the bank of the river where the current is less, living communities like those of the ponds grow there. In the ecosystem of rivers, the food chain is short e.g. Algae, Hilsa, Boal.



River ecosystem have:

- flowing water that is mostly unidirectional
- a state of continuous physical change
- many different (and changing) microhabitats
- variability in the flow rates of water
- plants and animals that have adapted to live within water flow conditions.

The food base of streams within riparian forests is mostly derived from the trees, but wider streams and those that lack a canopy derive the majority of their food base from algae. Anadromous fishes are also an important source of nutrients. Environmental threats to rivers include loss of water, dams, chemical pollution and introduced species. A dam produces negative effects that continue down the watershed. The most important negative effects are the reduction of spring flooding, which damages wetlands, and the retention of sediment, which leads to the loss of deltaic wetlands.

River ecosystems are prime examples of lotic ecosystems. *Lotic* refers to flowing water, from the Latin *lotus*, meaning washed. Lotic waters range from springs only a few centimeters wide to major rivers kilometers in width. Much of this article applies to lotic ecosystems in general, including related lotic systems such as streams and springs. Lotic ecosystems can be contrasted with lentic ecosystems, which involve relatively still terrestrial waters such as lakes, ponds, and wetlands. Together, these two ecosystems form the more general study area of freshwater or aquatic ecology.

Abiotic Components

The non-living components of an ecosystem are called abiotic components. E.g. stone, air, soil, etc.

Water flow

A pensive Cooplacurripa River, NSW

Rapids in Mount Robson Provincial Park

Unidirectional water flow is the key factor in lotic systems influencing their ecology. Streamflow can be continuous or intermittent, though. Streamflow is the result of the summative inputs from groundwater, precipitation, and overland flow. Water flow can vary between systems, ranging from torrential rapids to slow backwaters that almost seem like lentic systems.

Light

Light is important to lotic systems, because it provides the energy necessary to drive primary production via photosynthesis, and can also provide refuge for prey species in shadows it casts. The amount of light that a system receives can be related to a combination of internal and external stream variables. The area surrounding a small stream, for example, might be shaded by surrounding forests or by valley walls.

Temperature

Castle Geyser, Yellowstone National Park

A forest stream in the winter near Erzhausen, Germany

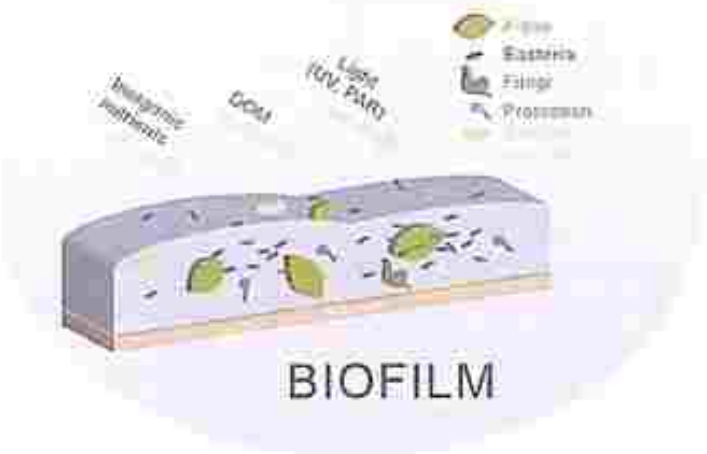
Cascade in the Pyrénées

Most lotic species are poikilotherms whose internal temperature varies with their environment, thus temperature is a key abiotic factor for them. Water can be heated or cooled through radiation at the surface and conduction to or from the air and surrounding substrate. Shallow streams are typically well mixed and maintain a relatively uniform temperature within an area. In deeper, slower moving water systems, however, a strong difference between the bottom and surface temperatures may develop.

Biotic components (living)

The living components of an ecosystem are called the biotic components. Streams have numerous types of biotic organisms that live in them, including bacteria, primary producers, insects and other invertebrates, as well as fish and other vertebrates.

Biofilm

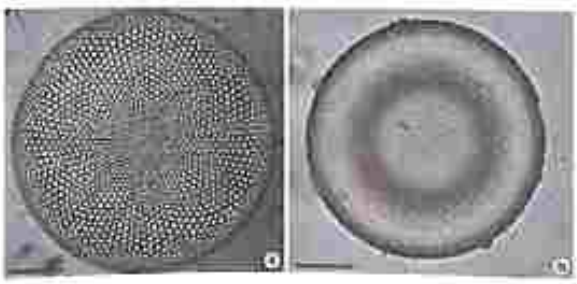


Different biofilm components in streams[1][2]

principal components are algae and bacteria

A biofilm is a combination of algae (diatoms etc.), fungi, bacteria, and other small microorganisms that exist in a film along the streambed or the benthos. Biofilm assemblages themselves are complex, and add to the complexity of a streambed.

The different biofilm components (algae and bacteria are the principal components) are embedded in an exopolysaccharide matrix (EPS), and are net receptors of inorganic and organic elements and remain submitted to the influences of the different environmental factors.



Epilithic diatoms from a river bed [3]

size bars: 30 µm

This slime on streambed cobbles is a biofilm

Biofilms are one of the main biological interphases in river ecosystems, and probably the most important in intermittent rivers, where the importance of the water column is reduced during extended low-activity periods of the hydrological cycle. Biofilms can be understood

as microbial consortia of autotrophs and heterotrophs, coexisting in a matrix of hydrated extracellular polymeric substances (EPS). These two main biological components are respectively mainly algae and cyanobacteria on one side, and bacteria and fungi on the other.

Microorganisms

Bacteria are present in large numbers in lotic waters. Free-living forms are associated with decomposing organic material, biofilm on the surfaces of rocks and vegetation, in between particles that compose the substrate, and suspended in the water column. Other forms are also associated with the guts of lotic organisms as parasites or in commensal relationships. Bacteria play a large role in energy recycling.

HUMAN IMPACTS

Humans exert a geomorphic force that now rivals that of the natural Earth. The period of human dominance has been termed the Anthropocene, and several dates have been proposed for its onset. Many researchers have emphasized the dramatic changes associated with the Industrial Revolution in Europe after about 1750 CE (Common Era) and the great acceleration in technology at about 1950 CE.

Pollution

River pollution can include but is not limited to: increasing sediment export, excess nutrients from fertilizer or urban runoff, sewage and septic inputs, plastic pollution, nano-particles, pharmaceuticals and personal care products, synthetic chemicals, road salt, inorganic contaminants (e.g., heavy metals), and even heat via thermal pollutions. The effects of pollution often depend on the context and material, but can reduce ecosystem functioning, limit ecosystem services, reduce stream biodiversity, and impact human health.

CONCLUSION

The Aquatic biodiversity is a primary concept in environmental analysis.
It encompasses most of the freshwater ecosystems, including lakes, ponds, and reservoirs, rivers and streams, groundwater, and the wetlands. Aquatic ecosystems also provide a home to many species including the phytoplankton, zooplankton, aquatic plants, insects, fish, birds, mammals, and others. They are organized at many levels, from the smallest building blocks of life to complete ecosystems, encompassing communities, populations, species, and genetic levels. In summary, aquatic biodiversity includes all unique species and habitats, and the interaction between them. It has enormous economic and aesthetic value and is largely responsible for maintaining the overall environment. Humans have long depended on aquatic resources for food, medicines, and materials as well as for recreational and commercial purposes such as fishing and tourism. Aquatic organisms also rely upon the great diversity of resources existing in rivers for their food, materials, and breeding. Several Factors affect these conditions. They are over exploitation of species, introduction of exotic species, pollution from urban, industrial, and agricultural activities, as well as the habitat loss and alteration through damming, and diversion of water into other places. All these contribute to the declining levels of aquatic biodiversity, especially the freshwater ecosystems.
It is necessary to adopt certain conservation strategies to protect and conserve the aquatic life and to maintain the balance of nature and support the availability of resources for future generations.

BIBLIOGRAPHY

The reference while doing this project was taken from the following websites:

https://plantlet.org/river-ecosystem-in-bangladesh-bangshai-river-part-1/

https://www.researchgate.net/publication/309461971_River_as_an_Ecosystem

https://www.sciencedirect.com/science/article/pii/B9780124165588000019

https://en.wikipedia.org/wiki/River_ecosystem

NB
20/6/202

TITLE OF THE PROJECT: DOCUMENTATION OF ENVIRONMENTAL ASSETS

FLORA AND FAUNA IN THE SUNDARBAN REGIONS

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ACKNOWLEDGEMENT

I would like to thank my teacher, Namrata Basu who gave me this opportunity to work on this project. I got to learn a lot from this project about (what you learned from the project). I would also like to thank our school principal Dr. Atashi Karpha.

At last, I would like to extend my heartfelt thanks to my parents because without their help this project would not have been successful. Finally, I would like to thank my dear friends who have been with me all the time.

INTRODUCTION

ENVIRONMENTAL ASSETS

Naturally occurring entities that provides environmental "functions" or services. Environmental assets in the SEEA are broader than environmental assets in the SNA: they cover all assets including those which have no economic values, but bring indirect uses benefits, options and bequest benefits or simply existence benefits which cannot be translated into a present day monetary value.
There are seven individual components of the environment that are considered environmental assets in the Central Framework. They are mineral and energy resources, land, soil resources, timber resources, aquatic resources, other biological resources (excluding timber and aquatic resources), and water resources.

MEANING OF FLORA AND FAUNA

Lotus

Tiger

(Source: Wikipedia)

Flora is all the plant life present in a particular region or time, generally the naturally occurring (indigenous) native plants. Sometimes bacteria and fungi are also referred to as flora, as in the terms *gut flora* or *skin flora*.
Fauna is all of the animal life present in a particular region or time. The corresponding term for plants is *flora*, and for fungi, it is *funga*. Flora, fauna, funga and other forms of life are collectively referred to as *biota*.

(Source: nationalgeographic.com)

SUNDARBANS

Sundarbans is a mangrove area in the delta formed by the confluence of the Padma, Brahmaputra and Meghna Rivers in the Bay of Bengal. It spans the area from the Baleswar River in Bangladesh's division of Khulna to the Hooghly River in India's state of West Bengal. It comprises closed and open mangrove forests, land used for agricultural purpose, mudflats and barren land, and is intersected by multiple tidal streams and channels.

The Sundarbans mangrove forest covers an area of about 10,000 km^2 (3,900 sq mi), of which forests in Bangladesh's Khulna Division extend over 6,017 km^2 (2,323 sq mi) and in West Bengal, they extend over 4,260 km^2 (1,640 sq mi) across the South 24 Parganas and North 24 Parganas districts.[5] The most abundant tree species are sundri (*Heritiera fomes*) and gewa (*Excoecaria agallocha*). The forests provide habitat to 453 fauna wildlife, including 290 bird, 120 fish, 42 mammal, 35 reptile and eight amphibian species.[6] Despite a total ban on all killing or capture of wildlife other than fish and some invertebrates, it appears that there is a consistent pattern of depleted biodiversity or loss of species in the 20th century, and that the ecological quality of the forest is declining.

GEOGRAPHY

Map of sundarban (Source: Wikipedia)

The Sundarban forest lies in the vast delta on the Bay of Bengal formed by the super confluence of the Hooghly, Padma (both are distributaries of Ganges), Brahmaputra and Meghna rivers across southern Bangladesh. The seasonally flooded Sundarbans freshwater swamp forests lie inland from the mangrove forests on the coastal fringe.

The Sundarbans is intersected by a complex network of tidal waterways, mudflats and small islands of salt-tolerant mangrove forests. The interconnected network of waterways makes almost every corner of the forest accessible by boat. The area is known for the Bengal tiger (*Panthera tigris*), as well as numerous fauna including species of birds, spotted deer, crocodiles and snakes. The fertile soils of the delta have been subject to intensive human use for centuries, and the ecoregion has been mostly converted to intensive agriculture, with few enclaves of forest remaining. The remaining forests, taken together with the Sundarbans mangroves, are important habitat for the endangered tiger. Additionally, the Mangroves species present in the Sundarban area serve a crucial function as a protective barrier for the millions of inhabitants in and around Khulna and Mongla against the floods that result from the cyclones. It also protects from Tsunami and soil erosion for the coastal population.

FLORA IN SUNDARBANS

Sundari tree (*Heritiera littoralis*)

Golpata (*Nypa fruticans*)

(Source: Wikipedia)

A total of 245 genera and 334 plant species were recorded by David Prain in 1903.[30] While most of the mangroves in other parts of the world are characterised by members of the Rhizophoraceae, Avicenneaceae or Combretaceae, the mangroves of Bangladesh are dominated by the Malvaceae and Euphorbiaceae.[17]

The Sundarbans flora is characterised by the abundance of sundari (*Heritiera fomes*), gewa (*Excoecaria agallocha*), goran (*Ceriops decandra*) and keora (*Sonneratia apetala*) all of which occur prominently throughout the area. The characteristic tree of the forest is the *sundari* (*Heritiera littoralis*), from which the name of the forest had probably been derived. It yields a hard wood, used for building houses and making boats, furniture and other things. New forest accretions is often conspicuously dominated by keora (*Sonneratia apetala*) and tidal forests. It is an indicator species for newly accreted mudbanks and is an important species for wildlife, especially spotted deer (*Axis axis*). There is abundance of *dhundul* or *passur* (*Xylocarpus granatum*) and *kankra* (*Bruguiera gymnorhiza*) though distribution is discontinuous. Among palms, *Poresia coaractata*, *Myriostachya wightiana* and golpata (*Nypa fruticans*), and among grasses spear grass (*Imperata cylindrica*) and khagra (*Phragmites karka*) are well distributed.

The varieties of the forests that exist in Sundarbans include mangrove scrub, littoral forest, saltwater mixed forest, brackish water mixed forest and swamp forest. Besides the forest, there are extensive areas of brackish water and freshwater marshes, intertidal mudflats, sandflats, sand dunes with typical dune vegetation, open grassland on sandy soils and raised areas supporting a variety of terrestrial shrubs and trees.

FAUNA IN SUNDARBANS

The Sundarbans provides a unique ecosystem and a rich wildlife habitat. According to the 2015 tiger census in Bangladesh, and the 2011 tiger census in India, the Sundarbans have about 180 tigers (106 in Bangladesh and 74 in India). Earlier estimates, based on counting unique pugmarks, were much higher. The more recent counts have used camera traps, an improved methodology that yields more accurate results. Tiger attacks were historically common in the area, and are still frequent in the Sundarbans, with around 40 people killed in 2000-2010.

Most importantly, mangroves are a transition from the marine to freshwater and terrestrial systems, and provide critical habitat for numerous species of small fish, crabs, shrimps and other crustaceans that adapt to feed and shelter, and reproduce among the tangled mass of roots, known as pneumatophores, which grow upward from the anaerobic mud to get the supply of oxygen. A 1991 study has revealed that the Indian part of the Sundarbans supports diverse biological resources including at least 150 species of commercially important fish, 270 species of birds, 42 species of mammals, 35 reptiles and 8 amphibian species, although new ones are being discovered. This represents a significant proportion of the species present in Bangladesh (i.e. about 30% of the reptiles, 37% the birds and 34% of the mammals) and includes many species which are now extinct elsewhere in the country. Two amphibians, 14 reptiles, 25 aves and five mammals are endangered. The Sundarbans is an important wintering area for migrant water birds and is an area suitable for watching and studying avifauna.

Mammals

A Bengal tiger in the Sundarbans

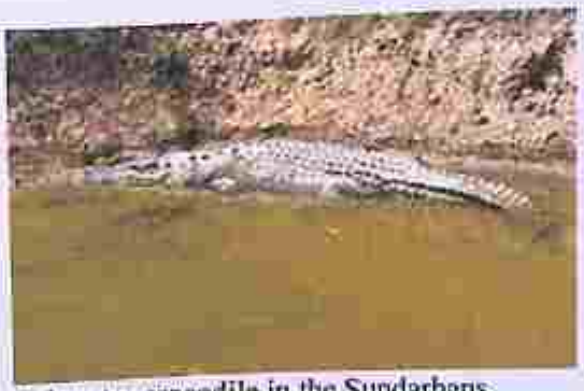
A chital deer (*Axis axis*)

A Rhesus macaque (*Macaca mulatta*)
(Source: Wikipedia)

The Sundarbans are an important habitat for the Bengal tiger (*Panthera tigris*). The forest also provides habitat for small wild cats such as the jungle cat (*Felis chaus*), fishing cat (*Prionailurus viverrinus*), and leopard cat (*P. bengalensis*).

Several predators dwell in the labyrinth of channels, branches, and roots that poke up into the air. This is the only mangrove ecoregion that harbors the Indo-Pacific region's largest terrestrial predator, the Bengal tiger. Unlike in other habitats, tigers live here and swim among the mangrove islands, where they hunt scarce prey such as the chital deer (*Axis axis*), Indian muntjacs (*Muntiacus muntjak*), wild boar (*Sus scrofa*), and Rhesus macaque (*Macaca mulatta*). It is estimated that there are now 180 Bengal tigers and about 30,000 spotted deer in the area. The tigers are known to attack and kill humans who venture into the forest, with around 40 deaths recorded in 2000-2010.

Aquafauna



Saltwater crocodile in the Sundarbans

A largetooth sawfish

A mudskipper

(Source: Wikipedia)

The Sundarbans National Park is home to olive ridley turtle, hawksbill turtle, green turtle, sea snake, dog-faced water snake, saltwater crocodile, South Asian river dolphin, king cobra, Russell's viper, house gecko, monitor lizard, pythons, common krait, checkered keelback and rat snake, river terrapin, Indian flapshell turtle (*Lissemys punctata*), Indian peacock softshell turtle (*Trionyx hurum*), Asian water monitor (*Varanus salvator*), and Indian python. Fish and amphibians in the Sundarbans include sawfish, butter fish, electric ray, common carp, silver carp, barb, river eels, starfish, king crab, fiddler crab, hermit crab, prawn, shrimps, skipper frogs, common toads and tree frogs. One particularly interesting fish is the mudskipper, a gobioid that climbs out of the water into mudflats and even climbs trees.

Avifauna

(Source: Times of India)

The forest is also rich in bird life, with 286 species including the endemic brown-winged kingfishers (Pelargopsis amauroptera) and the globally threatened lesser adjutants (Leptoptilos javanicus) and masked finfoots (Heliopais personata) and birds of prey such as the ospreys (Pandion haliaetus), white-bellied sea eagles (Haliaeetus leucogaster) and grey-headed fish eagles (Ichthyophaga ichthyaetus). Some more popular birds found in this region are open billed storks, black-headed ibis, water hens, coots, pheasant-tailed jacanas, pariah kites, brahminy kites, marsh harriers, swamp partridges, red junglefowls, spotted doves, common mynahs, jungle crows, jungle babblers, cotton teals, herring gulls, Caspian terns, gray herons, brahminy ducks, spot-billed pelicans, great egrets, night herons, common snipes, wood sandpipers, green pigeons, rose-ringed parakeets, paradise flycatchers, cormorants, white-bellied sea eagles, seagulls, common kingfishers, peregrine falcons, woodpeckers, Eurasian whimbrels, black-tailed godwits, little stints, eastern knots, curlews, golden plovers, pintails, white-eyed pochards and lesser whistling ducks.

CONCLUSION

Forests and the products they provide are universally required for the continuation of human society as we know it. To change our society to one that does not depend on the forest (to the forest's detriment) and its associated benefits requires such an enormous paradigm shift that we generally do not even consider it worthy of further investigation. Given this situation therefore, it is imperative that we discover mechanisms to manage the forest for all the benefits it can provide, in a sustainable manner.

Few countries have all the answers to all the issues faced, thus there exists a real need for international cooperation. Loss of forest resources transcends national boundaries and affects the entire planet. Given this, the roles of various agencies become vitally important in order to minimise any potential downside and to maximise the upside. Governments, NGOs, intergovernmental panels and the like must work more closely in order to resolve the pressing issues facing the forests. In many cases a collaborative approach will provide a solution which is more acceptable to all parties, and more robust than a solution that is developed unilaterally.

Societies around the world are beginning to face up to the reality that as a species man requires forest resources - both the wood and non-wood products a sustainably managed forest can provide. As the guardians of those resources our performance has to date been abysmal. It is with a great deal of urgency that we must turn that record around and ensure that we have sustainably managed forests for the generations that are to follow. Only a long term global commitment to conservation and sustainable development can reverse the tide of uncontrolled deforestation. A sound policy framework is central to this commitment.

BIBLIOGRAPHY

The sources from which I took the information and picture to complete the project are:

www.wikipedia.com

Times of India

www.britannica.com

http://naturewildlife.org/flora-of-sundarbans/

http://en.banglapedia.org/index.php/Sundarbans

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SUBJECT CODE: **AECC-2**

COLLEGE NAME: **Gokhale Memorial Girls'College**

ENVIRONMENT ASSETS OF NORTH BENGAL HIMALAYAN REGION

ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to our Principal Dr. Atashi Karpha and my subject professor, Madam Namrata Basu for their constant guidance and encouragement throughout.

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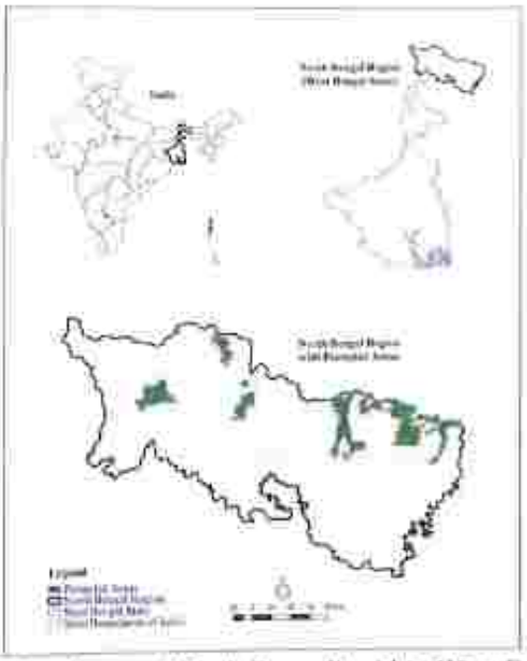
INTRODUCTION

The term 'environment' is derived from the French word 'environ' which means 'surround'/to be around. Environmental studies deals with the sum of all social, economic, physical and chemical interrelations with our surroundings. Environment is the sum total of all living and non-living factors that compose the surroundings of man.

"Environmental assets are the naturally occurring living and non-living components of the Earth, together constituting the bio-physical environment, which may provide benefits to humanity" (2012 SEEA Central Framework 2.17)

North Bengal comprising the districts of Jalpaiguri, Darjeeling, Dinajpur and Cooch Behar lies at the foothill of the great Himalayas. The area covers the moist and dense riverine forests of the Bengal Dooars (Duars) and the stark foothills of the snow-capped Kanchenjunga range. The unique climatic and ecological conditions makes North Bengal an unique home for a large variety of mega-fauna & superb restricted bird species.



Map depicting location of study area (North Bengal) within West Bengal State, India.
https://doi.org/10.1371/journal.pone.0204528.g002

CLIMATE AND TOPOGRAPHY

The climate of Himalayas in West Bengal is as diverse as its relief. Here the higher one goes, the cooler one feels. It is often sultry hot dawn valleys and chilly cold on the ridges at the same time. When one side ridge is sick of rain the other side is smiling with cool sunshine.

Clouds grip, rather swallow, Darjeeling during the rains, and the Jalpaiguri foothills the rainy season lasts from late March to November. While annual rainfall at Kurseong is 400 cm. It is only 225 cm. at Kalimpong. Thunder storms occur in summer and October. July is the wettest and January the coldest month. The lowest temperature recorded was -5°C (23°F.) 1905.

The topography of these region can be aptly compared to a huge and steep staircase, which rises from the foothills (Doars) at 100 m (328 Feet) above sea level, to a snowy peak above 7000 m (22,966 Feet) . Within a distance of 220 kilometres, one can pass from Sub tropical of Doars to sub temperate of Darjeeling, Kalimpong and Gangtok and to the alpine regions of Lachung, Yumuthang and alpine highland of Lamune, Thangsing and Dzongri while doing Goechala Trek in Sikkim.
These regions can be conveniently divided horizontally into three geographic zones. Firstly, the foothills of Doars, which rise from the plains of 90 m (295 Feet) to an altitude of 1750 m (5741Feet), have thick broadleaf evergreen forests, fertile farmland and a relatively high population especially in commercial town of Siliguri. This regions is home to some of the prominent wild life Sanctuaries and Reserve forests. The climate is warm and humid during summer largely due to abundance of vegetation and pleasant during winter, temperature ranging from 15 C (59 F) to 20 C (68 F).

FLORA AND FAUNA

North Bengal has rich diversity of Flora & Fauna, the plains of North Bengal (Siliguri, Jalpaiguri, Coochbehar, e.t.c.,) are surrounded by deep forests. Variety of Mammals, Reptiles, rare species of Trees are found in these forests. The forest in North Bengal is Tropical in nature and deep growth of tall Sal trees are common, Sal occupies nearly 80% of all vegetation in the tropical forest. It is also the home to varied types of birds such as woodpeckers, orioles, sunbirds, flycatchers, finches etc. During the migrating season, one can also witness a varied numbers of migratory birds making their way to and from the plains. Other than birds, one can also find number of small mammals such as civets, mongoose and badgers in this part of the hills

Some forest are famous for their their distinct wildlife, for example, Jaldapara Wildlife Sanctuary is

famous for One Horned India Rhino, whereas Mahananda Wildlife Sanctuary is famous for Elephants.

Moreover, these hilly slopes are home to many medicinal plants such as Aconitum ferox , Adhatoda vasica , Artemisia vulgaris, Berginia ciliata , Hedychium spicatum, Sapindus mukorossi, Taxus baccata, Zingiber cassumunar etc. Sadly, deforestation due to rapid urbanization is now eating away the green cover. However, it must be said that government is doing its level best to preserve the flora of

the Darjeeling hills. Even today, one can witness dense forests of both deciduous and evergreen trees in and around Darjeeling town. Apart from deciduous trees such as sal, birch, oak, and elm, many wet alpine trees are also grown here and if one is on the lookout he/she can also find rare orchids growing wildly in these forests. Rhododendron too is a common site in these hills.

Vegetation changes with altitude in North Bengal, the plains and foot hills are covered by Sal, as soon as the altitude increases vegetation changes. In the high altitude regions ferns, and wild grass are common. In the cool climate rare species of mammals like Red Panda, Snow Leopard, Gaur, Himalayan Black Bear are found. In Darjeeling Zoo, one can get a sight of Red Panda. Some rare Orchids, Rhododendrons known for their medicinal value are found. But due to lack of care and deforestation all these are in endangered species list, and with in few years they are definitely going to be extinct. With in the last 50 years North Bengal including Sub - Himalayan West Bengal has lost more than 45 % of its vegetation. This has contributed to a regular series of landslides in Darjeeling and Sikkim Himalayas.

RED PANDA([illegible])

SNOW LEOPARD ([illegible])

CONCLUSION

Deforestation is still going on vast forests of West Bengal, and the reason for this is not timber but illegal immigrant settlements form Bangladeshi People. The population of North Bengal was few thousand after gaining independence from the British but has increased considerably in the last 10 years and the estimated population in the plains of North Bengal is over 1 and 1/2 million. For this wildlife not only suffered, but the local people is suffering till now, high rate of unemployment is a common factor. This has bring a sort of revenge on the minds of the ethnic groups of North Bengal, (specially the hill areas), and they has also started a separatist movement in the hills and plains. The only one responsible for this is the government, if it had taken proper steps in proper time, the scenario of North Bengal and Darjeeling would have been very different. In North Bengal the government should look at the work of Sikkim's Government, who not only follows strict immigration rules, and deforestation rules. Due to this more and more visitors are attracted towards Sikkim. Darjeeling, and all other places in North Bengal is losing their importance day by day. We, the people should work hand in hand with the government to stop deforestation and promote Eco- Tourism in North Bengal, if we the Government and People can dedicate a very small fraction of life to North Bengal, then I am sure Darjeeling will soon gain it's lost glory.

World famous tea gardens of Darjeeling

Source: self captured

BIBLIOGRAPHY

- https://www.unsiap.or.jp/e-learning/el_material/6_Env_disaster/6_1_env_stat/13_SEEA_1_mly/Asset-accounting.pdf
- http://www.gurunanakcollegease.in/userfiles/UNIT-I%20(Sem-I)%20EVS-%20Environment%20&%20Ecosystem.pdf
- https://imp.center/i/climate-darjeeling-himalaya-west-bengal-1454/
- https://www.darjeelingonline.in/city-guide/geography-of-darjeeling
- https://nbtourism.tripod.com/flora_and_fauna_of_north_bengal.htm
- http://biodiversity-mohanpai.blogspot.com/2008/12/biodiversity-north-bengal.html?m=1

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GOKHALE MEMORIAL GIRL'S COLLEGE

STUDY OF ECOSYSTEMS – FOREST ECOSYSTEMS

~INDEX~

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to our ENVS teacher Namrata Basu Ma'am who gave me this wonderful opportunity for doing this project on the Study of Ecosystems which is mainly the Study of Forest Ecosystems. While doing this project I also came across several new things and I had to do a lot of research on it. Secondly, I would like to thank my parents and friends who had helped me a lot in finalizing the project within the time frame.

INTRODUCTION

An **ecosystem** consists of all the organisms and the physical environment with which they interact. These biotic and abiotic components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present.

Forests have an enormously important role to play in the global ecosystem. Forests produce approximately 28% of the Earth's oxygen (the vast majority being created by oceanic plankton), they also serve as homes for millions of people, and billions depend on forests in some way. Likewise, a large proportion of the world's animal species live in forests. That's why we absolutely must protect them. Forest ecology helps to understand life in the forest. It shows how living organisms behave, live and survive.

Forest ecology is the study of all aspects of the ecology of wooded areas, including rainforest, deciduous and evergreen, temperate and boreal forest.

TYPES OF FOREST ECOSYSTEMS

1. **Rainforest** : Some of the most biodiverse ecosystems on the planet, with the Amazon being a prime example. The north-eastern part of India is particularly rich in rainforests. Further, the tropical rainforests in India are found in Assam, Andaman and Nicobar Islands, and Western Ghats, etc.

2. **Mangroves** : Mangroves are a unique mix of trees and tidal swamps. These fascinating forest ecosystems change greatly throughout the day.

3. **Inland forests** : Here, one will find plenty of mainland animals and birds (such as foxes and owls). Inland forests can be vast and ancient, or they can be smaller, like copses.

4. **The Taiga** : The taiga is the name for the sparse forest right towards the polar regions of the world, where conditions can be very cold and quite harsh.

5. **Mountain forests** : The forests that grow on mountains (such as mountain pines) help to create unique ecosystems. For example, the Himalayan Mountain forests in India.

CHARACTERISTICS OF FORESTS ECOSYSTEMS

Forest ecosystems are so rich and diverse, and they have so many exciting and fascinating features. Below, one will find a discussion of some of the key features of these ecosystems.

1. Seasonality : In countries that have seasonal climates, forest ecosystems will change with the seasons.

2. Deciduous or evergreen : A forest may be deciduous (i.e., it sheds its leaves in winter) or evergreen (i.e., its leaves stay green and intact all the time), or it may be a mix of both deciduous and evergreen trees.

3. Attractive to birds : Many birds species nest in tree tops and this makes forest ecosystems attractive to birds.

4. Attractive to insects : Many insects live in tree bark, leaf mulch or flowers and as such they find forest ecosystems very attractive places to make their homes.

FOREST DEGRADATION

Forest degradation results owing to decrease in tree cover, the biodiversity in the forests or the changes to a lower state of the forest structure. Continued degradation of the forests can destroy the entire forest cover and biodiversity, and it mainly occurs because of environmental and anthropogenic changes.

MAIN CAUSES AND EFFECTS OF FOREST DEGRADATION

1. Climate Change

Changes in world's climate due to extreme alterations of average atmospheric temperatures are a leading cause of forest degradation. Prolonged dry conditions and droughts can equally dry out the water systems running through the forests thereby gradually reducing the number of trees and species in such areas.

2. Forest Fires

Forest fires such as the ones that commonly happen in dry tropical forests are a major cause of forest degradation. Whenever forest fires are experienced, thousands of acres of trees and vegetation cover are wiped out. Almost every year, forests fires are witnessed across different forest region on earth which persistently affects the economy and biodiversity.

3. Air Pollution

Air pollution is a substantial causal factor for forest degradation. Pollution of the air by harmful gases and emissions leads to atmospheric acidification and acid rain that causes damage to trees and vegetation cover. Acid rain destroys the leaves of trees and vegetations needed for photosynthesis and alters the acidity of the water systems supporting the forests.

4. Forest Fragmentation

Fragmentation can also contribute to forest degradation. It mainly occurs due to natural causes such as tectonic movements or flooding. Fragmentation destroys healthy ecosystems since large forest animals mostly flourish in large forest regions as opposed to pieces of forests.

CONCLUSION

There are several ways to conserve the forest ecosystems which are as follows:

1. Controlled Deforestation

While deforestation cannot be avoided completely, one must look to control it. Young and immature trees should not be felled as far as possible. Adapting practices such as clear-cutting or selective cutting will be beneficial in the long run.

2. Protect against Forest Fires

Forest fires are the most common and deadly cause of loss of forests. They can start due to natural causes or can be accidents caused by man or even intentional in some cases. Once a fire spreads in a forest it is very difficult to control. Precautions must be taken for such incidents.

3. Afforestation

This is the process by which we plant more trees in the area. One tries to increase the forest cover by manual transplantation, or fresh plantation of trees. It is an attempt to balance our ecosystem to reduce the effects of deforestation and environmental pollutions of all types.

4. Better Farming Practices

Slash and burn farming, overgrazing by cattle, shifting agriculture are all farming practices that are harmful to the environment and particularly to forests.

Jhoom farming is one such practice we can employ to combat forest pollution. In the North-east areas of India, where the land is kept barren after cutting the crops. Weeds and creepers and wild plants grow on this land and make it fertile again in time. And then the land is cultivated again.

BIBLIOGRAPHY

- https://en.wikipedia.org/wiki/Forest_ecology
- https://importantindia.com/24333/forest-ecosystem-types.
- https://climate-woodlands.extension.org/forest-ecosystems.

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ACKNOWLEDGEMENT

I, Purbasha Sau, student of Gokhale Memorial Girls' College, Kolkata, would like to thank Ma'am Namrata Basu, ENVS teacher, who gave me an opportunity to work on this project. I got to engage in necessary research work, and to learn a lot about the various aspects and components prevailing in a forest ecosystem. I would also like to thank Calcutta University, and respected Principal ma'am, Smt. Atashi Karpha, for introducing the subject.

At last, I would like to extend my gratitude to my parents and friends, without the support of who, the work would not have been successful.

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INTRODUCTION

An ecosystem, also referred to as an ecological system, consists of all the organisms and the physical environment with which they interact. The biotic (plants, animals and microorganisms) and abiotic (soil, air, water, rocks and minerals) components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present.

Ecosystems are controlled by external and internal factors. The external factors, including climate, parent rock and topography, control the overall structure of an ecosystem. They are, however, themselves not influenced by the ecosystem. The internal factors are controlled, for example, by decomposition, root competition, shading and the types of species present. While the resource inputs are generally controlled by external factors, the internal factors contribute to the availability of the resources within the ecosystem.

Ecosystems, being dynamic entities, are subject to disturbances and are always in the process of recovery and change. The tendency of an ecosystem to remain close to its equilibrium state, despite the disturbance, is termed as its *resistance*. The capacity of a system to absorb disturbance and reorganize itself while undergoing change so as to retain essentially the same function, structure, identity and feedback is termed as its *ecological resilience*.

The study of an ecosystem can be done through a variety of approaches- theoretical studies, studies monitoring specific ecosystems over long periods of time, those that look at differences between ecosystems to elucidate how they work and through direct manipulative experimentation. Ecosystem classifications are specific kinds of ecological classifications that consider all four elements of the definition of ecosystem: a biotic component, an abiotic complex, the interactions between and within them, and the physical space occupied by them.

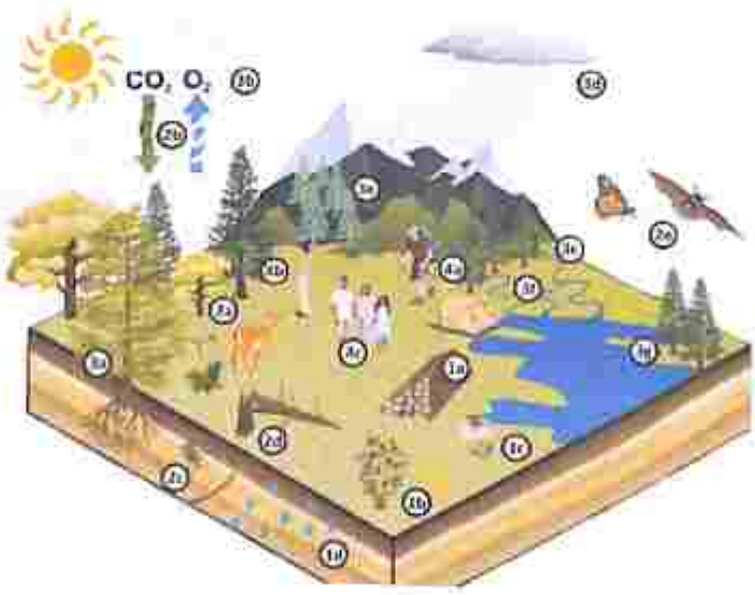
Ecosystems provide a variety of goods and services upon which the humankind depends. The goods include the 'tangible, material products', of ecosystem processes, such as water, food, fuel construction material and medicinal plants. Ecosystem services, on the other hand, are generally 'improvements in the condition or location of things of value'. These include maintenance of hydrological cycles, cleansing of air and water, maintenance of oxygen in the atmosphere and crop pollination.

As a result of human intervention and exploitation, ecosystems across the world are presently witnessing disruption and degradation in the forms of loss of soil fertility, habitat fragmentation, water diversion and pollution, fire suppression and imbalance in biodiversity. Ecosystem restoration, can however, contribute to achieving the goals of Sustainable Development.

WHAT IS A FOREST ECOSYSTEM?

A forest ecosystem is part of the terrestrial ecosystem, beside desert and grassland ecosystems. It is a functional unit or system which comprises of soil, trees, insects, animals, birds and humans as its interacting units. A forest is a large and complex ecosystem, and hence has a wide diversity of species.

A forest ecosystem, much like any other type of ecosystem, is comprised of both biotic and abiotic components. While the abiotic elements include inorganic materials like air, water and soil, on the other hand, the producers, consumers and decomposers make up the biotic aspects.



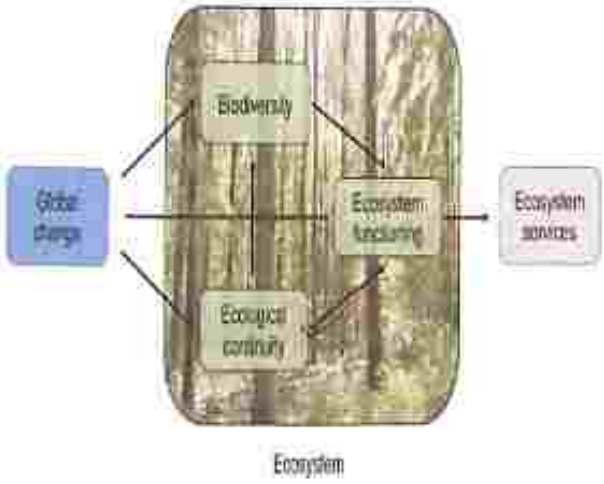
Ecosystem services of forests

1. **Provisioning Services**
   a. Timber/Fibre (construction, energy)
   b. Food (deer, fruits, herbs, seeds, honey)
   c. Chemical and medicinal products
   d. Water
2. **Supporting Services**
   a. Habitats for fauna and flora (biodiversity)
   b. Photosynthesis/Primary production
   c. Soil formation
   d. Nutrient cycling
   e. Pollination, seed dispersal
3. **Regulating Services**
   a. Carbon storage (above/below ground)
   b. Purification of air
   c. Purification of water
   d. Climate regulation
   e. Protection against erosion/ avalanches
   f. Flood mitigation
   g. Protection against coastal erosion and storms

STRUCTURAL FEATURES OF FOREST ECOSYSTEM

The two main structural features of a forest ecosystem are:

1. **Species Composition:** It refers to the identification and enumeration of the plant and animal species of a forest ecosystem.
2. **Stratification:** It refers to the vertical distribution of different species which occupy different levels in the forest ecosystem. Every organism occupies a place in an ecosystem on the basis of source of nutrition. For example, in a forest ecosystem, trees occupy the top level, shrubs occupy the second and the herbs and grasses occupy the bottom level.

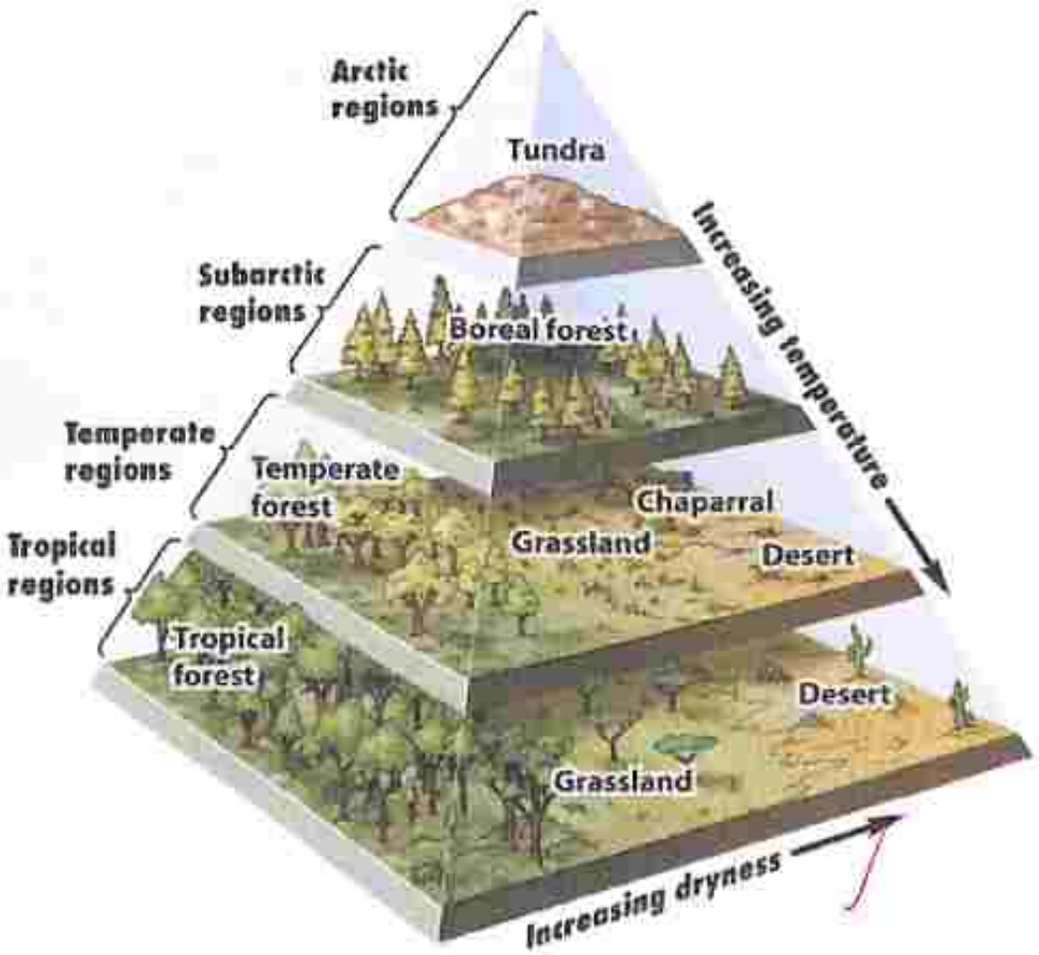


Ecosystem

CLASSIFICATIONS OF FOREST ECOSYSTEM

Forest ecosystems can be classified into the following categories:

1. The tropical forest ecosystem
2. The temperate forest ecosystem
3. The Boreal or Taiga forest ecosystem



TROPICAL FOREST ECOSYSTEM

Tropical forests (more commonly known as jungles), are forested landscapes in tropical regions, that is, land areas approximately bounded by the tropic of Cancer and Capricorn. The nature of tropical forest in any given area is affected by a number of factors, such as geographical location, climatic zone, levels of precipitation and characteristics of soil.

Tropical Evergreen Forests: These forests are also called tropical rainforests, and they occur in regions near the equator and close to the tropics, in regions of hot and humid climate. They do not have a particular dry season, and hence, the trees do not shed their leaves altogether. The thick canopies of the closely spaced trees do not allow sunlight to penetrate inside the forest. Hardwood trees like rosewood, ebony and mahogany are common here.

In India, such forests are found in the Western Ghats, regions of Greater Assam and Andaman and Nicobar Islands.

Tropical Deciduous Forests: Also known as monsoon forests, the tropical deciduous forests are found in regions that experience seasonal changes. The trees shed their leaves in dry season to conserve water. The hardwood trees of sal, teak, neem and shisham are found here, that are extremely useful for making furniture, transport and constructional materials.

In India, tropical deciduous forests can be found in the states of Madhya Pradesh, Chhattisgarh, Uttar Pradesh and Odisha.

TROPICAL EVERGREEN FOREST

TROPICAL DECIDUOUS FOREST

TEMPERATE FOREST ECOSYSTEM

A temperate forest is found between the tropical and boreal regions, in the temperate zone. It is the second largest biome on our planet, covering 25% of the world's forest area. These forests cover both the northern and southern hemispheres at latitudes ranging from 25 to 50 degrees.

Temperate Evergreen Forests: The temperate evergreen forests are located in the mid-latitudinal coastal region. They are commonly found along the eastern margin of the continents, e.g., In south east USA, South China and in South East Brazil. They comprise both hard and soft wood trees like oak, pine, eucalyptus, etc. The fauna in such forests includes raccoon, platypus, porcupine, lemur etc.

Temperate Deciduous Forests: These forests are found in higher latitudes, in the north-eastern parts of USA, China, Chile and New Zealand. They shed their leaves in the dry season. The common trees are oak, ash, beech, etc. Deer, foxes, wolves are the animals commonly found. Birds like pheasants, monals are also found here.

TEMPERATE EVERGREEN FOREST

TEMPERATE DECIDUOUS FOREST

CONCLUSION

Ecosystems form an indispensable part of nature, and the overall existence of mankind in general. To protect and to promote an ecosystem is the sole responsibility of man, and it is of utmost importance with regard to the present state of environmental degradation, that has been brought about by constant exploitation of natural resources. Conservation of ecosystem is the first and primary path toward sustainable development, which refers to the development that meets the needs of the current generation, without compromising the ability of the future generations to meet their own needs.

BIBLIOGRAPHY

The following websites have been referred to while completion of the project.

1. https://en.wikipedia.org/wiki/Ecosystem
2. https://www.researchgate.net/publication/345716175/figure/fig1/AS:956602651795461@1605083253998/Ecosystem-services-of-forests-subdivided-into-provisioning-services-supporting.png
3. https://img.brainkart.com/article/article-Structure-and-Functi-kps.jpg
4. https://media.springernature.com/lw685/springer-static/image/chp%3A10.1007%2F978-3-030-57710-0_16/MediaObjects/467062_1_En_16_Fig1_HTML.png
5. https://media.springernature.com/lw685/springer-static/image/chp%3A10.1007%2F978-3-030-57710-0_16/MediaObjects/467062_1_En_16_Fig1_HTML.png
6. https://avianreport.com/wp-content/uploads/2018/03/piura-jorge-novoa_optimized.jpg
7. https://media.istockphoto.com/photos/green-forest-foliage-aerial-view-woodland-tree-canopy-nature-picture-id598520904?k=20&m=598520904&s=612x612&w=0&h=k70hEEZ_S7PJT1_6lWueTOQe3w5Ue1nzODzT-fU-14E=
8. https://cdn.britannica.com/27/205327-050-FA4A0FE2/trees-beeches-birches-chestnuts-maples-elms-aspens.jpg
9. https://letstalkscience.ca/sites/default/files/2020-02/wild-elk-banff.jpg

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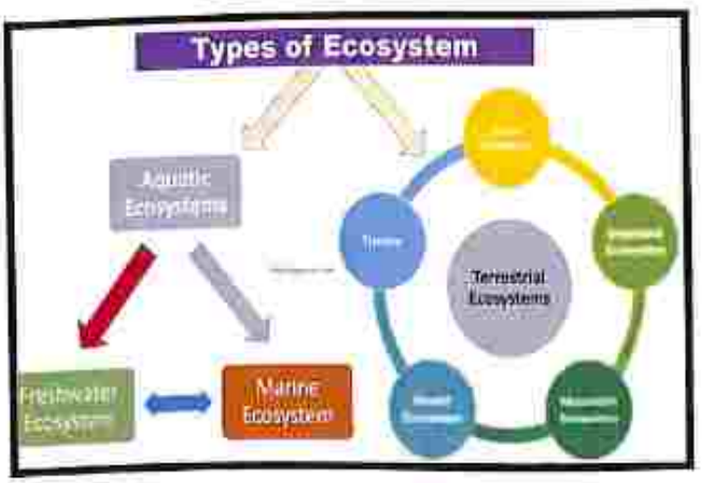
ACKNOWLEDGEMENT

I would like to show my sincere gratitude to my environmental science teacher Ms. N. Basu for guiding us in making this project. I would also like to thank my parents to encouraged me to do this project. Lastly I would also thank my classmates who provided me with their help throughout the project to make it a success.

INDEX

INTRODUCTION

Ecosystem ecology is the integrated study of living (biotic) and non-living (abiotic) components of ecosystems and their interactions within an ecosystem framework. This science examines how ecosystems work and relates this to their components such as chemicals, bedrock, soil, plants, and animals. An ecosystem (or ecological system) consists of all the organisms and the physical environment with which they interact.[2]:458 These biotic and abiotic components are linked together through nutrient cycles and energy flows. Energy enters the system through photosynthesis and is incorporated into plant tissue. By feeding on plants and on one another, animals play an important role in the movement of matter and energy through the system. They also influence the quantity of plant and microbial biomass present. By breaking down dead organic matter, decomposers release carbon back to the atmosphere and facilitate nutrient cycling by converting nutrients stored in dead biomass back to a form that can be readily used by plants and microbes.



CLASSIFICATION OF ECOSYSTEMS OF THE WORLD

Ecosystems are divided into two types: Natural ecosystems, and Man-made Ecosystems. Ecosystems are the structural and functional units of ecology in which living species interact with one another and with their surroundings.An ecosystem, in other terms, is a series of interactions between species and their surroundings.

NATURAL ECOSYSTEM:

A natural ecosystem is an assemblage of plants and animals that works as a unit and is capable of retaining its identities, such as a forest, grassland, or estuary.A natural ecosystem may sometimes include human intervention.Solar energy is essential to a natural ecosystem's survival. Natural Ecosystems are divided into two groups:

Terrestrial ecosystems include forests, grasslands, deserts, and tundra ecosystems.
Aquatic ecosystems include plants and animals that live in bodies of water.

Terrestrial ecosystems are ecosystems that are mostly found on land.
Terrestrial ecosystems cover roughly 140 to 150 million km2, or about 25 to 30 percent of the total land area on the planet.The decreased availability of water in terrestrial ecosystems, as well as the role of water as a limiting factor, distinguishes them from aquatic ecosystems. Since the the atmosphere is more transparent than water, light is more readily available.

terrestrial environments than in aquatic ecosystems.Terrestrial ecosystems have more gas availability than aquatic environments. Terrestrial ecosystems are ecosystems which are found on land. Examples include tundra, taiga, temperate deciduous forest, tropical rain forest, grassland, deserts. Terrestrial ecosystems differ from aquatic ecosystems by the predominant presence of soil rather than water at the surface and by the extension of plants above this soil/water surface in terrestrial ecosystems.

The aquatic ecosystem definition states it is a water-based environment, wherein, living organisms interact with both physical and chemical features of the environment. These living creatures whose food, shelter, reproduction, and other essential activities depend on a water-based environment are known as aquatic organisms. There are two types of aquatic ecosystems, namely marine ecosystems and freshwater ecosystems.

Marine Water Ecosystem:

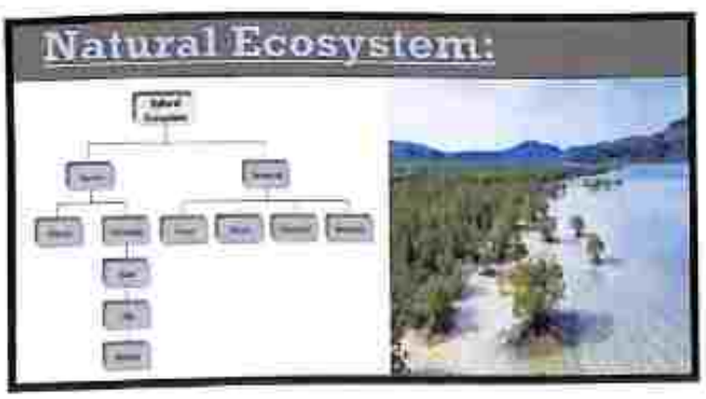
This particular ecosystem is the largest aquatic ecosystem and covers over 70% of the earth's total surface. This ecosystem is relatively more concentrated in terms of salinity. Nonetheless, the body of aquatic organisms is well-adjusted to saline water, and they may find it challenging to survive in freshwater.

Ocean Ecosystems:

Our planet earth is gifted with the five major oceans, namely Pacific, Indian, Arctic, and the Atlantic Ocean. Among all these five oceans, the Pacific and the Atlantic are the largest and deepest ocean. These oceans serve as a home to more than five lakh aquatic species. Few creatures of these ecosystems include shellfish, shark, tube worms, crab small and large ocean fishes, turtles, crustaceans, blue whale, reptiles, marine mammals, seabirds, plankton, corals and other ocean plants.

Coastal Systems:

They are the open systems of land and water which are joined together to form the coastal ecosystems. The coastal ecosystems have a different structure, and diversity. A wide variety of species of aquatic plants and algae are found at the bottom of the coastal ecosystem. The fauna is diverse and it mainly consists of crabs, fish, insects, lobsters snails, shrimp, etc.



TYPES OF NATURAL ECOSYSTEM

POND ECOSYSTEM

A pond ecosystem is a freshwater ecosystem that can either be temporary or permanent and consists of a wide variety of aquatic plants and animals interacting with each other and the surrounding aquatic conditions. The pond ecosystem falls under the category of a lentic ecosystem because the water remains stagnant for a longer period.

Characteristics of Pond Ecosystem:

The following are the main characteristics of the pond ecosystem:

- The water in the pond ecosystem is stagnant.
- Either natural or artificial boundaries surround the pond ecosystem.
- The pond ecosystem exhibits three distinct zones, the littoral zone, limnetic zone, profundal zone, and benthic zone.
- The biotic components of the pond ecosystem occupy different levels in the pond ecosystem, therefore, avoid the competition for survival. Scavengers and decomposers occupy the bottom level, and fish occupy the middle level. The plants enclose the pond's boundaries and provide shelter to small animals and insects.
- Pond ecosystems show a wide range of variety in their size.

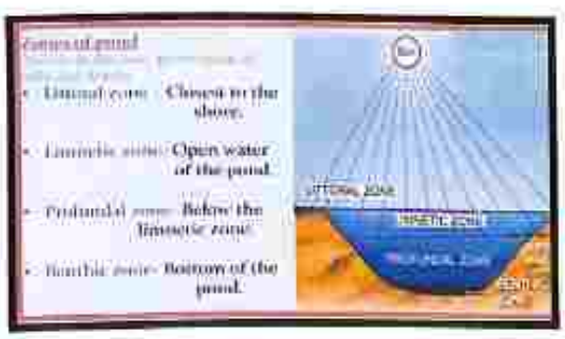
Stratification of Pond Ecosystem:

Littoral zone: It is the zone closer to the shore. It contains shallow water and allows easy penetration of light. Rooted plant species occupy it. Animal species include reeds, crawfish, snails, insects, etc.

Limnetic zone: The limnetic zone refers to the open water of the pond with an effective penetration of light. This zone is dominated by phytoplankton. Animal species mainly include small fishes and insects.

Profundal zone: The region of a pond below the limnetic zone is called a profound zone with no effective light penetration. Some amphibians and small turtles occupy it.

Benthic zone: The bottom zone of a pond is benthic and is occupied by a community of decomposers. The decomposers are called benthos.



DIFFERENT ZONES OF POND ECOSYSTEM

Some aquatic plants help to improve the water quality by absorbing pollutants and heavy metals.The shoreline plants absorb nitrogen and phosphorus and therefore prevent the algal bloom and maintain the oxygen level in the pond. Moreover, aquatic plants absorb animal wastes to reduce the nutrient availability for plants and therefore prevent the growth of algae.The pond ecosystem is one of the sites for the conservation of biodiversity as different

types of plants and consumers occupy different strata in the pond and live together by interacting with each other. Ponds in mountain regions conserve the endangered species. The pond ecosystem also serves as a source of water for the species that do not live in the pond.Pond ecosystems contribute to the beauty of nature as they accommodate a variety of ornamental flowering plants.Stratification in the pond ecosystem determines the distribution of animal species in the pond. It reduces the competition among the species to some extent.

FOOD CHAIN IN POND ECOSYSTEM:

1. The food chain is a sequence of organisms in which each organism eats the lower member and is being eaten up by the next higher member.
2. Phytoplankton and algae serve as producers that convert solar energy into chemical energy.
3. Phytoplankton is being consumed by zooplankton (primary consumers).
4. The food chain further proceeds with the small pond species that feed on zooplankton.
5. Small pond species are eaten by large pond species.
6. A number of bacteria and fungi feed on dead and decaying parts of the animal species and are therefore called decomposers. Decomposers convert the organic matter (dead plants and animals) into their inorganic components that are again utilised by producers, and hence a continuous flow of energy is maintained.

FOOD CHAIN POND ECOSYSTEM

TYPES OF POND ECOSYSTEM:

Garden pond ecosystems: These are man-made artificial pond ecosystems that comprise ornamental plants and animal species exported from all over the world.

Salt pond ecosystems: These ecosystems are naturally formed at the seaside and contain brackish water. These are formed due to waterlogging. These can also be found in rocky areas on the beach called rock pools. Since it contains brackish water, it can accommodate sea plants and animals.

Freshwater pond ecosystems: These ecosystems are naturally formed due to rainfall or soil water saturation due to continuous rain. Moreover, they can also be formed due to the flow of river water into a large and deep depression. These ecosystems serve as a home to freshwater fishes, amphibians, crustaceans, and many other kinds of wildlife.

Venereal pond ecosystems: These are seasonal ponds that are temporarily formed during the heaviest rainfall due to the accumulation of water in the depressions in the ground. With the change in the season, they often turn into desert land.

Mountain pond ecosystems: Naturally formed ponds are found in the mountain regions. These are formed due to the shifting of rocks and snow melting. They accommodate rare or endangered aquatic species.

Abiotic components are the non-living components of an ecosystem that matter for the aquatic species' survival. There are the following main abiotic components of a pond ecosystem:

Light: Light serves as a main abiotic component required for the photosynthetic activities of the phytoplankton. The littoral zone has the maximum light penetration, whereas the profound zone has the least light penetration.

Temperature: As the depth of the pond increases, the temperature of the water gradually decreases due to the gradual decrease in the light penetration.

Dissolved oxygen: The amount of dissolved oxygen is maximum in the shallow water and gradually decreases while moving from the surface to the depth of the pond.

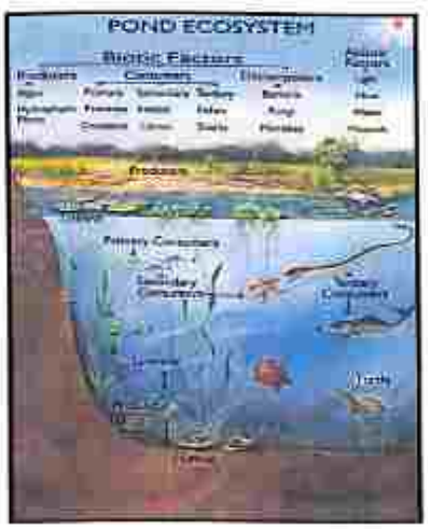
Biotic components are living components. A wide variety of living components are found in the pond ecosystem can be discussed as follows:

Producers: These include species of rooted, submerged, emerged, floating plants and algae. The most common filamentous algae found in ponds is Spirogyra. Mougeotia and Zygnema are some other algae found in the pond. Azolla, Hydrilla, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Potamogeton, Jussiaea, etc., are a few examples of green plants that are found in the pond ecosystem.

Primary consumers: A large population of zooplanktons are the main primary consumers. Besides these, small herbivores such as snails, insects, small fishes, tadpoles, and larvae of aquatic animals are the primary consumers often found in the pond.

Secondary consumers: These include large animal species such as frogs, big fishes, water snakes, crabs, etc. The consumers of the highest order might include mammals like water shrews, water voles, herons, ducks, kingfishers, etc.

Decomposers: These include different types of bacteria and fungi that feed upon dead and decaying parts of the aquatic species.



BIOTIC AND ABIOTIC FACTORS AFFECTING POND ECOSYSTEM

The pond ecosystem is an aquatic ecosystem that comprises several submerged, emerged, free-floating plants and algae living together with different types of animal species. Stratification is one of the characteristic features of the pond ecosystem that determines the availability of essential abiotic factors such as light, oxygen, minerals, etc., to the different levels of depth in the pond. The availability of abiotic factors also determines the distribution of consumers and decomposers according to their need for different abiotic factors.

Aquatic Plant Benefits:

Improvement of water quality: Some water plants soak up pollutants and heavy metals, which help in improving water quality. Aquatic plants also remove excess nutrients that help prevent contaminants enter the Pond. The shoreline plants absorb nitrogen and phosphorus before algae could use them.

Habitat for wildlife: Aquatic plants provide a layout for fish to hide to protect them from predators. Some construct a nesting site in vegetation. But some fish use plants to catch their prey. Plants also provide shade which helps reduce the amount of sunlight entering the water, thus helping to slow down algae growth.

Algae control: Aquatic plants that absorb nutrients such as fish waste help to reduce nutrient availability, thus slowing down algae growth. Floating plants like water lettuce, water hyacinth are heavy feeders. They help in starving algae and prevent the Pond from going green.

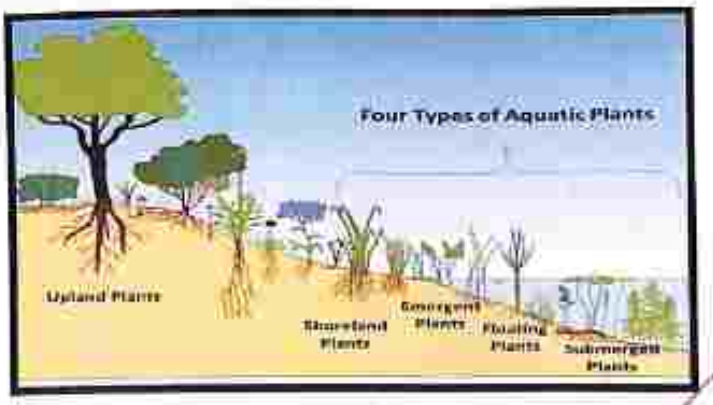
Stabilized shorelines: Shoreline or emerging plants have large root structures. This helps to reduce wave flow and stabilize the shore. They hold on to the sediments at the pond bottom effectively.

Food for fish and wildlife: Toads, fish, turtles, insects, ducks, and many other animals in the Pond consumes aquatic plants.

Improve Aesthetics: Aquatic plants add beauty to the Pond with colorful flowers floating on the surface while maintaining a healthy and balanced pond ecosystem.

Native plants: including grass, rush, reed, iris, lily pads, arrowhead, pickerel plants, shoreline shrubs, and trees are some of the options to choose from to manage the natural Pond.

Plants in pond ecosystem: All ponds support aquatic plants at various depths of water. However, the native plant species differ by location in the world. Evergreen plants that are intolerant of winter frosts typically grow in tropical regions, while in moderate climates, plants that go passive in winter resprout from their roots.



TYPES OF AQUATIC PLANTS

These are the various types of pond ecosystem present around us. Ponds are a part of aquatic ecosystem of the world.

CONCLUSION

Though they can be found all over the globe, pond ecosystems are often neglected by conservationists. All of our wetland ecosystems ought to be safeguarded because they are vital habitats for an abundance of different species. Ecosystems are created by the interrelationships between living organisms and the physical environments they inhabit (land, water, air). Ecosystems require a source of energy to make them work and for most, although not all, this is light from the sun. Food chains and food webs are a way of mapping one type of interrelationship between the organisms in an ecosystem. Human beings are part of ecosystems, as well as manipulators of ecosystems. As such we are dependent on, as well as responsible for, the ecological health of the ecosystems we inhabit. We have found that ponds are greatly influenced by humans, even though we don't pay much attention to them because they are usually quite small and uninteresting with not many animals, or they seem very man-made and controlled with man-made waterfalls or species. All of our wetland ecosystems ought to be safeguarded because they are vital habitats for an abundance of different species. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions.

BIBLIOGRAPHY

Websites referred to:

http://ncert-solution.in/pond-ecosystem-meaning-types-characteristics-importance-essay/

https://www.earthreminder.com/pond-ecosystem-types-food-chain-animals-plants/

https://education.nationalgeographic.org/resource/resource-library-terrestrial-ecosystem

https://www.nature.com/scitable/knowledge/ecosystem-ecology-13228212/

Pictures reference:

https://www.google.co.in/search?q=different+ecosystems+pictures&tbm

https://www.google.co.in/search?q=study+of+ecosystem&tbm=isch&hl=en

https://www.google.co.in/search?q=study+of+ecosystem&tbm=isch&h

https://www.google.co.in/search?q=types+of+ecosystem&client=

NB
20/6/2022

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SEMESTER – II

UNIVERSITY ROLL NO. - 213013-11-0005

REGISTRATION NO. - 013-1211-0132-21

SUBJECT – ENVIRONMENTAL STUDIES

SUBJECT CODE- AECC 2

COLLEGE- GOKHALE MEMORIAL GIRLS' COLLEGE

ACKNOWLEDGEMENT

I would like to thank our respected Principal Ma'am, Dr. Atashi Karpha and our respected Namrata Basu Ma'am for giving us the opportunity to work on this project and guiding our way throughout.

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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.

TYPES OF POLLUTION:

Air pollution: the release of chemicals and particulates into the atmosphere. Common gaseous pollutants include carbon monoxide, sulfur dioxide, chlorofluorocarbons (CFCs) and nitrogen oxides produced by industry and motor vehicles.

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.

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

Further, pollution can be categorized into:

- **Urban pollution:** It is the presence or introduction in cities and urban areas of poisonous or harmful substances.
- **Rural pollution:** the presence or introduction in cities and urban areas of poisonous or harmful substances.

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.

CAUSES OF URBAN POLLUTION:

1. **Transportation** - The use of private vehicles (particularly older, diesel models) is the major source of urban pollution. About one-quarter of particulate matter in the air is due to vehicles. About one-quarter of particulate matter in the air is due to vehicles
2. **Industrialization** - Industrialization is also a major contributor to urban pollution as the area having industries particularly show poor air quality. Factories release many toxic gases due to the burning of fossil fuels and the use of chemicals. These gases react with each other and with other atmospheric constituents, as a result contaminating the quality of air.
3. **Combustion and agriculture** - Combustion of material is an activity that releases toxic gases in the atmosphere and contributes to urban air pollution.
4. **Mining Operations** - Mining is a process wherein minerals below the earth are extracted using large equipment. During the process, dust and chemicals are released in the air causing massive air pollution.
5. **Deforestation** – large number of trees have been cut down and forests are being cleared at a high rate to give way for building houses, factories, industries etc. This leads to deforestation.

EFFECTS OF URBAN POLLUTION:

- Respiratory problems and heart trouble
- Forest fires
- Depletion of ozone layer
- Harm to aquatic life
- Eutrophication
- Acid rain

PREVENTION:

- Using the public mode of transport instead of private ones
- Afforestation
- Building factories away from cities and towns
- Using CNG AND LPG based vehicles
- Installing solar panels wherever possible
- Adoption of less environmentally harmful pesticides or cultivation of crop strains with natural resistance to pests; and
- Reducing the use of plastic

VISIT TO A LOCAL POLLUTED SITE:

BELGHORIA EXPRESS WAY (LAND AND AIR POLLUTION)

The previous pictures, were taken in the belghoria expressway. Huge number of wastes are dumped there regularly. The garbage dump has been around for 50 years, spread over 20 acres and used by five different municipalities: Dum Dum, South Dum Dum, North Dum Dum, Baranagar and New Barrackpore. Nowadays, the waste is either being burnt or self-igniting, releasing huge number of toxic fumes during the process. Residents of the place have called it "unfit for living" and have developed heart problems and skin disease because of it.

CAUSES OF POLLUTION IN THIS AREA:

- Solid wastes being dumped carelessly
- Agricultural waste
- Use of plastic bags
- No proper disposal of the waste
- Burning of the wastes
- Lack of proper sanitization and cleaning
- Industrial waste directly being dumped without proper treatment

EFFECTS OF POLLUTION IN THIS AREA:

- Climate change
- Deterioration of fields
- Respiratory health problems
- Ground water contamination
- Landfills fires
- Sore to the eye

CONCLUSION:

Environmental pollution has become a greatly hazardous. Environmental pollution and our survival are among the biggest challenges of future as pollution and contamination of natural resources are adversely affecting global livelihood. hence proper measures should be taken to control and keep it in check. Few of the control measures are:

- Reducing food wastes
- Saving the leftovers for the next day instead of dumping it
- Buying things with less packing
- Minimizing the use of plastic bags.

It is upon us and the society at large, to work unitedly towards the prevention of pollution and protect our environment. Everyone must take a step towards change ranging from individuals to the industries.

BIBLIOGRAPHY

https://link.springer.com/referenceworkentry

https://airqoon.com/urban-air-pollution-sources-and-pollutants.html

https://www.conserve-energy-future.com/causes-effects-solutions-of-air-pollution.php

https://wasteadvantagemag.com/

AB 20/6/2022

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UNIVERSITY ROLL NUMBER- 213013-11-0006

REGISTRATION NUMBER- 013-1211-0133-21

SUBJECT- ENVIRONMENTAL SCIENCE

SUBJECT CODE-AECC-2

COLLEGE – GOKHALE MEMORIAL GIRLS' COLLEGE

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ACKNOWLEDGEMENT

I would like to express my gratitude to our principal Dr Atashi Karpha and my subject professor , Madam Namrata Basu for their constant guidance and encouragement throughout

POLLUTION

Pollution, also called environmental pollution, the addition of any substance (solid, liquid, or gas) or any form of energy (such as heat, sound, or radioactivity) to the environment at a rate faster than it can be dispersed, diluted, decomposed, recycled, or stored in some harmless form. The major kinds of pollution, usually classified by environment, are air pollution, water pollution, and land pollution. Modern society is also concerned about specific types of pollutants, such as noise pollution, light pollution, and plastic pollution. Pollution of all kinds can have negative effects on the environment and wildlife and often impacts human health and well-being.

The different types of pollution are as follows:-

• **Air Pollution:** - It is the contamination of the natural air by mixing it with different pollutants such as harmful fumes and chemicals. This type of contamination can be caused by burning material or by gases emitted by vehicles or harmful fumes emitted as a by-product of industries. Global warming is one of the biggest side effects of air pollution .

• **Water Pollution:-** It includes water contamination by pollutants such as bacterial, chemical, and particulate that reduces the purity of the water. Oil seepage, as well as littering is one of the most common forms of pollution.

• **Land Pollution:-** It is also known as soil pollution. It is the contamination of the soil or the land that prevents the growth of natural life. The very common causes of soil pollution include hazardous wastage, mining as well as littering, non-sustainable farming practice, seepage into the soil, etc.

• **Noise Pollution:-** It is the loud noises which are fashioned by human activities that disturb the standard of living in the affected area. It can shoot from things such as railroads, traffic, loud music, concerts, aeroplanes, fireworks etc. This can even result in permanent or temporary loss of hearing .

• **Radioactive Pollution:-** This is one of the most dangerous forms of pollution. It is enormously harmful and can even result in death. Leakages or accidents at nuclear power plants, as well as from improper disposal of nuclear waste are also reasons for this pollution. This pollution results in birth defects, cancer, deteriorating of health and even death.

Pollution is seen mainly found in 2 sectors -

- Urban pollution – urban pollution refers to presence or introduction of poisonous or harmful substances in the urban areas
- Rural pollution- rural pollution refers to the contamination of the rural areas due to agricultural waste , power plants nearby rural areas

URBAN POLLUTION

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 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.

CAUSES OF URBAN POLLUTION

1)Transportation
The use of private vehicles (particularly older, diesel models) is the major source of urban pollution.

2) Domestic use of fossil fuels
Half of the world population still relies on solid fuels for cooking and heating. These fuels, including wood, charcoal and coal, are burned in inefficient stoves that release large quantities of health and environment damaging matter around urban areas.

3)Industrialization
Industrialization is also a major contributor to urban pollution. Factories release many toxic gases due to the burning of fossil fuels and the use of chemicals in the nearby environment causing urban pollution.

4) Power generation
With increased population, there is an increased energy demand. To fulfill that demand, fossil fuels are tremendously being used to generate energy as they are cheap and readily. The coal powered power plants are a major source of urban pollution.

5) Deforestation

Another primary cause of urban pollution is cutting down of trees to provide space for building of houses and industries for the huge amount of population in the urban areas leading to deforestation.

EFFECTS OF URBAN POLLUTION

- Respiratory and heart problems

- Acid rain
- Depletion of ozone layer
- Soil degradation

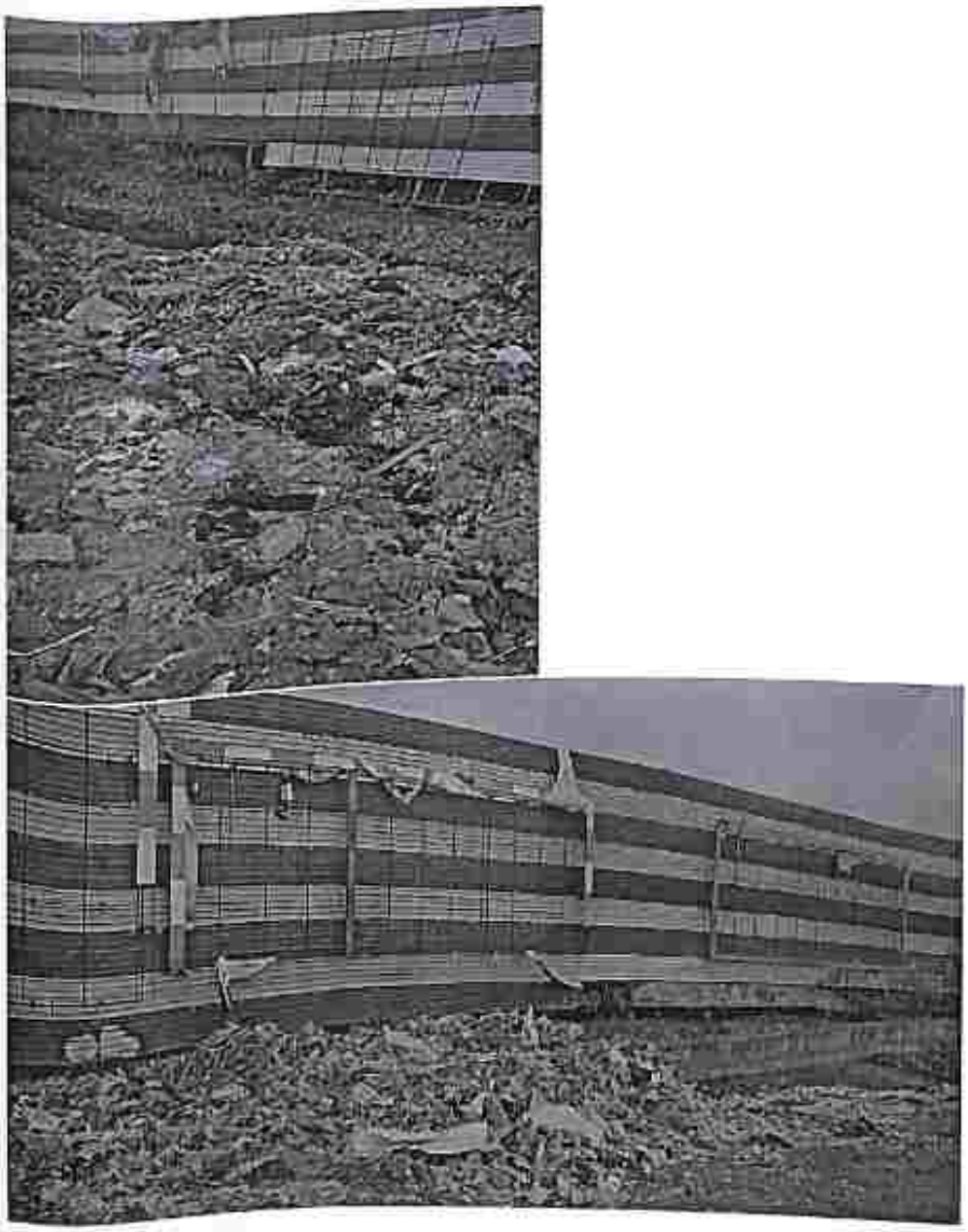
- Harmful for aquatic animals
- Loss of wildlife
- Forest fires

PREVENTION OF URBAN POLLUTION

- Afforestation
- Building factories away from cities and towns
- Using vehicles that run on LPG , CNG or batteries
- Avoid using plastic bags
- Proper discharge of thermal waste should be ensured.

VISIT TO A LOCAL POLLUTED SITE [URBAN]

BELGHORIA EXPRESSWAY (LAND AND AIR POLLUTION)



The previously given picture shows the urban land pollution in the Belghoria Expressway located in the northern fringes of Kolkata , West Bengal. These pictures show that the area is covered with huge garbage dumps. The situation there is worse now because the dump is either self igniting or is being set on fire and is billowing our toxic fumes which is causing air pollution and inturn leading to various health problems to the residents living nearby .

CAUSES OF POLLUTION IN THIS AREA

- Careless dumping of waste.
- Use of plastic bags.
- Burning of waste materials.
- Irregular cleaning and sanitization .
- Lack of reuse and recycling of waste.

EFFECTS OF POLLUTION IN THIS AREA

- Emits bad odour and toxic gases which might lead to various respiratory problems.
- Garbage may be consumed by street animals .
- Breeding grounds for mosquitoes and rodents .
- Since Kolkata is a major metropolitan city it maybe a sore to the eye for tourists and other people who visit the area .
- Causes major soil degradation in the area.
- Water supply nearby maybe contaminated .

CONCLUSION

Environment pollution can prove to be very hazardous and to not only the environment but even causes various hard diseases and skin problems to the people and effective steps should be taken to reduce them . Therefore, we need to adapt various measures to reduce environment pollution . Some of them includes reducing the use of non-renewable sources of energy, proper disposal of waste . It is the responsibilty of every individual to keep their surroundings clean and not litter waste on the public areas . The government should also take initiatives in clearing up garbage dumps in places like Belghoria Expressway .

Other ways to reduce land and air pollution -

- Avoid burning of waste materials
- Proper cleaning and sanitization
- Reuse and recycle of waste
- Saying no to plastic bags
- Avoid using chemical products

BIBLIOGRAPHY

IMAGE SOURCE -

Taken by the researcher

- https://www.qld.gov.au
- https://www.conserve-energy-future.com
- https://link.springer.com

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20/6/2022

ECOSYSTEMS

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NAME: Shalini Chakraborty
SEMESTER: 2
UNIVERSITY ROLL NO.: 213013-11-0007
UNIVERSITY REGD NO.: 013-1211-0134-21
SUBJECT CODE: AECC 2

ACKNOWLEDGEMENT

I would like to thank my professor Smt. Namrata Basu for allowing me to work on this project and helping me with the same. Along with that, I would also like to thank our respected college principal Mrs. Atashi Karpha wholeheartedly.

I would also want to thank my parents and friends who helped me in finalizing and completing this project within the very limited time frame.

INDEX:

NTRODUCTION:

All organisms such as plants animals microorganisms and human beings as well as the physical surroundings interact with each other and maintain a balance in nature. All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. **Ecosystems can be visualised as a functional unit of nature where living organisms interact among themselves and also with the surrounding physical environment.** Ecosystems varies greatly in size from a small pond to a large forest or a sea.

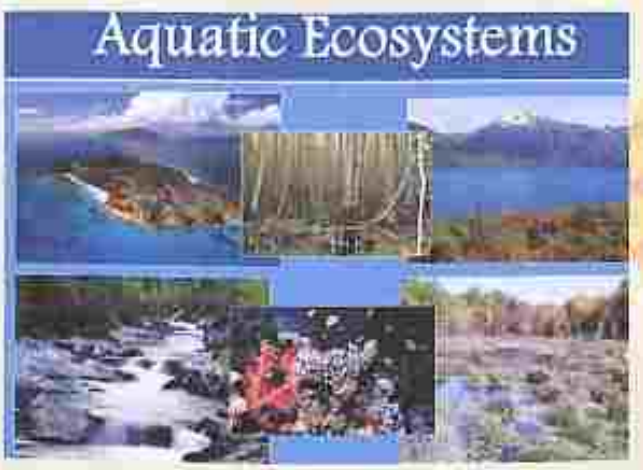
In 1935, Sir Arthur Tansley was the first ecologist who used the term ecosystem to explain the tangible relationships that exist between organisms in the biological world. The concept of an equal ecosystem introduced by him viewed each locale habitat as an integrated whole.

An Ecosystem

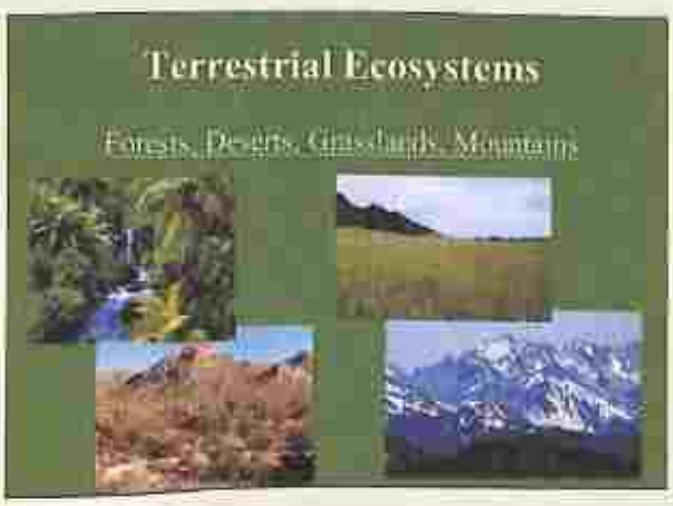
CLASSIFICATION OF ECOSYSTEMS:

Ecosystems can be broadly divided into two main categories as **terrestrial** and **aquatic** ecosystems. Major terrestrial or land ecosystems include grasslands, forests, deserts, etc. while major aquatic ecosystems include ponds, lakes, rivers, estuaries, oceans, coastal and inland wetlands, etc.

Here, our discussions would be restricted to only Forest ecosystems.



Different types of ecosystems



FORESTS:

A forest is an area of land dominated by trees. The United Nations' Food and Agriculture Organization (FAO) defines a forest as, **"Land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban use."**

These pictures depict the various kinds of forests

Forest ecosystems are areas of the landscape that are dominated by trees and consist of biologically integrated communities of plants, animals and microbes, together with the local soils (substrates) and atmospheres (climates) with which they interact. Forests are much more than the present population or community of trees. Forests that have been recently killed or altered by fire, insects, disease, wind or logging are still forests because of the biological and physical legacies from the previous forest – legacies of forest soil, organic matter, microbes, minor vegetation and animals. Under a regime of sustainable forest management, many or most of these legacies persist during the period between forest disturbance and the redevelopment of tree cover. Periodic disturbance is a key attribute of most forest ecosystems, and maintenance of their historical character and values will generally require maintenance of historical disturbance regimes, or the ecological effects thereof.

We will now discuss a bit about the Sundarbans, which is one of the classic examples of forest ecosystems.

THE SUNDARBANS:

The Sunderbans is a mangrove area formed by the confluence of **Ganga**, **Brahmaputra** and **Meghna** rivers in the Bay of Bengal. It comprises closed and open mangrove forests, land used for agricultural purpose, mudflats, and barren lands and is intersected by multiple tidal streams and channels. The physiography of Sunderbans is dominated by deltaic formations that include innumerable drainage lines associated with surface and sub-aqueous levees, splays and tidal flats. There are also marginal marshes above mean sea level, tidal sandbars and islands.

The life of people inhabiting in Sunderbans

Satellite image of the Sundarbans Deltaic region

The Sundarbans mainly features 2 Ecoregions:

The Sundarbans freshwater Swamp Forests- The Sundarbans freshwater swamp forests are a tropical moist broadleaf forest ecoregion of Bangladesh. It represents the brackish swamp forests that lie behind the Sundarbans Mangroves, where the salinity is more pronounced. It covers 14,600 sq. kilometres of the vast Ganges-Brahmaputra delta, extending from the northern part of Khulna district and finishing at the mouth of the Bay of Bengal with scattered portions extending to India's West Bengal state. The Sundarbans freshwater swamp lies between the upland Lower Gangetic moist deciduous forests and the brackish-water Sundarbans mangrove bordering the Bay of Bengal. Victims of large-scale clearing and settlement to support one of the densest human populations in Asia, this ecoregion is under a great threat of extinction. Hundreds of years of habitation and exploitation have exacted a heavy toll on its ecoregion's habitat and biodiversity. Habitat loss in this ecoregion is so extensive and remaining habitat is so fragmented that it is difficult to assert in the composition of the original vegetation of this ecoregion.

A Bengal Tiger in the Sundarban's freshwater Swamp Forest

Sundarbans Mangroves- The Sundarbans mangrove ecoregion on the coast forms the seaward fringe of the delta and is the world's largest mangrove ecosystem with 20,400 sq. kilometres of area covered. The dominant mangrove species is *Heritiera fomes*. Twenty-six of the fifty broad mangrove species found in the world grow well in the Sundarbans. The commonly identifiable vegetation types in the dense Sundarbans mangrove forests are salt water mixed forest, mangrove scrub, brackish water mixed forest, littoral forest, wet forest and wet alluvial grass forest. The Bangladesh mangrove vegetation of the Sundarbans differs greatly from the other non-deltaic coastal mangrove forest and upland forest associations.

The Sundarban Mangroves

The Flora and Fauna of Sundarbans:

The Mangrove vegetation of Sundarbans have 64 plant species which are capable of withstanding estuarine conditions and large amounts of salinity. Several species are endemic such as *Aegialitis rotundifolia*, *Heritiera fomes*, *Sonneratia apetala*, or *S. griffithii*.

Among the fauna, the Royal Bengal tiger (*Panthera tigris*), Jungle cat, Leopard cat, Chital deer, etc. are some of the mammals found. The aquafauna include Sea snake, Rat snake, Pythons, Hawksbill turtle, etc. Brown-winged kingfisher, Woodpeckers, Spot-billed pelicans, Masked finfoots, Brahminy kites, etc. are some of the common avifauna found in the Sundarbans.

Royal Bengal Tiger (*Panthera tigris*)

Sonneratia caseolaris

Brahminy kite

Bruguiera gymnarrhiza

Brown-winged kingfisher

CONCLUSION:

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

Many ecosystems become degraded through human impacts, such as soil loss, air and water pollution, habitat fragmentation, water diversion, fire suppression, and introduced species and invasive species.

BIBLIOGRAPHY:

https://www.rajras.in/ecosystem-structure-functions-components/

https://en.m.wikipedia.org/wiki/Forest

en.wikipedia.org/w/index.php

https://www.fao.org/3/xii/ms18-e.htm

https://en.m.wikipedia.org/wiki/Ecosystem

Flora of Sundarbans | naturewildlife

Getty Images/iStockphoto Copyright: Thomas_Zsebok_Images

Plants & Animals in Deciduous Forests (sciencing.com)

X

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PAPER CODE: **AECC-2**

COLLEGE: **GOKHALE MEMORIAL GIRLS' COLLEGE**

TOPIC: **VISIT TO A LOCAL URBAN POLLUTED SITE**

ACKNOWLEDGEMENT

I would like to convey my deepest gratitude to our Principal madam, Dr. Atashi Karpha for the opportunity to do this project, and to our instructor, Namrata Basu ma'am for her guidance on this project. Last but not the least, I would like to thank my parents for their everlasting support, which has enabled me to complete this project within the limited time frame.

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Introduction

Pollution is an undesirable change in the physical, chemical, or biological characteristics of the environment. It adversely affects the life support system of the biosphere. The agents that pollute the environment are called pollutants. Pollutants are of two types- non-degradable and biodegradable. Non-degradable pollutants like plastic, pesticides, are not decomposed by bacteria, so they persist for a long time in the environment. Biodegradable pollutants like paper, fertilizers, domestic sewage are broken down by bacteria into simple components.

In this project, urban pollution in and around Dunlop area has been focused upon.

Urban Pollution: Meaning

The presence or introduction of harmful or poisonous substances in cities and urban areas is referred to as urban pollution.

Urban Pollution: Causes

Urban pollution is majorly caused due to emissions related to human activities. Factory emissions, transportation, dumping of waste in landfills or water bodies, are examples of detrimental human activities leading to pollution.

Urban Pollution: Types

Urban pollution can be classified majorly into air pollution, water pollution, soil pollution, waste pollution, noise pollution. Other types may include light pollution, radioactive pollution, thermal pollution. These types are briefly discussed below.

Air Pollution

Air pollution is intensified in cities because of housing, population density, industry accumulation, and traffic. Major pollutants that affect human health include suspended particulate matter (SPM), ground-level ozone, nitrogen dioxide, sulphur dioxide, and carbon monoxide. Automobile exhausts are majorly responsible for the release of sulphur dioxide and carbon monoxide which cause respiratory diseases like asthma.

Water Pollution

Industrialization and population growth are increasing water consumption and deteriorating water quality in cities. Water can be present as both surface water, as in lakes, reservoirs, ponds, rivers and streams, while groundwater is present in porous rock units. Chemicals that remain dissolved or suspended in water contaminates and thus pollutes water. Humans and other organisms are thus exposed to contamination also through polluted food, polluted workplace environments, septic tank leachate, overflows of combined storm and sanitary sewers, runoff from construction sites. Waterlogging also generates contaminants.

Soil and Land Pollution

In cities, soil supports urban development and embraces parks and gardens which play an important environmental role in urban communities. Urban soil degradation is being increased because of soil sealing (the permanent covering of soil with an impermeable material), soil erosion, soil acidification (caused by the deposition of acidifying air pollutants), soil contamination, and threats to soil

biodiversity. Soil represents the interface between the biosphere, the atmosphere and the hydrosphere, thus directly affection water and atmospheric quality.

Waste Pollution

There are different types of wastes: food waste, commercial and industrial waste, construction and demolition waste, agricultural waste, forestry waste, mining waste, and quarrying waste. Waste pollution is caused by the mismanagement of solid waste from humans and their activities, waste collectors and waste disposal contractors. There are different types of wastes: food waste, commercial and industrial waste, construction and demolition waste, agricultural waste, forestry waste, mining and quarrying waste, and electronic waste or e-waste. Apart from soil, air and water contamination, this type of pollution is responsible for extreme weather, from acid rain to severe hail storms, harm to animal and marine life, and to humans living around such regions.

Noise Pollution

According to the World Health Organization, noise pollution is one of the three most harmful types of environmental pollution in cities. Noise pollution sources are mainly transportation and industrial activity. Noise pollution increases because of society's growing demand for greater mobility and productivity. However, noise from road traffic is the most important threat for citizens because it covers a large area and it affects many people. The most disturbing noises are those from road traffic, railways, and airports, which result in diverse health problems in people living in those environments. Noise is a very invasive pollutant that affects the health and well-being of exposed humans. Noise pollution and its consequences are stress-inducing and have a psychosocial impact on people's condition. The primary specific health issues related to noise pollution are hearing problems, cardiovascular disease, cognitive impairment, sleep disorders, and annoyance.

Urban Pollution in Dunlop Area

Figure 1- Air Quality Index (AQI) at Dunlop on November 24, 2021.

Figure 2- Landfill near Dunlop area, releasing harmful fumes.

Soil and air pollution can be observed from the enormous landfills near Dunlop, covering several acres of land, releasing foul smell when the heaps are set on fire, or after rains. Presence of various chemicals also lead to leaching of soil, and the runoff may contaminate groundwater sources. Continuous passage of automobiles, and the exhaust they let out, are factors contributing toward air and noise pollution. So many pollutants in a residential area are the major causes for several health problems like chronic respiratory diseases, cardiac problems, chronic stress, lung cancer, sterility, diabetes, mood disorders, and even damage to the brain, liver, kidneys or nerves.

Conclusion

The issue of pollution is nothing new to us, rather it feels as we have never not known it. Environmental crises seem to have been aggravated in the recent years; melting of icebergs, ozone depletion, wildfires, skyrocketing AQIs are proof of that. Advocates like Greta Thunberg are actively participating in fighting climate crises. Committees of experts are attending discussions; governments are passing more laws. However, the problem is nowhere near gone. According to the official mission statement of Sustainable Development Goal 13 laid down by the United Nations, we are required to "Take urgent action to combat climate change and its impacts". Quick and efficient execution of anti-pollution measures by individuals, volunteers, organizations, governments are required to be taken up by more and more people. Only when non-ignorant individuals come together as teams around the world, will we be able to successfully combat this environmental crisis that has long disturbed us.

BIBLIOGRAPHY

Citation:

Martínez-Bravo, Maria Del Mar & Martínez-del-Río, Javier. (2019). Urban Pollution and Emission Reduction. 10.1007/978-3-319-71061-7_30-1.

Book referred to:

Environmental Pollution and Health by V.K. Ahluwalia

Websites:

www.researchgate.net

www.waste4change.com

www.metropolitantransferstation.com.au

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ACKNOWLEDGEMENT

I would like to express my heartfelt gratitude to our Principal Dr. Atashi Karpha and my subject professor, Madam Namrata Basu for their constant guidance and encouragement throughout.

VISIT TO A LOCAL POLLUTED SITE {URBAN}

INTRODUCTION

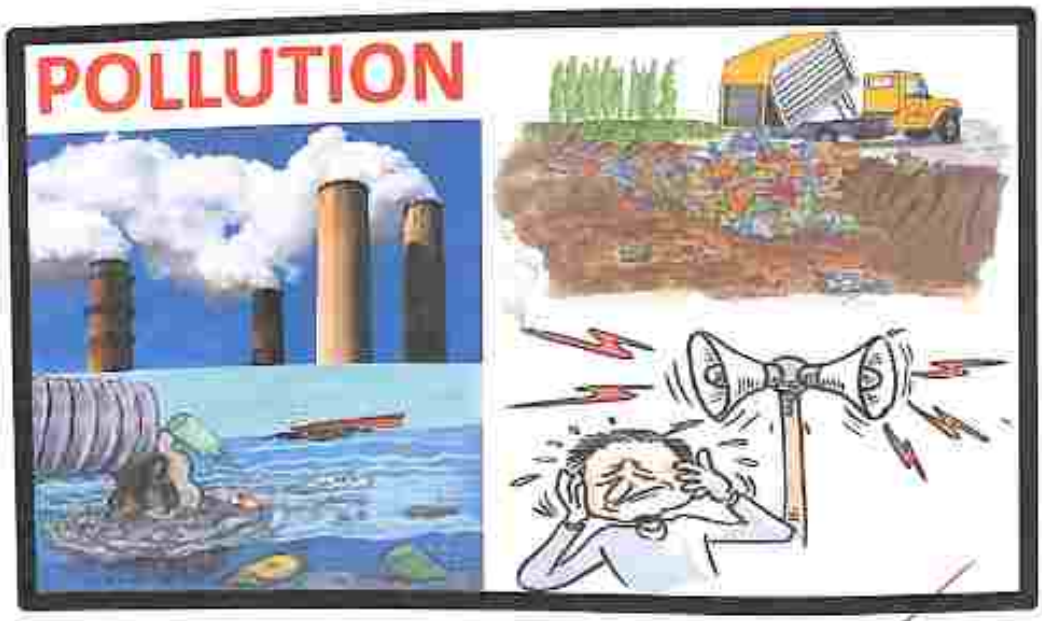

Fig.1.1Pollutions

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.

Many things that are useful to people produce pollution. Cars spew pollutants from their exhaust pipes. Burning coal to create electricity pollutes the air. Industries and homes generate garbage and sewage that can pollute the land and water. Pesticides—chemical poisons used to kill weeds and insects—seep into waterways and harm wildlife.

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.

Pollution is a global problem. Although urban areas are usually more polluted than the countryside, pollution can spread to remote places where no people live. For example, pesticides and other chemicals have been found in the Antarctic ice sheet. In the middle of the northern Pacific Ocean, a huge collection of microscopic plastic particles forms what is known as the Great Pacific Garbage Patch.

Air and water currents carry pollution. Ocean currents and migrating fish carry marine pollutants far and wide. Winds can pick up radioactive material accidentally released from a nuclear reactor and scatter it around the world. Smoke from a factory in one country drifts into another country. In the past, visitors to Big Bend National Park in the U.S. state of Texas could seems 290 kilometers (180 miles) across the vast landscape. Now, coal-burning power plants in Texas and the neighboring state of Chihuahua, Mexico have spewed so much pollution into the air that visitors to Big Bend can sometimes see only 50 kilometers (30 miles).
The three major types of pollution are air pollution, water pollution, and land pollution. There are other types of pollutions as well such as the radioactive pollution, noise pollution etc.

VISIT TO A LOCAL POLLUTED SITE- URBAN

Pollution can be further divided into four sectors; Rural, urban, industrial and agricultural.

In this assignment Urban(land) Pollution has been selected as the issue of concern.

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 threats, such as global warming, and by locally originated environmental challenges, such as waste management, recycling, and light and noise generation.

Causes:

- Emission of harmful greenhouse gases.
- Increasing population.
- Industrial and chemical waste accumulation in the water.
- Household wastes
- Deforestation

Effects:

- Health hazards like Cancer, Asthma and other chronic respiratory diseases.
- Polluted soil, which leads to loss of fertile lands for agriculture.
- The endangerment and extinction of species and wildlife.
- Climate change and ozone depletion.

- Polluted water which is harmful.

Fig.1.2 garbage thrown outside the bin

Fig.1.3 land pollution.

Description of the local polluted site:

The photographs were taken by the researcher in a local polluted site. The photographs (i.e fig.1.2 and fig. 1.3) show one of the polluted streets in Elliot Road, Kolkata. Land pollution is a concerning issue in most parts of our city (Kolkata), like for example in the fig.1.2 garbage has

been thrown all around the trash bin which is comparatively empty. In fig.1.3 the vehicles have been garaged at the corner of this littered street.

LAND POLLUTION

Land pollution, the deposition of solid or liquid waste materials on land or underground in a manner that can contaminate the soil and groundwater, threaten public health, and cause unsightly conditions and nuisances.

The waste materials that cause land pollution are broadly classified as municipal solid waste (MSW, also called municipal refuse), construction and demolition (C&D) waste or debris, and hazardous waste.

Causes of land pollution in this area:

- Careless attitude of people living in the vicinity.
- Wastage of food resources.
- Animal waste accumulation.
- Irregular cleaning and sanitization.

Effects of land pollution in this area:

- Emits bad odour and harmful gases which is inhaled by people passing by.
- Large amount of plastic pollution which could be consumed by the street animals deteriorating their health.
- Breeding ground for mosquitoes and rodents.
- Blockage of a huge passage for movements of transportation.

CONCLUSION

Any natural resource found in the environment, when used at a higher rate than the ability of its restoration, leads to depletion, thereby causing environmental pollution. This will lead to the declination of environmental quality and is evidenced by the loss of biodiversity, loss of flora and fauna, the introduction of new diseases and stressful life in the human population, etc.

Environmental pollution has become a great concern to save our planet. We need to adapt various measures to reduce environment pollution. Some of them includes reducing the use of non-renewable resources, proper disposal of wastes, etc. It is the responsibility of every individual to save our environment from getting polluted.

Some other control measures:

- Using public transportation.
- Saving electricity
- Reduce, Reuse and Recycle
- NO to plastic bags.
- Planting trees and reduction of forest fires.
- Avoid using chemical products

BIBLIOGRAPHY

- Photographs:-
  - Fig.1.1 - https://i.ytimg.com/vi/TVMYY4Uun8M/maxresdefault.jpg
  - Fig. 1.2 – taken by the researcher.
  - Fig. 1.3- taken by researcher

- www.linkspringer.com
- https://www.britannica.com
- https://www.airqoons.com

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Acknowledgement

I acknowledge my deepest gratitude to our Principal madam, Dr. Atashi karpha and Namrata Basu madam for their constant guidence for the project.

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VISIT TO A LOCAL URBAN POLLUTED SITE

INTRODUCTION

Pollution refers to the undesirable changes occurring in the physical, chemical and biological composition of natural environment. Pollution is mainly based on three types, i.e, Air, Water and Land pollutions. There are other different pollutions like sound, thermal etc .Depending on the location, pollution can be characterised as Industrial, Agricultural, Urban and Rural.

In this field study, pollution in the **urban sector** has been focused.

Urban Pollution

The pollutions which are mainly caused by the actions of human in the urban conditions is called urban pollution.

Causes:

1. Rapid industrializaton
2. Emission of harmful substances from factories
3. Residential wastes
4. Emission of CFCs, COs from refrigerators, air-conditioners etc
5. Deforestation

Effects:

1. Chronic diseases like: different types of cancer,heart diseases and other chronic diseases in human.
2. Depletion of ozone layer causing direct contact of harmful ultraviolet rays with the earth.
3. Degradation of soil fertility, water quality index; deforestation and others
4. Change in rainfall cycle.
5. Migratory birds and animals change their routes. Many birds die because of skyscrappers and high rise towers.

LAND POLLUTION IN THAKURPUKUR AREA

"Images showing waste dumped land in Thakurpukur"

WHAT IS LAND POLLUTION?

Land pollution refers to the deterioration of Earth's surface at and below ground level.

CAUSES OF LAND POLLUTION IN THIS LOCALITY

1. Dumping of various wastes from the market.
2. Sewage dumps and underground sewage leaks.
3. Various household wastes are thrown in the open areas.
4. Continuous construction works which produces a lot of poisonous gases and substances which are disposed on the land.
5. Excess use of insecticides and pesticides on the land.

EFFECTS ON THE LOCALITY

1. The dumps accumulated from the market produces odours within the residential area.
2. The wasteland is a breeding ground for mosquitoes and various other harmful insects which in turn spreads various diseases like malaria, dengue and others
3. The quality of soil degrades.
4. Due to excess use of insecticides and pesticides, there has been a depletion of plants and greenery.
5. The dirty water accumulated seeps down the ground which in turn degrades the underground water quality.
6. The scenic beauty is destroyed.

CONCLUSION

Pollution has become a serious threat to everyone around the world. It affects each and every elements biosphere existing. Pollution is mostly because of human action and for natural causes for very rare cases. Thus the check on our actions can be a remedial measure to prevent on further exceeding pollution level.

Some remedial measures can be:

- use of biodegradable substances
-having a proper waste disposable place
-using public transport and using nature-friendly gases like CNG (compressed natural gas)
-implementation of afforestation
-enlightening people about the concept of REDUCE-REUSE-RECYCLE

BIBLIOGRAPHY

1. Source of the images: self-photographed. (Region: Thakurpukur, Kolkata-700063)
2. www.texasdisposal.com
3. www.un.org
4. www.tutorialspoint.com

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SUBJECT CODE-AECC-2

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ACKNOWLEDGEMENT

I would like to thank our respected principal, Dr Atashi Karpha and our teacher, Namrata Basu, for giving us this opportunity for showing our potential through this project and in the process, learning new things from the research done.

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INTRODUCTION:

An ecosystem consists of the biological community that occurs in some local and the physical and chemical factors that make up its non-living or abiotic environment. There are many examples of ecosystems- a pond, a forest, an estuary, a grassland. The boundaries are not fixed in any objective way, although sometimes they seem obvious, as with the shoreline of a small pond. Usually the boundaries of an ecosystem are chosen for practical reasons having to do with the goals of the particular study.

The study of ecosystems mainly consists of the study of certain processes that link the living, or biotic, components to the non-living, or abiotic comphonents.

A forest is a complex ecological system in which trees are the dominant life-form. A forest is nature's most efficient ecosystem, with a high rate of photosynthesis affecting both plant and animal systems in a series of complex organic relationships. Forests can develop under various conditions, and the kind of soil, plant, and animal life differs according to the extremes of environmental influences. Forests are the predominant terrestrial ecosystem of Earth, and are distributed around the globe.[7] More than half of the world's forests are found in only five countries (Brazil, Canada, China, the Russian Federation, and the United States of America). The largest share of forests (45 percent) are in the tropical latitudes, followed by those in the boreal, temperate, and subtropic domains.

Forests account for 75% of the gross primary production of the Earth's biosphere, and contain 80% of the Earth's plant biomass. Net primary production is estimated at 21.9 gigatonnes of biomass per year for tropical

TYPES OF FORESTS:

Forests can occur wherever the temperatures rise above 10 °C (50 °F) in the warmest months and the annual precipitation is more than 200 mm (8 inches). They can develop under a variety of conditions within these climatic limits, and the kind of soil, plant, and animal life differs according to the extremes of environmental influences

In cool high-latitude subpolar regions, forests are dominated by hardy conifers such as pines (Pinus), spruces (Picea), and larches (Larix). In the Northern Hemisphere, these forests, called taiga, or boreal forests, have prolonged winters and between 250 and 500 mm (10 and 20 inches) of rainfall annually. Coniferous forests also cover mountains in many temperate parts of the world.

In more temperate high-latitude climates, mixed forests of both conifers and broad-leaved deciduous trees predominate. Broad-leaved deciduous forests develop in middle-latitude climates, where there is an average temperature above 10 °C (50 °F) for at least six months every year and annual precipitation is above 400 mm (16 inches). A growing period of 100 to 200 days allows deciduous forests to be dominated by oaks (Quercus), elms (Ulmus), birches (Betula), maples (Acer), beeches (Fagus), and aspens (Populus).

In the humid climates of the equatorial belt are tropical rainforests, which support incredible plant and animal biodiversity. There heavy rainfall supports evergreens that have broad leaves instead of needle leaves, as in cooler forests. Monsoon forests, which are the deciduous forests of tropical areas, are found in regions with a long dry season followed by an intense rainy season. In the lower latitudes of the Southern Hemisphere, the temperate deciduous forest reappears.

COMPONENTS OF A FOREST ECOSYSTEM:

- Productivity- The basic requirement for any ecosystem to function and sustain is the constant input of solar energy. Plants are also the producers in a forest ecosystem.
  There are two types of productivity in a forest ecosystem, primary and secondary. Primary productivity means the rate of capture of solar energy or biomass production per unit area over a period of time by the plants during photosynthesis.
- Decomposition- Decomposition is an extremely oxygen-requiring process. In the process of decomposition, decomposers convert the complex organic compounds of detritus into inorganic substances such as carbon dioxide, water and nutrients.
- Energy flow- Energy flows in a single direction. Firstly, plants capture solar energy and then, transfer the food to decomposers. Organisms of different trophic levels are connected to each other for food or energy relationship and thus form a food chain.
- Nutrient Cycling- Nutrient cycling refers to the storage and movement of nutrient elements through the various components of the ecosystem. There are two types of Nutrient cycling, gaseous and sedimentary.

BIBLIOGRAPHY:

For this project, I have taken help from the following websites:

- ***https://en.wikipedia.org/wiki/Forest***
- ***https://www.britannica.com/science/forest***
- ***https://www.greenpeace.org/usa/forests/solutions-to-deforestation/***

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ACKNOWLEDGEMENT

I would like to express my gratitude To Namrata Bose ma'am for giving me a chance to work on this project. Her suggestions and directions have helped in the completion of this project. I got to learn a lot from this project about Ecosystems.

I would like to extend my heartfelt thanks to my parents because without their help this project would not have been successful. Finally, I would like to thank my dear friends who have been with me all the time.

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INTRODUCTION

Ecosystem

An ecosystem refers to a functional unit of nature in which living organisms interact among themselves as well as with the surrounding physical environment. An ecosystem is a geographic area where plants, animals, and other organisms, as well as weather and landscape, work together to form a bubble of life. Ecosystems contain biotic or living parts, as well as abiotic factors, or nonliving parts. Biotic factors include plants, animals, and other organisms. Abiotic factors include rocks, temperature, and humidity.

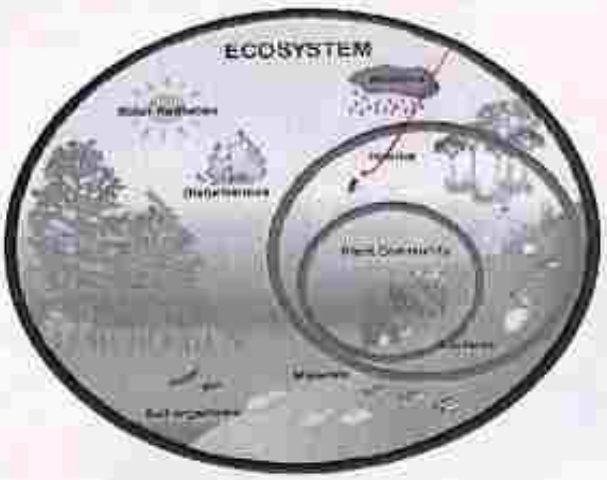
Every factor in an ecosystem depends on every other factor, either directly or indirectly. A change in the temperature of an ecosystem will often affect what plants will grow there, for instance. Animals that depend on plants for food and shelter will have to adapt to the changes, move to another ecosystem, or perish.

Ecosystems can be very large or very small. Tide pools, the ponds left by the ocean as the tide goes out, are complete, tiny ecosystems. Tide pools contain seaweed, a kind of algae, which uses photosynthesis to create food. Herbivores such as abalone eat the seaweed. Carnivores such as sea stars eat other animals in the tide pool, such as clams or mussels. Tide pools depend on the changing level of ocean water. Some organisms, such asseaweed, thrive in an aquatic environment, when the tide is in and the pool is full. Other organisms, such as hermit crabs, cannot live underwater and depend on the shallow pools left by low tides. In this way, the biotic parts of the ecosystem depend on abiotic factors.

Types of Ecosystem

There are two types of ecosystem:

- Terrestrial Ecosystem-
    1. Forest Ecosystem
    2. Grassland Ecosystem
    3. Tundra Ecosystem
    4. Desert Ecosystem
- Aquatic Ecosystem-
    1. Freshwater Ecosystem
    2. Marine Ecosystem



FOREST ECOSYSTEM

A forest ecosystem is an ecosystem of forests and resources. Forests are renewable natural resources. Forests are formed by a community of plants that are predominantly structurally defined by their trees, shrubs, herbs, climbers and ground cover. Soil, animals, insects, microorganisms and birds are the most important interacting units of a forest ecosystem. In India, the forests occupy about 18–20% of the total land area.

1. Abiotic Components of the forest include inorganic and organic components present in the soil along with temperature, rainfall, light, etc.

2. Biotic Components are represented by producers, consumers and decomposers.

Structural Features of the Forest Ecosystem

The two main structural features of a forest ecosystem are:

1. Species composition:

   It refers to the identification and enumeration of the plant and animal species of a forest ecosystem.

2. Stratification:

   It refers to the vertical distribution of different species which occupy different levels in the forest ecosystem. Every organism occupies a place in an ecosystem on the basis of source of nutrition. For example, in a forest ecosystem, trees occupy the top level, shrubs occupy the second and the herbs and grasses occupy the bottom level.

Characteristics of Forest Ecosystem

1. Forests are characterised by warm temperature and adequate rainfall, which make the generation of a number of ponds, lakes etc..
2. The forest maintains climate and rainfall.
3. The forest supports many wild animals and protects biodiversity.
4. The soil is rich in organic matter and nutrients, which support the growth of trees.

Components of a Forest Ecosystem

The components of a forest ecosystem are as follows:

1.Productivity

The basic requirement for any ecosystem to function and sustain is the constant input of solar energy. Plants are also the producers in a forest ecosystem.

There are two types of productivity in a forest ecosystem, primary and secondary. Primary productivity means the rate of capture of solar energy or biomass production per unit area over a period of time by the plants during photosynthesis.

2. Decomposition

Decomposition is an extremely oxygen-requiring process. In the process of decomposition, decomposers convert the complex organic compounds of detritus into inorganic substances such as carbon dioxide, water and nutrients.

3. Energy flow

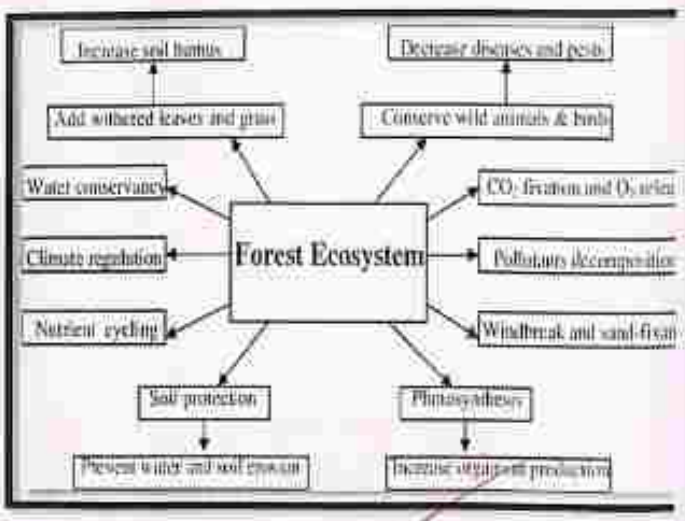
Energy flows in a single direction. Firstly, plants capture solar energy and then, transfer the food to decomposers. Organisms of different trophic levels are connected to each other for food or energy relationship and thus form a food chain.

Energy Pyramid is always upright because energy flows from one trophic level to the next trophic level and in this process, some energy is always lost as heat at each step.

4. Nutrient Cycling

Nutrient cycling refers to the storage and movement of nutrient elements through the various components of the ecosystem. There are two types of Nutrient cycling, gaseous and sedimentary.

Functions of Forest Ecosystem



1. Goods Obtained from Forests:
   There are various types of food products such as honey, wild meat, fruits, mushrooms, palm oil and wine, medicinal plants, etc., obtained from forests. Other than edible parts, we can obtain timber, wood biomass, cork, etc., from forests. The fuel can be extracted from old trees that are buried under the soil.
2. Ecological Functions:
   Forests play an important role in maintaining ecological factors such as climate, carbon storage, nutrient cycling and rainfall.
3. Culture and Social Benefits:
   The tribal people who live in the forests treat forests as nature goddesses. The traditional beliefs and spirituality saves wild animals from hunters and cutting down of trees by urban people. Few modern people visit forests for recreation.

Types of Forest Ecosystem

There are a few types of forest ecosystems listed below:

1. Tropical Evergreen Rainforest:
Only a small percentage of tropical forests are rainforests where average rainfall is 80–40080–400 inches in a year. This forest is characterised by deep and dense vegetation consisting of tall trees reaching different levels.

2.Tropical Deciduous Rainforest:
The main characteristic of tropical deciduous rainforest are broad-leaved trees along with dense bushes, shrubs, etc. Two main seasons- summer and winter are distinctly visible there. This type of forest is found in many parts of the world. A large variety of flora and fauna are found here.

3.Temperate Evergreen Forest:
Temperate evergreen forest is a type of forest that is characterised by a smaller number of trees but an adequate number of ferns and mosses.

4.Temperate Deciduous Forest:
Temperate deciduous forest evolves in the moist temperate region with sufficient rainfall. Here also, winter and summer are well defined, and trees shed their leaves during winter. Dominant trees are maple, oak, peach, etc.

5.Taiga/Boreal:
Situated just south of the Tundra, Taiga is characterised by evergreen conifers. The average temperature is below the freezing point for almost half of the year.

CONCLUSION

Forest is a dense land covered with various plants and trees. There are three main types of forests: coniferous, deciduous and tropical rain forests. Forests ecosystem are divided based on adequate rainfalls and temperature. The Forest ecosystem is home to many animals and fully fills all the basic needs required such as wood, timber, medicinal plants, etc. Forest helps in maintaining the oxygen and temperature levels of the atmosphere.

Forest ecosystem helps in preventing global warming. The water in the soil is absorbed by plants through roots. They release excess into the atmosphere, which helps in the occurrence of rainfall. Forest ecosystems prevent soil erosion and maintain the fertility of the soil.

BIBLIOGRAPHY

For making this project, I have taken reference from the following websites:

- https://byjus.com/biology/ecosystem/
- https://www.britannica.com/science/forest
- https://www.embibe.com/exams/forest-ecosystem/
- https://www.toppr.com/guides/science/nature/ecosystem/forest-ecosystem/

NB
20/6/2022

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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. Atashi 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 occurring 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 stray 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.

Samantha
25/05/2022

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ACKNOWLEDGEMENT

I am overwhelmed in all humbleness and gratefulness to acknowledge my depth to all those who have helped me to put these ideas, well above the level of simplicity and into something concrete.

I would like to express my special thanks of gratitude to my Professor, Ms. Namrata Basu as well as our Principal, Dr. Atashi Karpha; who gave us the golden opportunity to do this wonderful tutorial project on topic, **STUDY OF COMMON PLANTS,** which helped me in doing a lot of research and I came to know about so many things. I am really thankful to them.

I would like to thank my parents and friends who helped me a lot in gathering different information, collecting data and guiding me from time to time in making this project.

THANK YOU

YOU'S FAITHFULLY

SUCHARITA MANDAL

21/BSCH/0043

PSYA (SEM 2)

TOPIC: COMMON STUDY PLANTS

INTRODUCTION

Plants are critical to other life on this planet because they form the basis of all webs. Most plants are autotrophic, creating their own food using water, carbon dioxide, and light 3.8 billion years. These fossil deposits show evidence of photosynthesis, so plants, or the plant-like ancestors of plants, have lived on this planet longer than most other groups of organisms. At one time, anything that was green and that wasn't an animal was considered to be a plant. Now, what were once considered "plants" are divided into several kingdoms: Protista, Fungi, and Plantae? Most aquatic plants occur in the kingdoms Plantae and Protista.

AREA OF STUDY: Sonarpur

OBSERVATION

1.MARGOSA TREE

Scientific name: Azadirachta indica.

Vernacular Name: Neem, Kadu-limb.

Family: Meliaceae, it is native of Burma but grown all over India.

Chemical composition: The alkaloids are the main active principles. They are nimbin, nimbinin, nimbidine, nimbosterine and nimbectin etc. fatty acid present in the plant and seed contain 40 to 45 % fixed oil.

Uses: The leaves are carminative, expectorant, anthelmintic, diuretic and insecticidal properties. Fresh leaf juice with salt given for intestinal worms, jaundice, skin disease and malarial fever. The leaves are applied for boils, chronic ulcers, swelling and wounds. Bark is used for liver complaint, remove round worms. Gum is stimulant, demulcent tonic and used in debility.

2. PERIWINKLE

Scientific Name: Catharanthus roseus

Vernacular Name: Sadaphuli, sadabahar.

Family: Apocynaceae

Chemical composition: Catharanthus mainly consists of glycosides and alkaloids. The alkaloids are present in entire plant but they are found in more proportion in leaves and root. Some important alkaloids are vinblastine, vincristine, other alkaloids present in the plant are ajmalcine, serpentine, lochnerine, tetrahydroalstonine, vindoline, vindolinine and catheranthine.

Uses: It is used in hypotensive, antidibetic action, other dimer indole-indoline used for curing the anticancer activity. The alkaloids vincristine is highly active in treatment of childhood leukaemia. Vincristine proves effective in breast cancer and the leaves are used in diabetes.

3. BANANA TREE

Scientific Name: Musa acuminata

Vernacular Name: Kola Gach.

Family: Musaceae

Chemical composition: All morphologic parts of banana plant contained considerable amounts of ashes (from 11.6 to 26.8%) composed mainly by potassium, calcium and silicium salts. The hemicelluloses in banana plant are proposed to be mainly glucuronoxylan and xyloglucan (from 5.5% in floral stalk to 21.5% in petioles/midrib).

Uses: The flower of this plant is used to treat ulcers, dysentery, and bronchitis and cooked flowers are good food for diabetics. The astringent ashes of the unripe banana peel and leaves are used in the treatment of dysentery and diarrhea and also for the treatment of malignant ulcers.

4. BASIL PLANT

Scientific Name: Ocimum tenuiflorum

Vernacular Name: Tulsi

Family: Lamiaceae

Chemical composition: Some of the phytochemical constituents of tulsi are oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, and β-caryophyllene (about 8%).

Uses: Tulsi (Sanskrit :- Surasa) has been used in Ayurveda and Siddha practices for its supposed treatment of diseases. For centuries, the dried leaves have been mixed with stored grains to repel insects. Also used for the common cold, influenza ("the flu"), H1N1 (swine) flu, diabetes, asthma, bronchitis, earache, headache, stomach upset, heart disease, fever, viral hepatitis, malaria, stress, and tuberculosis.

5. ALOE VERA

Scientific Name: Aloe barbadensesMills.

Vernacular Name: Korphad, Gritakumari

Family: Liliaceae

Chemical composition: The main active principle present in Aloe is crystalline glucoside known as barbaloin, other constituent like resin and derivatives like emodin, chrysophanic acid, anthroquinones, emoclin, also it contain glucose, galactose, mannose an galacturonic acid with protein. The plant contain aloesone and aloesin.

Uses: Aloe is chiefly used as purgative, abortificient, anthelmintic, blood purifier, cathartic, cooling, digestive and diuretic, inflammation, painful parts of the body. It is useful in burn, cold cough, jaundice, worms and piles. Aloe is used in preparation of vegetables, pickles, cosmetics, skin blemisars, help to grow new healthy tissue. It is used as hair tonic as it stimulates the growth of hair.

CONCLUSION

Each plant is characterized by one of the three life histories: haploid (1n), diploid (2n), or the most common haploid-diploid. Within each of these three types, there are also variations. Of the plants with haploid life cycles, most algae lack a dikaryotic phase, while most fungi have a dikaryotic phase. There are also other algae and fungi that are characterized by diploid life cycles. Lastly, plants with a haploid-diploid life history undergo an alternation of generations, either similar or dissimilar. In all of these life cycles, asexual reproduction may occur, but it is sexual reproduction that is responsible for genetic diversity. Due to variations arising separately and at different rates, the evolution of land plants did not follow a linear sequence. Before land plants, alga with mostly haploid life cycles existed, but land plants later originated From a haploid-diploid ancestor.

BOBLIOGRAPHY

I gathered all these information from Wikipedia.

AB
25/6/2022

TITLE:

Flora and Fauna in the Sajnekhali Area.

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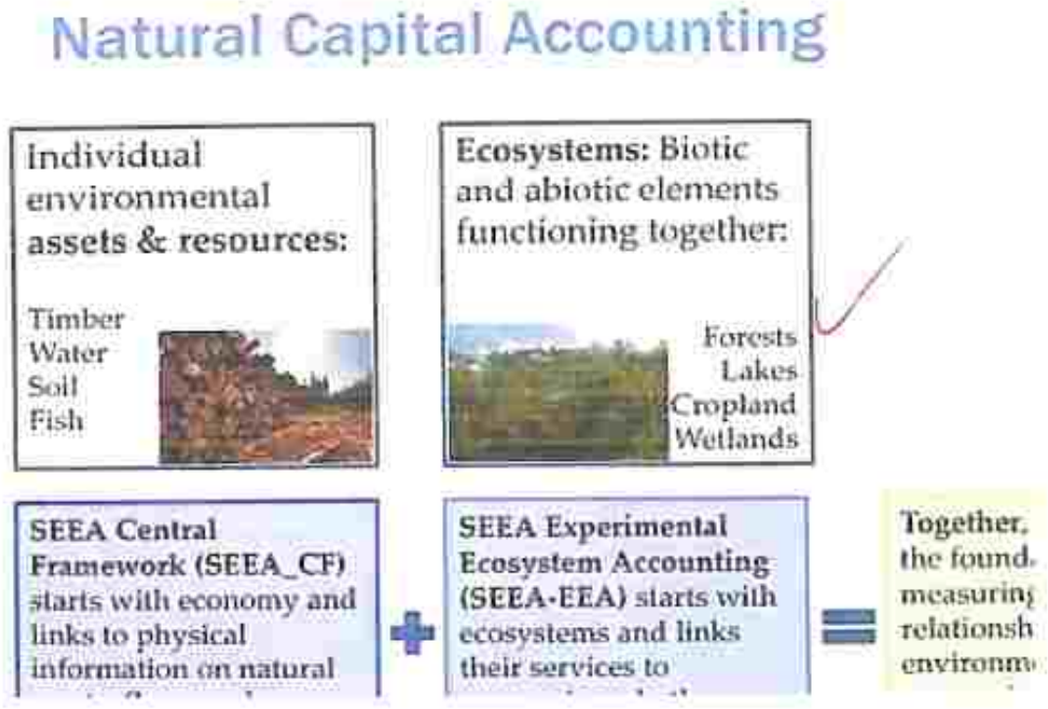
ACKNOWLEDGEMENT

I would like to thank my teacher Namrata Basu who gave me this opportunity to work on this project. I got to learn a lot from this project about our diverse ecosystem and the need to save our environment for the future of ours. I would also like to thank our college principal Dr. Atashi Karpha .

At last, I would like to extend my heartfelt thanks to my parents because without their help this project would not have been successful. Finally, I would like to thank my dear friends who have been with me all the time.

INTRODUCTION



In natural capital accounting, ecosystems are assets that provide ecosystem services to people. Assets can be measured using both physical and monetary units. In the international System of Environmental-Economic Accounting, ecosystem assets are generally valued on the basis of the net present value of the expected flow of ecosystem services.

We define ecosystems' capacity and capability to supply ecosystem services, as well as the potential supply of ecosystem services. Capacity relates to sustainable use levels of multiple ecosystem services, capability involves prioritising the use of one ecosystem service over a basket of services, and potential supply considers the ability of ecosystems to generate services regardless of demand for these services.

Ecosystem functions have been identified as ecological properties that underlie the supply of ecosystem services, visualized for instance in cascade diagrams . However, few studies have managed to quantify ecosystem functions and a systematic framework for defining and measuring ecosystem functions has never been developed. In the SEEA EEA framework , capacity is a function of ecosystem condition and extent, and it is related to expected service provision sustainable yield . Nevertheless, a clear definition of

capacity is not provided in the SEEA EEA framework. Recent experiences with ecosystem accounting , and also the recent Technical Recommendations for SEEA EEA show that there is a need to better define the concept of capacity and related concepts and how they can be applied to the different types of services. We first focus on capacity, and subsequently analyses two related concepts, i.e., the potential supply of ecosystem services, and ecosystems' capability to generate those services. We contrast these definitions with ecosystem service flow, using the definition for ecosystem services from the SEEA EEA framework.

SAJNEKHALI

Sajnekhali is a 362 km2 area in the northern part of the Sundarbans delta in South 24 Parganas district, West Bengal, India. It is located at the confluence of the Matla and Gumdi rivers. The area is mainly mangrove scrub, forest and swamp. It was set up as a sanctuary in 1976. It is home to a rich population of different species of wildlife. Various species of animals found in Sajnekhali forest include Fishing Cats, Flying Fox, Macaque, Wild Boar, Pangolin, Chital and many more. Exotic birds are the most fascinating members of Sajnekhali. Some of the commonly found birds in this region are Spotted Billed

FLORA IN SAJNEKHALI

SUNDARI TREE(H. littoralis) :-

The tree may grow up to 25 m; trunk straight; leaves elliptic; roots with pneumatophores and blind root sucker; bell-shaped flowers are small, about 5 mm, unisexual, orange to pinkish; fruits are formed in clusters. The tree is the chief source of timber among the people of the surrounding districts of the Sundarbans; the annual production is about 250,000 cu ft.; wood is hard, red in colour, used mostly in boat building, and in making hard-board, furniture, etc.; wood also yields good quality charcoal. The Sundari plants are declining because of overexploitation, and also due to top dying diseases; about 50 per cent of the trees suffer from top dying diseases; increased salinity is also considered responsible for the decline.

GOLPATA(Nipa Palm)

Nipa regenerates naturally in the mangrove. It can also be propagated artificially by planting seedlings along the muddy banks of mangrove forests and also in exposed shorelines. Generally seedlings are raised on nursery beds regularly inundated by tidal water. Usually two months old seedlings attaining height of about 25cm are suitable for planting. Generally leaves are harvested at the age of five and done annually. Harvesting is done once in a year, usually during dry months.

FAUNA IN SAJNEKHALI

THE ROYAL BENGAL TIGER:-

The Bengal tiger is a population of the Panthera tigris tigris subspecies. It ranks among the biggest wild cats alive today. It is considered to belong to the world's charismatic megafauna.The Bengal tiger's coat is yellow to light orange, with stripes ranging from dark brown to black; the belly and the interior parts of the limbs are white, and the tail is orange with black rings. The white tiger is a recessive mutant, which is reported in the wild from time to time in Assam, Bengal, Bihar, and especially in the former State of Rewa. However, it is not an occurrence of albinism.

GREY HERON*(Ardea cinerea)*

The grey heron (Ardea cinerea) is a long-legged wading bird of the heron family, Ardeidae, native throughout temperate Europe and Asia and also parts of Africa. It is resident in much of its range, but some populations from the more northern parts migrate southwards in autumn. A bird of wetland areas, it can be seen around lakes, rivers, ponds, marshes and on the sea coast. It feeds mostly on aquatic creatures which it catches after standing stationary beside or in the water or stalking its prey through the shallows.

CONCLUSION

Forests and the products they provide are universally required for the continuation of human society as we know it. To change our society to one that does not depend on the forest (to the forest's detriment) and its associated benefits requires such an enormous paradigm shift that we generally do not even consider it worthy of further investigation. Given this situation therefore, it is imperative that we discover mechanisms to manage the forest for all the benefits it can provide, in a sustainable manner.

Few countries have all the answers to all the issues faced, thus there exists a real need for international cooperation. Loss of forest resources transcends national boundaries and affects the entire planet. Given this, the roles of various agencies become vitally important in order to minimise any potential downside and to maximise the upside. Governments, NGOs, intergovernmental panels and the like must work more closely in order to resolve the pressing issues facing the forests. In many cases a collaborative approach will provide a solution which is more acceptable to all parties, and more robust than a solution that is developed unilaterally.

NB 20/6/2012

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ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my professor(prof. Namrata Basu) as well as our principal(Dr. Atashi Karpha) who gave me the golden opportunity to do this wonderful project on the topic ECOSYSTEM, which also helped me in doing a lot of research and I came to know about so many new things.

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.

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INTRODUCTION

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

Ecosystems are controlled by external and internal factors. External factors such as climate, parent material which forms the soil and topography, control the overall structure of an ecosystem but are not themselves influenced by the ecosystem. Internal factors are controlled, for example, by decomposition, root competition, shading, disturbance, succession, and the types of species present. While the resource inputs are generally controlled by external processes, the availability of these resources within the ecosystem is controlled by internal factors. Therefore, internal factors not only control ecosystem processes but are also controlled by them.

Mainly there are two types of ecosystems, namely terrestrial ecosystem and aquatic ecosystem.

1. Terrestrial ecosystem: This is the ecosystem which exists on land. It can be further divided into the following types,

Forest ecosystem

Grassland ecosystem

Desert ecosystem

2. Aquatic ecosystem: This is the ecosystem which exists in water. It can be further divided into,

Fresh water ecosystem (Pong or lake or river ecosystem)

Marine ecosystem (Ocean ecosystem)

The whole surface of Earth is a series of connected ecosystems. Ecosystems are often connected in a larger biome. Biomes are large sections of land, sea, or atmosphere. Forests, ponds, reefs, and tundra are all types of biomes, for example. They're organized very generally, based on the types of plants and animals that live in them. Within each forest, each pond, each reef, or each section of tundra, you'll find many different ecosystems.

Ecosystem Services are the benefits nature provides to human well-being. The term is frequently thrown around in academic circles, but why should you care about them?

Although the term is quite new, our connection to nature is not. We depend on nature for our survival - without healthy ecosystems, our drinking water isn't clean nor is the air we breathe. We also enjoy nature... studies show that people who spend time in nature tend to be happier than those that don't. It can even act as a natural anti-depressant. With industry and urban sprawl expanding at unprecedented rates, Ecosystem Services attempt to translate the benefits we receive from nature into economic terms so we can better understand the trade-offs we are making between nature and industrial development.

ECOSYSTEM : WETLAND

A wetland is a distinct ecosystem that is flooded by water, either permanently (for years or decades) or seasonally (for weeks or months). Flooding results in oxygen-free (anoxic) processes prevailing, especially in the soils. The primary factor that distinguishes wetlands from terrestrial land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique anoxic hydric soils. Wetlands are considered among the most biologically diverse of all ecosystems, serving as home to a wide range of plant and animal species. Methods for assessing wetland functions, wetland ecological health, and general wetland condition have been developed for many regions of the world. These methods have contributed to wetland conservation partly by raising public awareness of the functions some wetlands provide.

Wetlands occur naturally on every continent, except for Antarctica. The water in wetlands is either freshwater, brackish or saltwater. The main wetland types are classified based on the dominant plants and/or the source of the water. For example, marshes are wetlands dominated by emergent vegetation such as reeds, cattails and sedges; swamps are ones dominated by woody vegetation such as trees and shrubs (although reed swamps in Europe are dominated by reeds, not trees). Examples of wetlands classified by their sources of water include tidal wetlands (oceanic tides), estuaries (mixed tidal and river waters), floodplains (excess water from overflowed rivers or lakes), springs, seeps and fens (groundwater discharge out onto the surface), bogs and vernal ponds (rainfall or meltwater). Some wetlands have multiple types of plants and are fed by multiple sources of water, making them difficult to classify.

Fig.: Freshwater swamp forest in Bangladesh

Fig.: Marshes develop along the edges of rivers and lakes

Fig. ; A bog in Lauhanvuori National Park, Isojoki, Finland

Fig.: Kakerdaja fen in spring, Estonia

Wetlands contribute a number of functions that benefit people. These are called ecosystem services and include water purification, groundwater replenishment, stabilization of shorelines and storm protection, water storage and flood control, processing of carbon (carbon fixation, decomposition and sequestration), other nutrients and pollutants, and support of plants and animals. Wetlands are reservoirs of biodiversity and provide wetland products. They also place a role in climate change mitigation and adaptation. However, some wetlands are a significant source of methane emissions and some are also emitters of nitrous oxide. Constructed wetlands are designed and built to treat municipal and industrial wastewater as well as to divert stormwater runoff. Constructed wetlands may also play a role in water-sensitive urban design.

The world's largest wetlands include the Amazon River basin, the West Siberian Plain, the Pantanal in South America, and the Sundarbans in the Ganges-Brahmaputra delta.

Fig.: Amazon River Basin

Fig.: Sundarban in the Ganges-Brahmaputra Delta

Since the advent of industrialization and urbanization the wetlands came under severe threat due to increased anthropogenic-pressures. As per an estimate, India has lost 38 percent of its wetlands between 1991 and 2001 alone.

1. Urban And Land Use Changes : During the 90 year period from 1901 to 1991, the number of urban centres doubled while urban population has increased eightfold. This magnitude of

growth exerted tremendous pressure on wetlands and flood and flood plain areas for meeting water and food demand of growing population.

2. Agricultural Residues :As a result of intensification of agricultural activities over the past four decades, fertilizer consumption in India has increased from about 2.8 million tonne in 1973–1974 to 28.3 million tonne in 2010–2011.

3. Municipal and Industrial Pollution : Less than 31 percent of the domestic wastewater from Indian urban centres is treated, compared to 80 percent in the developed world, which is largely discharged in the natural water bodies such as streams and rivers.

• For example, River Yamuna, which passes through 6 Indian States, receives about 1789 MLD of untreated waste water from the capital city of Delhi alone. This is about 78 percent of the total pollution load that flows in to the river every day.

4. Climate Change : In 2007, the UNESCO estimated that Global climate change is expected to become an important driver of loss and change in wet-land ecosystem. These findings are important for India which has been experiencing the flood-drought-flood cycle for the last 2 decades.

Apart from the above major threats, immersion of idols and religious ritual waste, introduction of exotic species, encroachments and unregulated aquaculture (e.g. Kolleru lake) backed by Bureaucrats-Politicians-Businessmen nexus, dredging, un planned urbanization and development projects are some of the other dangers threatening the existence of wetlands across the country.

CONCLUSION

Wetlands are amongst the most productive ecosystems on the Earth. Historically, they have been at the centre of evolution of human civilization for millennia as they are means of precious ecological goods and services. However, unfortunately, they are also ecologically most sensitive ecosystems and are under threat due to increased anthropogenic-pressures. Hitherto, wetland research has focused more on the internal attributes of wetlands than on the role of wetlands in wider watershed contexts. It has also concentrated on coastal and floodplain wetlands more than those in headwaters, many of them peatlands, which have greater hydrological significance through potential downstream impacts. Previously, headwater wetlands have been valued mainly for their land use conversion potential. Recently, it has become recognised that these lands provide many valuable environmental services. They influence flood flows, sediment loads, and aquifer recharge; biochemical water qualities and biodiversity. They provide water, peat, timber, grazing land and, locally, aesthetic, cultural, recreational and educational benefits to local communities. Better environmental understanding is required to maximise their benefits to stakeholders and minimise potential negative impacts due to climatic emissions of greenhouse gases, hydrological changes (especially flooding, water chemistry, and sediment release).

GOKHALE MEMORIAL GIRLS' COLLEGE

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ENVIRONMENTAL STUDIES – AECC 2 TUTORIAL

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ACKNOWLEDGEMENT

I AM OVERWHELMED IN ALL HUMBLENESS AND GRATEFULNESS TO ACKNOWLEDGE THAT MY DEPTH TO ALL THOSE WHO HAVE HELPED ME TO PUT THESE IDEAS INTO SOMETHING CONCRETE.

I WOULD EXTEND GRATITUDE TO OUR PROFESSOR MS. NAMRATA BASU AND OUR PRINCIPAL DR. ATASHI KARPHA TO GIVE US THE OPPORTUNITY TO BE ABLE TO DO THIS PROJECT ON THE TOPIC – OBSERVATIONS ON LOCAL BIRDS.

I WOULD ALSO THANK MY PARENTS AND FRIENDS WHO HAVE HELPED ME IN THE SAME.

TOPIC :

OBSERVATION ON LOCAL BIRDS.

INTRODUCTION :

BIRDS HAVE ALWAYS FASCINATED MANKIND. THEY ARE DESCRIBED AS "GLORIFIED REPTILES" WHICH DENOTE THEIR LINE OF EVOLUTION. THESE WARM-BLOODED VERTEBRATES HAVE A BEAUTIFUL PLUMAGE AND VERY INTERESTING HABITS LIKE COURTSHIP, NEST-BUILDING, PARENTAL CARE AND MIGRATORY FLIGHTS. THEIR WONDERFUL SONG CALLS MAKE OUR MORNINGS AND EVENINGS VERY PLEASANT. THE BRANCH OF ZOOLOGY WHICH DEALS WITH STUDY OF BIRDS IS CALLED *ORNITHOLOGY.*

OBSERVATIONS:

- **HOUSE CROW (CROVUS PLENDENS)**

Kingdom:	Animalia
Phylum:	Chordata
Class:	Aves
Order:	Passeriformes
Family:	Corvidae
Subfamily:	Corvinae
Genus:	*Corvus*

Body with black plumage, grey around the neck. This is a scavenger inhabiting human dwelling areas and is highly useful to man (Commensal). Male and female are alike and show no sexual dimorphism. Omnivorous (Jungle crow does not have a grey neck). It builds nests and looks after its young ones.

DIET: Crows are omnivorous, and their diet is very diverse. They will eat almost anything, including other birds, fruits, nuts, mollusks, earthworms, seeds, frogs, eggs, nestlings, mice, and carrion. The origin of placing scarecrows in grain fields resulted from the crow's incessant damaging and scavenging, although crows assist farmers by eating insects otherwise attracted to their crops.

REPRODUCTION : Crows reach sexual maturity around the age of three years for females and five years for males. Clutch size is approximately three to nine eggs, and the nesting period lasts between 20 and 40 days. Crows often mate for life, and young from previous years often help nesting pairs protect a nest and feed nestlings. A crow's nest is made of materials like twigs, electrical wires, metal strips, plastic pieces, and other small

items. Crow nestlings in urban areas face threats such as nest entanglement from anthropogenic nesting materials and stunted growth due to poor nutrition.

- **CUCKOO (EUDYNAMIS SP.)**

Kingdom:	Animalia
Phylum:	Chordata
Class:	Aves
Clade:	Otidimorphae
Order:	Cuculiformes Wagler, 1830
Family:	Cuculidae

Male shining metallic black feathers with a striking yellowish green bill and blood red eyes. Females are grayish brown and spotted and barred with white. So there is a well marked sexual dimorphism. Male has an attractive song call. Female has no song. It does not build nests and lays its eggs in crow's nest and the young ones are hatched and looked after by foster parents. Its song is not heard in winter, but becomes noisy in spring and summer.

DIET : The cuckoos feed on insects, insect larvae, and a variety of other animals, as well as fruit. Some species are brood parasites, laying their eggs in the nests of other species, but the majority of species raise their own young.

REPRODUCTION : **Most cuckoos lay one egg per nest**, except in a few species in which cuckoo nestlings do not kill those of the host. Cuckoos defend territories against other cuckoos and usually remove at least one host egg before laying one of their own.

- **PIGEONS (COLUMBIA LIVIA)**

Scientific name: Columbidae
Family: Columbidae; Leach, 1820
Order: Columbiformes; Latham, 1790
Kingdom: Animalia
Phylum: Chordata
Clade: Columbimorphae

Commonly called blue-rock pigeon. Color is slaty grey with glistening metallic green, purple, and magenta sheen on neck and upper breast. Two dark bars on wings and a band across the end of the tail. No sexual dimorphism, semi-domesticated. Commensal of man.

DIET : Pigeons are generally herbivores but they will eat **insects, snails and worms** when they need to. Urban pigeons will happily munch on breadcrumbs, popcorn, biscuits, chips, rice, pasta, fish and pet food – pretty much anything that humans leave behind.

REPRODUCTION : Pigeons are monogamous. **Eight to 12 days after mating, the females lay 1 or 2 eggs which hatch after 18 days**. The male provides nesting material and guards the female and the nest. The young are fed pigeon milk, a liquid-solid substance secreted in the crop of the adult (both male and female) that is regurgitated.

- **PARROT (PSITTACULA KRAMERI)**

Scientific name: Psittaciformes
Order: Psittaciformes; Wagler, 1830
Phylum: Chordata
Kingdom: Animalia
Clade: Psittacopasserae
Lifespan: Cockatoos: 40 – 60 years, Kākāpō: 40 – 80 years, Hyacinth macaw: 50 years

Commonly called rose-ringed parakeet. Body slender with pointed tail. Feather grass green in color. Male has a black and red collar which is absent in the females. Bill red curved adapted for nut-cracking. Builds nests in hollow tree-trunks, crevices and holes of buildings. Found often in large flocks. It is a popular cage bird and can be taught to talk.

DIET : The best foods for your pet parrot to eat are **fresh vegetables, fruit and pellets or seeds**. In the wild, parrot's diet can vary considerably and they like to eat fruit and fruit seeds, nuts, flowers, and corn where they can find it. Your domesticated parrot is no different, with her diet needing to be varied.

REPRODUCTION : **Parrots breed sexually and lay eggs to reproduce**. This happens 1-3 times per year. After copulation, eggs are formed and fertilized inside the female before being laid in the nest. 75% of parrots are sexually monomorphic or have no outward physical differences between the sexes

- **SPARROW (PASSER DOMESTICUS)**

Lifespan: 3 years (In the wild)
Conservation status: Least Concern (Population decreasing)
Scientific name: Passer domesticus

Small bird with upper surface earthy-brown, streaked with black, under parts whitish. Male has a black area on the throat and breast. Feeds on seeds and grains. Unfailing Commensal of man. Nest is a collection of straw and rubbish stuffed into a hole in the wall. Useful to agriculture as it destroys several insects' pests.

DIET : Their diet will now comprise of **cooked rice, boiled egg, sprouts, chapattis, crushed nuts and seeds, whole-wheat dough, sattu or roasted chickpea flour**

dough and rolled oats. The chicks must not be hand-fed with raw grains like millet (jowar, bajra), rice, soaked pulses and other bird seed mixes.

REPRODUCTION : **The female lays two to five eggs at daily intervals and often starts to incubate part way through egg-laying**. Both sexes incubate, and the chicks hatch after 11-14 days. The parents share nesting duties equally. Chicks are brooded for 6-8 days, but can control their own body temperature only when 10 or 11 days old.

- **OWL (BUBO BUBO)**

Order: Strigiformes; Wagler, 1830
Class: Aves
Phylum: Chordata
Kingdom: Animalia
Clade: Telluraves

Commonly called great – horned owl. Large, heavy and robust birds. Color is dark brown, streaked and mottled with tawny buff and black. Head is large and bears two conspicuous black ear-tuffs or horns. Eyes large and round, forwardly directed. Legs fully feathered. Mainly noctural but frequently seen during day time. They feed on rodents

and harmful insects pests and so is helpful to agriculturalists and hence has no to be protected.

DIET : **Small, rodent-like mammals, such as voles and mice**, are the primary prey for many owl species. An owl's diet may also include frogs, lizards, snakes, fish, mice, rabbits, birds, squirrels, and other creatures. Occasionally, Great Horned Owls might even find skunks tasty enough to eat.

REPRODUCTION : **owls hatch their eggs at different times, spaced out by two days.** All birds can only lay 1 egg a day at most but owls start to incubate their eggs immediately unlike ducks and geese which wait until all eggs are laid before incubating. In general, **owls lay between 1 and 13 eggs, depending on the species, although for most species it is 2–5 eggs**. Incubation begins with the first egg being laid. During incubation, the eggs are rarely left alone.

CONCLUSION:

BIRDS HAVE ECOLOGICAL VALUE AS IMPORTANT ELEMENTS OF NATURAL SYSTEMS. BIRDS PROVIDE INSECT AND RODENT CONTROL, PLANT POLLINATION, AND SEED DISPERSAL WHICH RESULT IN TANGIBLE BENEFITS TO PEOPLE.

THEY KEEP THE CLIMATE STABLE, OXYGENATE AIR AND TRANSFORM POLLUTANTS INTO NUTRIENTS. BIRDS PLAY AN IMPORTANT ROLE IN THE EFFECTIVE FUNCTIONING OF THESE SYSTEMS. AS BIRDS ARE HIGH UP IN THE FOOD CHAIN, THEY ARE ALSO GOOD INDICATORS OF THE GENERAL STATE OF OUR BIODIVERSITY.

FOR MAINTAINING A HEALTHY ECOLOGICAL BALANCE ON THIS EARTH, ANIMALS, PLANTS AND MARINE SPECIES ARE AS IMPORTANT AS HUMANS. EACH ORGANISM ON THIS EARTH HAS A UNIQUE PLACE IN FOOD CHAIN THAT HELPS CONTRIBUTE TO THE ECOSYSTEM IN ITS OWN SPECIAL WAY. BUT, SADLY TODAY, MANY OF THE ANIMALS AND BIRDS ARE GETTING ENDANGERED.

NB
20/6/22

BIBLIOGRAPHY :'

I HAVE GATHERED ALL THE ABOVE INFORMATION FROM THE WIKIPEDIA.