



# UNIVERSITY OF CALCUTTA

## Notification No. CSR/ 12 /18

It is notified for information of all concerned that the Syndicate in its meeting held on 28.05.2018 (vide Item No.14) approved the Syllabi of different subjects in Undergraduate Honours / General / Major courses of studies (CBCS) under this University, as laid down in the accompanying pamphlet:

### List of the subjects

<u>Sl. No.</u>	<u>Subject</u>	<u>Sl. No.</u>	<u>Subject</u>
1	Anthropology (Honours / General)	29	Mathematics (Honours / General)
2	Arabic (Honours / General)	30	Microbiology (Honours / General)
3	Persian (Honours / General)	31	Mol. Biology (General)
4	Bengali (Honours / General /LCC2 /AECC1)	32	Philosophy (Honours / General)
5	Bio-Chemistry (Honours / General)	33	Physical Education (General)
6	Botany (Honours / General)	34	Physics (Honours / General)
7	Chemistry (Honours / General)	35	Physiology (Honours / General)
8	Computer Science (Honours / General)	36	Political Science (Honours / General)
9	Defence Studies (General)	37	Psychology (Honours / General)
10	Economics (Honours / General)	38	Sanskrit (Honours / General)
11	Education (Honours / General)	39	Social Science (General)
12	Electronics (Honours / General)	40	Sociology (Honours / General)
13	English ((Honours / General/ LCC1/ LCC2/AECC1)	41	Statistics (Honours / General)
14	Environmental Science (Honours / General)	42	Urdu (Honours / General /LCC2 /AECC1)
15	Environmental Studies (AECC2)	43	Women Studies (General)
16	Film Studies ( General)	44	Zoology (Honours / General)
17	Food Nutrition (Honours / General)	45	Industrial Fish and Fisheries – IFFV (Major)
18	French (General)	46	Sericulture – SRTV (Major)
19	Geography (Honours / General)	47	Computer Applications – CMAV (Major)
20	Geology (Honours / General)	48	Tourism and Travel Management – TTMV (Major)
21	Hindi (Honours / General /LCC2 /AECC1)	49	Advertising Sales Promotion and Sales Management –ASPV (Major)
22	History (Honours / General)	50	Communicative English –CMEV (Major)
23	Islamic History Culture (Honours / General)	51	Clinical Nutrition and Dietetics CNDV (Major)
24	Home Science Extension Education (General)	52	Bachelor of Business Administration (BBA) (Honours)
25	House Hold Art (General)	53	Bachelor of Fashion and Apparel Design – (B.F.A.D.) (Honours)
26	Human Development (Honours / General)	54	Bachelor of Fine Art (B.F.A.) (Honours)
27	Human Rights (General)	55	B. Music (Honours / General) and Music (General)
28	Journalism and Mass Communication (Honours / General)		

The above shall be effective from the academic session 2018-2019.

SENATE HOUSE  
KOLKATA-700073  
The 4<sup>th</sup> June, 2018

*Paul*  
4/6/18  
(Dr. Santanu Paul)  
Deputy Registrar

# University of Calcutta

## Under Graduate Curriculum under Choice Based Credit System (CBCS)

### Syllabus for Ability Enhancement Compulsory Course-2 (AECC-2) in Environmental Studies

Semester-2

**Total Marks-100(Credit -2)**

(50 Theory-MCQ type + 30 Project + 10 Internal Assessment + 10 Attendance)

[Marks obtained in this course will be taken to calculate SGPA & CGPA]

#### Theory

<b>Unit 1 Introduction to environmental studies</b>	2 lectures
<ul style="list-style-type: none"><li>•Multidisciplinary nature of environmental studies;</li><li>•Scope and importance; Concept of sustainability and sustainable development.</li></ul>	
<b>Unit 2 Ecology and Ecosystems</b>	6 lectures
<ul style="list-style-type: none"><li>•Concept of ecology and ecosystem, Structure and function of ecosystem; Energy flow in an ecosystem; food chains, food webs; Basic concept of population and community ecology; ecological succession.</li><li>•Characteristic features of the following:<ul style="list-style-type: none"><li>a) Forest ecosystem</li><li>b) Grassland ecosystem</li><li>c) Desert ecosystem</li><li>d) Aquatic ecosystems (ponds, streams, lakes, wetlands, rivers, oceans, estuaries)</li></ul></li></ul>	
<b>Unit 3 Natural Resources</b>	8 lectures
<ul style="list-style-type: none"><li>• Concept of Renewable and Non-renewable resources</li><li>• Land resources and land use change; Land degradation, soil erosion and desertification.</li><li>•Deforestation: Causes, consequences and remedial measures</li><li>•Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international &amp; inter-state).</li><li>•Energy resources: Environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.</li></ul>	
<b>Unit 4 Biodiversity and Conservation</b>	8 lectures
<ul style="list-style-type: none"><li>•Levels of biological diversity: genetic, species and ecosystem diversity;</li><li>• Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots</li><li>•India as a mega-biodiversity nation; Endangered and endemic species of India</li><li>•Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions;</li><li>•Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.</li><li>•Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.</li></ul>	
<b>Unit 5 Environmental Pollution</b>	8 lectures
<ul style="list-style-type: none"><li>• Environmental pollution: concepts and types,</li><li>• Air, water, soil, noise and marine pollution- causes, effects and controls</li><li>• Concept of hazardous waste and human health risks</li><li>• Solid waste management: Control measures of Municipal, biomedical and e-waste.</li></ul>	

<b>Unit 6 Environmental Policies and Practices</b>	7 lectures
<ul style="list-style-type: none"> <li>•Climate change, global warming, ozone layer depletion, acid rain and their impacts on human communities and agriculture</li> <li>•Environment Laws: Wildlife Protection Act; Forest Conservation Act. Water (Prevention and control of Pollution) Act; Air (Prevention &amp; Control of Pollution) Act; Environment Protection Act; Biodiversity Act.</li> <li>•International agreements: Montreal Protocol, Kyoto protocol and climate negotiations; Convention on Biological Diversity (CBD).</li> <li>•Protected area network, tribal populations and rights, and human wildlife conflicts in Indian context.</li> </ul>	
<b>Unit 7 Human Communities and the Environment</b>	6 lectures
<ul style="list-style-type: none"> <li>•Human population growth: Impacts on environment, human health and welfare.</li> <li>•Case studies on Resettlement and rehabilitation.</li> <li>• Environmental Disaster: Natural Disasters-floods, earthquake, cyclones, tsunami and landslides; Manmade Disaster- Bhopal and Chernobyl.</li> <li>•Environmental movements: Bishnois, Chipko, Silent valley, Big dam movements.</li> <li>•Environmental ethics: Role of gender and cultures in environmental conservation.</li> <li>•Environmental education and public awareness</li> </ul>	
<b>Project/ Field work</b>	Equal to 5 lectures
<ul style="list-style-type: none"> <li>•Visit to an area to document environmental assets: Natural resources/flora/fauna, etc.</li> <li>•Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.</li> <li>•Study of common plants, insects, fish, birds, mammals and basic principles of identification.</li> <li>•Study of ecosystems-pond, river, wetland, forest, estuary and agro ecosystem.</li> </ul>	
<b>Total</b>	<b>50 Lectures</b>

### Suggested Reading:

Asthana, D. K. (2006). *Text Book of Environmental Studies*. S. Chand Publishing.

Basu, M., Xavier, S. (2016). *Fundamentals of Environmental Studies*, Cambridge University Press, India

Basu, R. N., (Ed.) (2000). *Environment*. University of Calcutta, Kolkata

Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.

De, A.K., (2006). *Environmental Chemistry*, 6th Edition, New Age International, New Delhi.

Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). *Environment Reader for Universities*, Centre for Science and Environment, New Delhi.

Masters, G. M., & Ela, W. P. (1991). *Introduction to environmental engineering and science*. Englewood Cliffs, NJ: Prentice Hall.

Odum, E. P., Odum, H. T., & Andrews, J. (1971). *Fundamentals of ecology*. Philadelphia: Saunders.

Sharma, P. D., & Sharma, P. D. (2005). *Ecology and environment*. Rastogi Publications.

# PROJECT REPORT

Checked  
25 out of 30

SEMESTER II

COURSE : AECC2(Enviromental Studies)

Project Title

Study of common plants and basic principals of identification

College Roll No:PHSA20F580

CU Registration No : 223-1211-0288-20

CU Roll No : 203223-11-0024

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to our respected Environmental Science (ENVS) teachers, for giving me this wonderful opportunity to do a case study on plants. They provided me continuous support, guidance and encouragement throughout the project. Without those motivation, help and guidance, the successful completion of this project work would not be possible.

Secondly I would like to express my humble gratitude towards our respective Principal Dr. Madhu Manjari Mondal and our entire college for giving me the support and providing the environment needed to complete this project work during this pandemic time.

And lastly, I would like to give thanks to my dear friends who helped me a lot in finalizing this project within the limited time span.

**Principal's Signature**

**Teacher's Signature**

# **INTRODUCTION**

---

Plants are ethical to other life on this planet because they form the basis of all food webs. Most plants are autotrophic, creating their own food using water, carbon dioxide and light through a process called photosynthesis. Some of the earliest fossils found have been aged at 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 :**

The area is whole Ghatal, Paschim Medinipur districts of West Bengal in India

## **METHOD OF STUDY :**

Making this project we use internet collect information about plants.

**INSTRUMENT :** Use internet <http://www.cwejournal.org> [www.wikipedia.org](http://www.wikipedia.org)

# PLANTS

## FOUR COMMON PLANTS

### 1) **MARGOSA TREE :**

Scientific Name : *Azadirachta indica*

Kingdom : Plantae

Class : Magnoliophyta

Genus : *Azadirachta*



**Source** : The leaves, bark, flowers, fruits and seeds are used as drug

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

**Uses** :

- (i) Neem contains antibacterial properties.
- (ii) It may work as a contraceptive in some cases.
- (iii) Helps to treat ulcers, cures asthma, control diabetes, cure leprosy etc.
- (iv) Increases blood circulation, maintains oral hygiene and health.
- (v) Fresh leaf juice with salt given for intestinal worms, jaundice, skin disease and malarial fever.



## 2)ALOE VERA :

Scientific Name : *Aloe barbadensis*Mills

Kingdom : plantae

Family : Asphodelaceae

Genus : *Aloe*



**Source :** Thick fleshy leaves (pulp,dried,juice) are used as a drug

**Chemical composition :** The main active principal 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 and galacturonic acid with protein.The plant contain aloesone and aloesin.

**Uses :**

- (i) Aloe is chiefly used as purgative,abortifacient,blood purifier,cathartic,cooling.
- (ii) It is useful in burn,cold cough,jaundice,worms and piles.
- (iii)Aloe is used in preparation of vegetables,pickles,cosmetics,skin blemishes.
- (iv) It helps to grow new healthy tissue.
- (v) It is used as hair tonic as it stimulates the growth of hair.



### 3)PUDINA :

Scientific Name : Mentha

Kingdom : Plantae

Clade : angiosperms

Family : Lamiaceae



**Source :** The fresh or dried leaves are used as drug.

**Chemical composition :** The active chemical in mint is a terpene alcohol called menthol or peppermint camphor but let's stick with menthal for now. Traditionally it is extracted from the leaves of plants like peppermint, in which it may act as a natural insecticide. Mint plants contain an antioxidant and anti-inflammatory agent called fosmarinic acid.

- Uses :**
- (i) Improves bloating and indiagestion, reduces nausea, relief from allergy.
  - (ii) Relieves skin issues like acne and insect bites, promotes digestion.
  - (iii) Helps boost immunity and lose weight, prevents Cancer.
  - (iv) It is an effective relief for respiratory disorders and coughs.

## 4) TULSI :

Scientific Name : Holy basil

Kingdom : Plantae

Family : Lamiaceae

Genus : Ocimum



**Source** : Leaves, stem, flower, root, seeds and even whole plant are used as a drug.

**Chemical composition** : The main chemical constituents of tulsi are Oleanic acid, Ursolic acid, Rosmarinic acid, Eugenol. Essential oil and extract of Tulsi leaves have antiviral properties.

**Uses** :

- (i) Tulsi leaves are used to treat skin problems like acne, blackheads and Premature ageing.
- (ii) Tulsi is also used to treat heart disease and fever.
- (iii) Tulsi is also used to treat respiratory problems.
- (iv) Tulsi is rich in vitamin C and zinc. It acts as a natural immunity booster and keeps infections at bay.
- (v) It has immense anti-bacterial, anti-viral and anti-fungal properties.

## **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 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, algae with mostly haploid life cycles existed, but land plants later originated from a haploid-diploid ancestor.



## **RECOMMENDATION**

---

Plants are the most important part of our life. We cannot breathe without the help of plants. But we cut the plants randomly for our own purpose. Due to pollution, industrial activities, and deforestation, plants are being destroyed. For this reason, the rain is not coming out in proper time as a result of drought and flood occurring. So it is our duty to protect our environment. I recommend that all go to Google and search about plants, how to save them, their impact in nature, and their importance in nature. All related books should be read and awareness should be spread to all near you.

# PROJECT REPORT

SEMESTER II

COURSE : AECC2(Enviromental Studies)

## Project Title

Study of common plants and basic principals of identification

College Roll No:PHSA20F580

CU Registration No : 223-1211-0288-20

CU Roll No : 203223-11-0024

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to our respected Environmental Science (ENVS) teachers, for giving me this wonderful opportunity to do a case study on plants. They provided me continuous support, guidance and encouragement throughout the project. Without those motivation, help and guidance, the successful completion of this project work would not be possible.

Secondly I would like to express my humble gratitude towards our respective Principal Dr. Madhu Manjari Mondal and our entire college for giving me the support and providing the environment needed to complete this project work during this pandemic time.

And lastly, I would like to give thanks to my dear friends who helped me a lot in finalizing this project within the limited time span.

**Principal's Signature**

**Teacher's Signature**

# **INTRODUCTION**

---

Plants are ethical to other life on this planet because they form the basis of all food webs. Most plants are autotrophic, creating their own food using water, carbon dioxide and light through a process called photosynthesis. Some of the earliest fossils found have been aged at 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 :**

The area is whole Ghatal, Paschim Medinipur districts of West Bengal in India

## **METHOD OF STUDY :**

Making this project we use internet collect information about plants.

**INSTRUMENT :** Use internet <http://www.cwejournal.org> [www.wikipedia.org](http://www.wikipedia.org)

# PLANTS

## FOUR COMMON PLANTS

### 1) **MARGOSA TREE :**

Scientific Name : *Azadirachta indica*

Kingdom : Plantae

Class : Magnoliophyta

Genus : *Azadirachta*



**Source** : The leaves, bark, flowers, fruits and seeds are used as drug

**Chemical composition** : The alkaloids are the main active principles. They are nimbin, Nimbidine, nimbosterine and nimbecin etc. Fatty acid present in the plant and seed contain 40 to 45% fixed oil.

**Uses** :

- (i) Neem contains antibacterial properties.
- (ii) It may work as a contraceptive in some cases.
- (iii) Helps to treat ulcers, cures asthma, control diabetes, cure leprosy etc.
- (iv) Increases blood circulation, maintains oral hygiene and health.
- (v) Fresh leaf juice with salt given for intestinal worms, jaundice, skin disease and malarial fever.



## 2)ALOE VERA :

Scientific Name : Aloe barbadensesMills

Kingdom : plantae

Family : Asphodelaceae

Genus : Aloe



**Source :** Thick fleshy leaves (pulp,dried,juice) are used as a drug

**Chemical composition :** The main active principal 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 and galacturonic acid with protein.The plant contain aloesone and aloesin.

**Uses :**

- (i) Aloe is chiefly used as purgative,abortifacient,blood purifier,cathartic,cooling.
- (ii) It is useful in burn,cold cough,jaundice,worms and piles.
- (iii)Aloe is used in preparation of vegetables,pickles,cosmetics,skin blemishes.
- (iv) It helps to grow new healthy tissue.
- (v) It is used as hair tonic as it stimulates the growth of hair.



### 3)PUDINA :

Scientific Name : Mentha

Kingdom : Plantae

Clade : angiosperms

Family : Lamiaceae



**Source :** The fresh or dried leaves are used as drug.

**Chemical composition :** The active chemical in mint is a terpene alcohol called menthol or peppermint camphor but let's stick with menthal for now. Traditionally it is extracted from the leaves of plants like peppermint, in which it may act as a natural insecticide. Mint plants contain an antioxidant and anti-inflammatory agent called fosmarinic acid.

- Uses :**
- (i) Improves bloating and indigestion, reduces nausea, relief from allergy.
  - (ii) Relieves skin issues like acne and insect bites, promotes digestion.
  - (iii) Helps boost immunity and lose weight, prevents Cancer.
  - (iv) It is an effective relief for respiratory disorders and coughs.

## 4) TULSI :

Scientific Name : Holy basil

Kingdom : Plantae

Family : Lamiaceae

Genus : Ocimum



**Source** : Leaves, stem, flower, root, seeds and even whole plant are used as a drug.

**Chemical composition** : The main chemical constituents of tulsi are Oleanic acid, Ursolic acid, Rosmarinic acid, Eugenol. Essential oil and extract of Tulsi leaves have antiviral properties.

**Uses** :

- (i) Tulsi leaves are used to treat skin problems like acne, blackheads and Premature ageing.
- (ii) Tulsi is also used to treat heart disease and fever.
- (iii) Tulsi is also used to treat respiratory problems.
- (iv) Tulsi is rich in vitamin C and zinc. It acts as a natural immunity booster and keeps infections at bay.
- (v) It has immense anti-bacterial, anti-viral and anti-fungal properties.

## **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 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, algae with mostly haploid life cycles existed, but land plants later originated from a haploid-diploid ancestor.



## **RECOMMENDATION**

---

Plants are the most important part of our life. We cannot breathe without the help of plants. But we cut the plants randomly for our own purpose. Due to pollution, industrial activities, and deforestation, plants are being destroyed. For this reason, the rain does not come out in proper time as a result of drought and flood occurring. So it is our duty to protect our environment. I recommend to all go to Google and search about plants, how to save them, their impact in nature, and their importance in nature. All related books read and aware to all near you.

# PROJECT REPORT

Semester II

VISIT TO AN AREA TO DOCUMENT  
ENVIRONMENTAL ASSETS: FAUNA  
DIVERSITY

COURSE: AECC 2  
(ENVIRONMENTAL SCIENCE)

Checked  
26 out of 30

COLLEGE ROLL NO: **PHSA20F585**

CU REGISTRATION NO: **223-1211-0311-20**

CU ROLL NO: **203223-11-0036**

# INDEX

<b>TOPIC</b>	<b>PAGE NO</b>
<b>Acknowledgement</b>	<b>2</b>
<b>Introduction</b>	<b>3</b>
<b>Study Site</b>	<b>4</b>
<b>Environmental Assets: Fauna</b>	
<b>Diversity</b>	<b>5</b>
<b>A. Bird Species (Avifauna)</b>	<b>5</b>
<b>B. Animal Species</b>	<b>10</b>
<b>C. Butterfly Species</b>	<b>11</b>
<b>Conclusion</b>	<b>14</b>

## **ACKNOWLEDGEMENT**

I am highly indebted to all the professors of Environmental Science Department of our Scottish Church College for their guidance and support. I am highly obliged to Dr. Jayeeta Chowdhury, HOD of Physics, Scottish Church College for her constant guidance and supervision. I would also like to express my gratitude towards batch mates for their help.

Date: July 5, 2021

# INTRODUCTION

An Environmental Asset is defined as naturally occurring living and non-living entities of the Earth, together comprising the bio-physical environment, that jointly deliver ecosystem services to the benefit of current and future generation. A functional network of greenspaces is important for the maintenance of ecological dimension of a sustainable urban landscape. These areas have been a priority for planners and land managers in many developed nations because they are also important for improving the quality of life in many ways, from the environmental services they provide to the aesthetic, psychological, health and social benefits for human inhabitants. Some studies have demonstrated that greenspaces can sustain a diverse avifauna. So we can consider greenspaces as an ideal place to document environmental assets.

Located within the floodplains of lower Gangetic delta, Kolkata is naturally gifted with rivers, canals, wetlands, water bodies and lush tropical landscapes which all are rich in environmental assets. Maidan, 620 hectares of open green space in the heart of the city, is referred to as the “lungs” of the city and constitutes 61 per cent of Kolkata’s public open space. Along with other adjoining parks, it is the hub of major recreational and sports activities, a green belt and repository of biodiversity. I made two times visit to this Maidan area to document its environmental assets.

# STUDY SITE

**Maidan (22.5545° N, 88.3409° E)** – The Maidan (literally open field) is the largest urban park in the city Kolkata. It is a vast stretch of field and home to numerous play grounds. The Maidan stretches as far north as the Raj Bhaban building in Esplanade and as far south as the National Library on Belvedere Road. Due to the freshness and greenery it provides to the metropolis, it has been referred to as the ‘lungs of Kolkata’. It is now a property of the Indian Army.



**MAIDAN**

















## **ENVIRONMENTAL ASSETS: FAUNA DIVERSITY**







### **A. Bird Species (Avifauna)**

Maidan contributes to a number of environmental functions in urban environments, such as the survival of urban-dwelling species mainly bird species. Birds amongst other species provide a wide range of environmental and social functions to cities and urban dwellers. This region in the heart of Kolkata has a wide range of bird species. Maidan can be considered as the resident or local birds of Kolkata. During the present study 25 species of resident birds belonging to 16 families were recorded from Maidan area as tabulated below:

Common Name	Scientific name	Family	Photos
House Crow	<i>Corvus splendens</i>	Corvidae	
Jungle babbler	<i>Turdoides striata</i>	Leiotrichidae	
House sparrow	<i>Passer domesticus</i>	Passeridae	
Common myna	<i>Acridotheres tristis</i>	Sturnidae	
Jungle myna	<i>Acridotheres fuscus</i>	Sturnidae	

Rufous treepie	<i>Dendrocitta vagabunda</i>	Corvidae	
Red Vented bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	
Alexandrine parakeet	<i>Psittacula eupatria</i>	Psittacidae	
Spotted dove	<i>Spilopelia chinensis</i>	Columbidae	
Eurasian collared dove	<i>Streptopelia decaocto</i>	Columbidae	
Rose ringed parakeet	<i>Psittacula krameri</i>	Psittacidae	

Asian pied starling	<i>Gracupica contra</i>	Sturnidae	
Coppersmith barbet	<i>Psilopogon haemacephalus</i>	Megalaimidae	
Blue throated barbet	<i>Psilopogon asiaticus</i>	Megalaimidae	
Black hooded oriole	<i>Oriolus xanthornus</i>	Oriolidae	
Oriental magpie robin	<i>Copsychus saularis</i>	Muscicapidae	

White Throated Kingfisher	<i>Halcyon smyrnensi</i>	Alcedinidae	
Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	
Kite	<i>Milvus migrans</i>	Accipitridae	
Flameback golden woodpecker	<i>Dinopium benghalense</i>	Picidae	
Rufous woodpecker	<i>Micropternus brachyurus</i>	Picidae	
Green bee eater	<i>Merops orientalis</i>	Meropidae	

Black drongo	<i>Dicrurus macrocercus</i>	Dicruridae	
Little egret	<i>Egretta garzetta</i>	Ardeidae	
Blue rock pigeon	<i>Columba livia</i>	Columbidae	

## B. Animal Species

The Maidan accounts for nearly half of the city's total open space. There has been a massive habitat destruction in recent years. But during my visit in Maidan area, I have noticed a few animals in the region. Horse is commonly seen in Maidan area. The horses are left to graze and fend for themselves on the Maidan by their owners. A few shepherds are also seen with their sheep flock at the vast green land of Maidan. Other common domestic animals are also found there.







## Horses








## Sheep Flock

### **C. Butterfly Species**

Butterflies are insects in the macrolepidopteran clade Rhopalocera from the order Lepidoptera. A large number of the butterflies like the Common Mormon, Tailed Jay, Common Jay, Common Emigrant, Psyche, Common Gull, Common Grass Yellow, Peacock Pansy and Blue Tiger are most common in the Maidan area.

COMMON NAME	SCIENTIFIC NAME	FAMILY	PHOTOS
Common Mormon	<i>Papilio polytes</i>	Papilionidae	
Tailed Jay	<i>Graphium agamemnon</i>	Papilionidae	
Common Jay	<i>Graphium doson</i>	Papilionidae	
Common Emigrant	<i>Catopsilia pomona</i>	Pieridae	



Psyche	<i>Leptosia nina</i>	Pieridae	
Common Gull	<i>Larus canus</i>	Laridae	
Common Grass Yellow	<i>Eurema hecabe</i>	Pieridae	
Peacock Pansy	<i>Junonia almana</i>	Lepidoptera	
Blue Tiger	<i>Tirumala limniace</i>	Nymphalidae	

## **CONCLUSION**

The present study was done in a green space in the heart of the city Kolkata, popularly known as Maidan. Fauna diversity of that area was measured. Species richness and evenness were seen in the study site. Birds are quite dominant among all other species in the area. From the study it is clearly evident that there is a greater number of terrestrial resident bird species found in Maidan. Though human interference occurs there, but the area is so well spread that the disturbance caused to the birds is relatively less. And they all are well adapted to the environmental conditions, climatic changes of this area throughout the year. Maximum number of birds were found to be Omnivores followed by granivores, insectivores, frugivores and carnivores. Along with birds, Maidan is well riched in butterflies. Varieties of butterflies are found there. The horses and sheep contribute to the animals of this area. Hence we can conclude that, the Maidan is a well deserved place to document environmental assets and under proper maintenance and management, it can be important for the conservation of different faunal species in a metropolitan city like Kolkata.

# PROJECT REPORT

Semester II

VISIT TO AN AREA TO DOCUMENT  
ENVIRONMENTAL ASSETS: FAUNA  
DIVERSITY

COURSE: AECC 2  
(ENVIRONMENTAL SCIENCE)

COLLEGE ROLL NO: **PHSA20F585**

CU REGISTRATION NO: **223-1211-0311-20**

CU ROLL NO: **203223-11-0036**

# INDEX

<b>TOPIC</b>	<b>PAGE NO</b>
<b>Acknowledgement</b>	<b>2</b>
<b>Introduction</b>	<b>3</b>
<b>Study Site</b>	<b>4</b>
<b>Environmental Assets: Fauna</b>	
<b>Diversity</b>	<b>5</b>
<b>A. Bird Species (Avifauna)</b>	<b>5</b>
<b>B. Animal Species</b>	<b>10</b>
<b>C. Butterfly Species</b>	<b>11</b>
<b>Conclusion</b>	<b>14</b>

## **ACKNOWLEDGEMENT**

I am highly indebted to all the professors of Environmental Science Department of our Scottish Church College for their guidance and support. I am highly obliged to Dr. Jayeeta Chowdhury, HOD of Physics, Scottish Church College for her constant guidance and supervision. I would also like to express my gratitude towards batch mates for their help.

Date: July 5, 2021

# INTRODUCTION

An Environmental Asset is defined as naturally occurring living and non-living entities of the Earth, together comprising the bio-physical environment, that jointly deliver ecosystem services to the benefit of current and future generation. A functional network of greenspaces is important for the maintenance of ecological dimension of a sustainable urban landscape. These areas have been a priority for planners and land managers in many developed nations because they are also important for improving the quality of life in many ways, from the environmental services they provide to the aesthetic, psychological, health and social benefits for human inhabitants. Some studies have demonstrated that greenspaces can sustain a diverse avifauna. So we can consider greenspaces as an ideal place to document environmental assets.

Located within the floodplains of lower Gangetic delta, Kolkata is naturally gifted with rivers, canals, wetlands, water bodies and lush tropical landscapes which all are rich in environmental assets. Maidan, 620 hectares of open green space in the heart of the city, is referred to as the “lungs” of the city and constitutes 61 per cent of Kolkata’s public open space. Along with other adjoining parks, it is the hub of major recreational and sports activities, a green belt and repository of biodiversity. I made two times visit to this Maidan area to document its environmental assets.

# STUDY SITE

**Maidan (22.5545° N, 88.3409° E)** – The Maidan (literally open field) is the largest urban park in the city Kolkata. It is a vast stretch of field and home to numerous play grounds. The Maidan stretches as far north as the Raj Bhaban building in Esplanade and as far south as the National Library on Belvedere Road. Due to the freshness and greenery it provides to the metropolis, it has been referred to as the ‘lungs of Kolkata’. It is now a property of the Indian Army.



**MAIDAN**









## **ENVIRONMENTAL ASSETS: FAUNA DIVERSITY**






### **A. Bird Species (Avifauna)**







Maidan contributes to a number of environmental functions in urban environments, such as the survival of urban-dwelling species mainly bird species. Birds amongst other species provide a wide range of environmental and social functions to cities and urban dwellers. This region in the heart of Kolkata has a wide range of bird species. Maidan can be considered as the resident or local birds of Kolkata. During the present study 25 species of resident birds belonging to 16 families were recorded from Maidan area as tabulated below:



Common Name	Scientific name	Family	Photos
House Crow	<i>Corvus splendens</i>	Corvidae	
Jungle babbler	<i>Turdoides striata</i>	Leiotrichidae	
House sparrow	<i>Passer domesticus</i>	Passeridae	
Common myna	<i>Acridotheres tristis</i>	Sturnidae	
Jungle myna	<i>Acridotheres fuscus</i>	Sturnidae	

Rufous treepie	<i>Dendrocitta vagabunda</i>	Corvidae	
Red Vented bulbul	<i>Pycnonotus cafer</i>	Pycnonotidae	
Alexandrine parakeet	<i>Psittacula eupatria</i>	Psittacidae	
Spotted dove	<i>Spilopelia chinensis</i>	Columbidae	
Eurasian collared dove	<i>Streptopelia decaocto</i>	Columbidae	
Rose ringed parakeet	<i>Psittacula krameri</i>	Psittacidae	

Asian pied starling	<i>Gracupica contra</i>	Sturnidae	
Coppersmith barbet	<i>Psilopogon haemacephalus</i>	Megalaimidae	
Blue throated barbet	<i>Psilopogon asiaticus</i>	Megalaimidae	
Black hooded oriole	<i>Oriolus xanthornus</i>	Oriolidae	
Oriental magpie robin	<i>Copsychus saularis</i>	Muscicapidae	

White Throated Kingfisher	<i>Halcyon smyrnensi</i>	Alcedinidae	
Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae	
Kite	<i>Milvus migrans</i>	Accipitridae	
Flameback golden woodpecker	<i>Dinopium benghalense</i>	Picidae	
Rufous woodpecker	<i>Micropternus brachyurus</i>	Picidae	
Green bee eater	<i>Merops orientalis</i>	Meropidae	

Black drongo	<i>Dicrurus macrocercus</i>	Dicruridae	
Little egret	<i>Egretta garzetta</i>	Ardeidae	
Blue rock pigeon	<i>Columba livia</i>	Columbidae	

## B. Animal Species

The Maidan accounts for nearly half of the city's total open space. There has been a massive habitat destruction in recent years. But during my visit in Maidan area, I have noticed a few animals in the region. Horse is commonly seen in Maidan area. The horses are left to graze and fend for themselves on the Maidan by their owners. A few shepherds are also seen with their sheep flock at the vast green land of Maidan. Other common domestic animals are also found there.







## Horses








## Sheep Flock

### **C. Butterfly Species**

Butterflies are insects in the macrolepidopteran clade Rhopalocera from the order Lepidoptera. A large number of the butterflies like the Common Mormon, Tailed Jay, Common Jay, Common Emigrant, Psyche, Common Gull, Common Grass Yellow, Peacock Pansy and Blue Tiger are most common in the Maidan area.

COMMON NAME	SCIENTIFIC NAME	FAMILY	PHOTOS
Common Mormon	<i>Papilio polytes</i>	Papilionidae	
Tailed Jay	<i>Graphium agamemnon</i>	Papilionidae	
Common Jay	<i>Graphium doson</i>	Papilionidae	
Common Emigrant	<i>Catopsilia pomona</i>	Pieridae	

Psyche	<i>Leptosia nina</i>	Pieridae	
Common Gull	<i>Larus canus</i>	Laridae	
Common Grass Yellow	<i>Eurema hecabe</i>	Pieridae	
Peacock Pansy	<i>Junonia almana</i>	Lepidoptera	
Blue Tiger	<i>Tirumala limniace</i>	Nymphalidae	



## **CONCLUSION**

The present study was done in a green space in the heart of the city Kolkata, popularly known as Maidan. Fauna diversity of that area was measured. Species richness and evenness were seen in the study site. Birds are quite dominant among all other species in the area. From the study it is clearly evident that there is a greater number of terrestrial resident bird species found in Maidan. Though human interference occurs there, but the area is so well spread that the disturbance caused to the birds is relatively less. And they all are well adapted to the environmental conditions, climatic changes of this area throughout the year. Maximum number of birds were found to be Omnivores followed by granivores, insectivores, frugivores and carnivores. Along with birds, Maidan is well riched in butterflies. Varieties of butterflies are found there. The horses and sheep contribute to the animals of this area. Hence we can conclude that, the Maidan is a well deserved place to document environmental assets and under proper maintenance and management, it can be important for the conservation of different faunal species in a metropolitan city like Kolkata.

# PROJECT REPORT

SEMESTER II

COURSE: AECC2 ( Environmental Studies)

Project Title :

Visit To A Local Urban Polluted Site

College

Collage Roll No.: PHSA20F589

CU Registration No. 223-1211-0328-20

CU Roll No. 203223-11-0042

Checked  
24 out of 30

## **Introduction :**

**Pollution** is the introduction of [contaminants](#) into the natural environment that cause adverse change. Pollution can take the form of [chemical substances](#) or [energy](#), such as noise, heat, or light. [Pollutants](#), the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as [point source](#) or [nonpoint source pollution](#). Pollution is the action of polluting especially by environmental contamination with man made waste. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollutants , the components of pollution can be either foreign substance or naturally occurring contaminates. Different types of pollution are air pollution, land pollution, water pollution, noise pollution, plastic pollution, light pollution, thermal pollution and so on. Major forms of pollution include [air pollution](#), [light pollution](#), [litter](#), [noise pollution](#), [plastic pollution](#), [soil contamination](#), [radioactive contamination](#), [thermal pollution](#), [visual pollution](#), and [water pollution](#).



The burning of coal and wood, and the presence of many horses in concentrated areas made the cities the primary sources of pollution. The [Industrial Revolution](#) brought an infusion of untreated chemicals and [wastes](#) into local streams that served . It was the Industrial Revolution that gave birth to environmental pollution as we know it today. London also recorded one of the earlier extreme cases of [water quality](#) problems with the area , which led to construction of the local area system soon afterward. Pollution issues escalated as [population growth](#) far exceeded viability of neighborhoods to handle their waste problem. Reformers began to demand sewer systems and clean water.

## **Forms of pollution :**

Blue drain and yellow fish symbol used by the UK Environment Agency to raise awareness of the ecological impacts of contaminating surface drainage. The major forms of pollution are listed below along with the particular [contaminant](#) relevant to each of them. [Air pollution](#): the release of chemicals and [particulates](#) into the atmosphere. Common gaseous pollutants include [carbon monoxide](#), [sulfur dioxide](#), [contaminant](#) relevant to each of them. [Air](#)

**pollution**: the release of chemicals and **particulates** into the atmosphere. Common gaseous pollutants include **carbon monoxide**, **sulfur dioxide**, **chlorofluorocarbons** (CFCs) and **nitrogen oxides** produced by **industry** and motor vehicles. Photochemical **ozone** and **smog** are created as nitrogen oxides and **hydrocarbons** react to sunlight. **Particulate matter**, or fine dust is characterized by their **micrometre** size PM<sub>10</sub> to PM<sub>2.5</sub>.



- **Electromagnetic pollution**: the overabundance of **electromagnetic radiation** in their **non-ionizing** form, like radio waves, etc, that people are constantly exposed at, especially in large cities. It's still unknown whether or not those types of radiation have any effects on human health, though.
- **Light pollution**: includes light trespass, **over-illumination** and **astronomical** interference.
- **Littering**: the criminal throwing of inappropriate man-made objects, unremoved, onto public and private properties.
- **Noise pollution**: which encompasses **roadway noise**, **aircraft noise**, **industrial noise** as well as high-intensity **sonar**.
- **Plastic pollution**: involves the accumulation of plastic products and **microplastics** in the environment that adversely affects wildlife, wildlife habitat, or humans.
- **Soil contamination** occurs when chemicals are released by spill or underground leakage. Among the most significant **soil contaminants** are **hydrocarbons**, **heavy metals**, **MTBE**, **herbicides**, **pesticides** and **chlorinated hydrocarbons**.
- **Radioactive contamination**, resulting from 20th century activities in **atomic physics**, such as nuclear power generation and nuclear weapons research, manufacture and deployment. (See **alpha emitters** and **actinides in the environment**. **Thermal pollution**, is a **temperature** change in natural water bodies caused by human influence, such as use of water as coolant in a power plant. **Visual pollution**, which can refer to the presence of overhead **power lines**, motorway **billboards**, scarred **landforms** (as from **strip mining**), open storage of trash, **municipal solid waste** or **space debris**.



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

### **Cause of Pollution :**

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

[Motor vehicle emissions](#) are one of the leading causes of air pollution. Principal stationary pollution sources include [chemical plants](#), coal-fired [power plants](#), [oil refineries](#),<sup>[38]</sup> [petrochemical](#) plants, [nuclear waste](#) disposal activity, incinerators, large [livestock farms](#) (dairy cows, pigs, poultry, etc.), [PVC](#) factories, metals production factories, plastics factories, and other [heavy industry](#). Agricultural air pollution comes from contemporary practices which include clear felling and burning of natural vegetation as well as spraying of pesticides and herbicides. About 400 million metric tons of [hazardous wastes](#) are generated each year. The United States alone produces about 250 million metric tons. Americans constitute less than 5% of the [world's population](#), but produce roughly 25% of the world's [CO2](#) and generate approximately 30% of [world's waste](#).



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

- Some of the more common [soil](#) contaminants are [chlorinated hydrocarbons](#) (CHH), [heavy metals](#) (such as [chromium](#), [cadmium](#) – found in rechargeable [batteries](#), and [lead](#) – found in lead [paint](#), [aviation fuel](#) and still in some countries, [gasoline](#)), [MTBE](#), [zinc](#), [arsenic](#) and [benzene](#). In 2001 a series of press reports culminating in a book called [Fateful Harvest](#) unveiled a widespread practice of recycling industrial byproducts into fertilizer, resulting in the contamination of the soil with various metals. Ordinary municipal [landfills](#) are the source of many chemical substances entering the soil environment (and often groundwater), emanating from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have been subject to little control in the U.S. or EU. There have also been some unusual releases of [polychlorinated dibenzodioxins](#), commonly called *dioxins* for simplicity, such as [TCDD](#).
- Pollution can also be the consequence of a natural disaster. For example, [hurricanes](#) often involve water contamination from sewage, and [petrochemical](#) spills from ruptured [boats](#) or [automobiles](#). Larger scale and environmental damage is not uncommon when coastal [oil rigs](#) or [refineries](#) are involved. Some sources of pollution, such as [nuclear power](#) plants or [oil tankers](#), can produce widespread and potentially hazardous releases when accidents occur.
- In the case of [noise pollution](#) the dominant source class is the [motor vehicle](#), producing about ninety percent of all unwanted noise worldwide.

## **Effects :**

### Human health :

Further information: [Soil pollution § Health effects](#), [Toxic hotspots](#), and [List of pollution-related diseases](#) etc. Overview of main health effects on humans from some common types of pollution. Adverse [air quality](#) can kill many organisms, including humans. Ozone pollution can cause [respiratory disease](#), [cardiovascular disease](#), [throat](#) inflammation, chest pain, and [congestion](#). [Water pollution](#) causes approximately 14,000 deaths per day, mostly due to [contamination of drinking water](#) by untreated [sewage](#) in [developing countries](#). An estimated 500 million [Indians](#) have no access to a proper toilet, Over ten million people in India fell ill with waterborne illnesses in 2013, and 1,535 people died, most of them children. Nearly 500 million Chinese lack access to safe drinking water. The high smog levels has been facing for a long time can do damage to civilians' bodies and cause different diseases. The [WHO](#) estimated in 2007 that air pollution causes half a million deaths per year in

India. Studies have estimated that the number of people killed annually in the United States could be over 50,000.

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

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

Environment :

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

[Biomagnification](#) describes situations where toxins (such as [heavy metals](#)) may pass through [trophic levels](#), becoming exponentially more concentrated [carbon dioxide emissions](#). [Carbon dioxide](#) emissions cause [ocean acidification](#), the ongoing decrease in the pH of the Earth's oceans as CO<sub>2</sub> becomes dissolved. The emission of [greenhouse gases](#) leads to [global warming](#) which affects ecosystems in many ways. [Invasive species](#) can outcompete native species and reduce [biodiversity](#). Invasive plants can contribute debris and biomolecules ([allelopathy](#)) that can alter soil and chemical compositions of an environment, often reducing native species [competitiveness](#).

- [Nitrogen oxides](#) are removed from the air by rain and [fertilise](#) land which can change the species composition of ecosystems.
- [Smog](#) and haze can reduce the amount of sunlight received by plants to carry out [photosynthesis](#) and leads to the production of [tropospheric ozone](#) which damages plants.
- Soil can become infertile and unsuitable for plants. This will affect other [environment](#).

## **Pollution control :**

Air pollution control system, known as a [Thermal oxidizer](#), decomposes hazard gases from industrial air streams at a factory in the [United States of America](#). Pollution control is a term used in [environmental management](#). It means the control of [emissions](#) and [effluents](#) into air, water or soil. Without pollution control, the [waste](#) products from [overconsumption](#), heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the [environment](#). In the hierarchy of controls, [pollution prevention](#) and [waste minimization](#) are more desirable than pollution control. In the field of [land development](#), [low impact development](#) is a similar technique for the prevention of urban pollution.

## **Process :**

Recycling, Reusing, Waste minimisation, Preventing, Compost etc.

## **Pollution control devices :**

- [Air pollution control](#) --- Thermal oxidizer
- [Dust collection systems](#) --- Baghouses, cyclones, electrostatic precipitator
- [Scrubbers](#) --- [Baffle spray scrubber](#)

## **Perspective :**

The earliest precursor of pollution generated by life forms would have been a natural function of their existence. The attendant consequences on viability and population levels fell within the sphere of [natural selection](#). These would have included the demise of a population locally or ultimately, species extinction. Processes that were untenable would have resulted in a new balance brought about by changes and adaptations. At the extremes, for any form of life, consideration of pollution is superseded by that of survival. For humankind, the factor of technology is a distinguishing and critical consideration, both as an enabler and an additional source of byproducts. Short of survival, human concerns include the range from quality of life to health hazards. Since science holds experimental demonstration to be definitive, modern treatment of toxicity or environmental harm involves defining a level at which an effect is observable. Common examples of fields where practical measurement is crucial include [automobile emissions control](#), industrial exposure (e.g. [Occupational Safety and Health Administration](#) (OSHA) [PELs](#)), [toxicology](#) (e.g. [LD](#)), and [medicine](#) (e.g. [medication](#) and [radiation](#) doses).



# PROJECT REPORT

SEMESTER II

COURSE: AECC2 ( Environmental Studies)

Project Title :

Visit To A Local Urban Polluted Site

Collage Roll No.: PHSA20F589

CU Registration No. 223-1211-0328-20

CU Roll No. 203223-11-0042

## **Introduction :**

**Pollution** is the introduction of [contaminants](#) into the natural environment that cause adverse change. Pollution can take the form of [chemical substances](#) or [energy](#), such as noise, heat, or light. [Pollutants](#), the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as [point source](#) or [nonpoint source pollution](#). Pollution is the action of polluting especially by environmental contamination with man made waste. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollutants , the components of pollution can be either foreign substance or naturally occurring contaminates. Different types of pollution are air pollution, land pollution, water pollution, noise pollution, plastic pollution, light pollution, thermal pollution and so on. Major forms of pollution include [air pollution](#), [light pollution](#), [litter](#), [noise pollution](#), [plastic pollution](#), [soil contamination](#), [radioactive contamination](#), [thermal pollution](#), [visual pollution](#), and [water pollution](#).



The burning of coal and wood, and the presence of many horses in concentrated areas made the cities the primary sources of pollution. The [Industrial Revolution](#) brought an infusion of untreated chemicals and [wastes](#) into local streams that served . It was the Industrial Revolution that gave birth to environmental pollution as we know it today. London also recorded one of the earlier extreme cases of [water quality](#) problems with the area , which led to construction of the local area system soon afterward. Pollution issues escalated as [population growth](#) far exceeded viability of neighborhoods to handle their waste problem. Reformers began to demand sewer systems and clean water.

## **Forms of pollution :**

Blue drain and yellow fish symbol used by the UK Environment Agency to raise awareness of the ecological impacts of contaminating surface drainage. The major forms of pollution are listed below along with the particular [contaminant](#) relevant to each of them. [Air pollution](#): the release of chemicals and [particulates](#) into the atmosphere. Common gaseous pollutants include [carbon monoxide](#), [sulfur dioxide](#), [contaminant](#) relevant to each of them. [Air](#)

**pollution**: the release of chemicals and **particulates** into the atmosphere. Common gaseous pollutants include **carbon monoxide**, **sulfur dioxide**, **chlorofluorocarbons** (CFCs) and **nitrogen oxides** produced by **industry** and motor vehicles. Photochemical **ozone** and **smog** are created as nitrogen oxides and **hydrocarbons** react to sunlight. **Particulate matter**, or fine dust is characterized by their **micrometre** size  $PM_{10}$  to  $PM_{2.5}$ .



- **Electromagnetic pollution**: the overabundance of **electromagnetic radiation** in their **non-ionizing** form, like radio waves, etc, that people are constantly exposed at, especially in large cities. It's still unknown whether or not those types of radiation have any effects on human health, though.
- **Light pollution**: includes light trespass, **over-illumination** and **astronomical** interference.
- **Littering**: the criminal throwing of inappropriate man-made objects, unremoved, onto public and private properties.
- **Noise pollution**: which encompasses **roadway noise**, **aircraft noise**, **industrial noise** as well as high-intensity **sonar**.
- **Plastic pollution**: involves the accumulation of plastic products and **microplastics** in the environment that adversely affects wildlife, wildlife habitat, or humans.
- **Soil contamination** occurs when chemicals are released by spill or underground leakage. Among the most significant **soil contaminants** are **hydrocarbons**, **heavy metals**, **MTBE**, **herbicides**, **pesticides** and **chlorinated hydrocarbons**.
- **Radioactive contamination**, resulting from 20th century activities in **atomic physics**, such as nuclear power generation and nuclear weapons research, manufacture and deployment. (See **alpha emitters** and **actinides in the environment**. **Thermal pollution**, is a **temperature** change in natural water bodies caused by human influence, such as use of water as coolant in a power plant. **Visual pollution**, which can refer to the presence of overhead **power lines**, motorway **billboards**, scarred **landforms** (as from **strip mining**), open storage of trash, **municipal solid waste** or **space debris**.



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

### **Cause of Pollution :**

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

[Motor vehicle emissions](#) are one of the leading causes of air pollution. Principal stationary pollution sources include [chemical plants](#), coal-fired [power plants](#), [oil refineries](#),<sup>[38]</sup> [petrochemical](#) plants, [nuclear waste](#) disposal activity, incinerators, large [livestock farms](#) (dairy cows, pigs, poultry, etc.), [PVC](#) factories, metals production factories, plastics factories, and other [heavy industry](#). Agricultural air pollution comes from contemporary practices which include clear felling and burning of natural vegetation as well as spraying of pesticides and herbicides. About 400 million metric tons of [hazardous wastes](#) are generated each year. The United States alone produces about 250 million metric tons. Americans constitute less than 5% of the [world's population](#), but produce roughly 25% of the world's [CO<sub>2</sub>](#) and generate approximately 30% of [world's waste](#).



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

- Some of the more common [soil](#) contaminants are [chlorinated hydrocarbons](#) (CFH), [heavy metals](#) (such as [chromium](#), [cadmium](#) – found in rechargeable [batteries](#), and [lead](#) – found in lead [paint](#), [aviation fuel](#) and still in some countries, [gasoline](#)), [MTBE](#), [zinc](#), [arsenic](#) and [benzene](#). In 2001 a series of press reports culminating in a book called [Fateful Harvest](#) unveiled a widespread practice of recycling industrial byproducts into fertilizer, resulting in the contamination of the soil with various metals. Ordinary municipal [landfills](#) are the source of many chemical substances entering the soil environment (and often groundwater), emanating from the wide variety of refuse accepted, especially substances illegally discarded there, or from pre-1970 landfills that may have been subject to little control in the U.S. or EU. There have also been some unusual releases of [polychlorinated dibenzodioxins](#), commonly called *dioxins* for simplicity, such as [TCDD](#).
- Pollution can also be the consequence of a natural disaster. For example, [hurricanes](#) often involve water contamination from sewage, and [petrochemical](#) spills from ruptured [boats](#) or [automobiles](#). Larger scale and environmental damage is not uncommon when coastal [oil rigs](#) or [refineries](#) are involved. Some sources of pollution, such as [nuclear power](#) plants or [oil tankers](#), can produce widespread and potentially hazardous releases when accidents occur.
- In the case of [noise pollution](#) the dominant source class is the [motor vehicle](#), producing about ninety percent of all unwanted noise worldwide.

## **Effects :**

### Human health :

Further information: [Soil pollution § Health effects](#), [Toxic hotspots](#), and [List of pollution-related diseases](#) etc. Overview of main health effects on humans from some common types of pollution. Adverse [air quality](#) can kill many organisms, including humans. Ozone pollution can cause [respiratory disease](#), [cardiovascular disease](#), [throat](#) inflammation, chest pain, and [congestion](#). [Water pollution](#) causes approximately 14,000 deaths per day, mostly due to [contamination of drinking water](#) by untreated [sewage](#) in [developing countries](#). An estimated 500 million [Indians](#) have no access to a proper toilet, Over ten million people in India fell ill with waterborne illnesses in 2013, and 1,535 people died, most of them children. Nearly 500 million Chinese lack access to safe drinking water. The high smog levels has been facing for a long time can do damage to civilians' bodies and cause different diseases. The [WHO](#) estimated in 2007 that air pollution causes half a million deaths per year in

India. Studies have estimated that the number of people killed annually in the United States could be over 50,000.

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

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

Environment :

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

[Biomagnification](#) describes situations where toxins (such as [heavy metals](#)) may pass through [trophic levels](#), becoming exponentially more concentrated [carbon dioxide emissions](#). [Carbon dioxide](#) emissions cause [ocean acidification](#), the ongoing decrease in the pH of the Earth's oceans as CO<sub>2</sub> becomes dissolved. The emission of [greenhouse gases](#) leads to [global warming](#) which affects ecosystems in many ways. [Invasive species](#) can outcompete native species and reduce [biodiversity](#). Invasive plants can contribute debris and biomolecules ([allelopathy](#)) that can alter soil and chemical compositions of an environment, often reducing native species [competitiveness](#).

- [Nitrogen oxides](#) are removed from the air by rain and [fertilise](#) land which can change the species composition of ecosystems.
- [Smog](#) and haze can reduce the amount of sunlight received by plants to carry out [photosynthesis](#) and leads to the production of [tropospheric ozone](#) which damages plants.
- Soil can become infertile and unsuitable for plants. This will affect other [environment](#).

## **Pollution control :**

Air pollution control system, known as a [Thermal oxidizer](#), decomposes hazard gases from industrial air streams at a factory in the [United States of America](#). Pollution control is a term used in [environmental management](#). It means the control of [emissions](#) and [effluents](#) into air, water or soil. Without pollution control, the [waste](#) products from [overconsumption](#), heating, agriculture, mining, manufacturing, transportation and other human activities, whether they accumulate or disperse, will degrade the [environment](#). In the hierarchy of controls, [pollution prevention](#) and [waste minimization](#) are more desirable than pollution control. In the field of [land development](#), [low impact development](#) is a similar technique for the prevention of urban pollution.

## **Process :**

Recycling, Reusing, Waste minimisation, Preventing, Compost etc.

## **Pollution control devices :**

- [Air pollution control](#) --- Thermal oxidizer
- [Dust collection systems](#) --- Baghouses, cyclones, electrostatic precipitator
- [Scrubbers](#) --- [Baffle spray scrubber](#)

## **Perspective :**

The earliest precursor of pollution generated by life forms would have been a natural function of their existence. The attendant consequences on viability and population levels fell within the sphere of [natural selection](#). These would have included the demise of a population locally or ultimately, species extinction. Processes that were untenable would have resulted in a new balance brought about by changes and adaptations. At the extremes, for any form of life, consideration of pollution is superseded by that of survival. For humankind, the factor of technology is a distinguishing and critical consideration, both as an enabler and an additional source of byproducts. Short of survival, human concerns include the range from quality of life to health hazards. Since science holds experimental demonstration to be definitive, modern treatment of toxicity or environmental harm involves defining a level at which an effect is observable. Common examples of fields where practical measurement is crucial include [automobile emissions control](#), industrial exposure (e.g. [Occupational Safety and Health Administration](#) (OSHA) [PELs](#)), [toxicology](#) (e.g. [LD](#)), and [medicine](#) (e.g. [medication](#) and [radiation](#) doses).

# PROJECT REPORT

## SEMESTER-II

COURSE: AECC2 (ENVIRONMENTAL STUDIES)

PROJECT TITLE: FLORA

College Roll No:- PHSA20F595

CU REGISTRATION NO:-

223-1211-0348-20

CU ROLL NO :- 203223-11-0048

Checked  
25 out of  
30



# INTRODUCTION :

- Flora is all the plant life present in a region on time. generally the naturally occurring particular (indigenous) native plants. Sometimes bacteria and fungi are also referred as flora, as in the terms Gut flora or skin flora.

The word flora comes from the Latin name of "Flora", the goddess of plants, flowers and fertility in Roman mythology. The technical term "Flora" is then derived from a metonymy of their fountains at the end of sixteenth century. It was first reseeded in to denote the natural vegetation of an area. Then in **POCTY** seventeenth century "Flora" was used to refer the flowers of an artificial garden.

- Flora may be subdivided below in special environment :

(a) **Native Flora**: The native and indigenous flora of an area.

(b) **Garden Flora** : The plants that are deliberately grown by humans agriculture and horticulture.

(c) **Weed Flora**: Traditionally this classification was applied to plants regarded as undesirable and studied in efforts to control or eradicate them.

## ➤ AIMS AND OBJECTIVES:

- To study plant eco-systems in order to understand sensing and communication mechanisms, which will be used as models for the specification of the plant ante fact interfacing mechanisms.
- To implement strict restrictions on exports of mane plants.
- To pressure all varieties of old and new flora.
- To assess the biodiversity and to understand the resource potential.
- To assess the nature and distribution of vegetation in and around my surrounding area..
  - \* And most important to study the ecological importance of flora.

## • LOCATION OF THE STUDY

### AREA :

My study area located in South Kolkata. This is located towards east side of our township. It situated at  $22^{\circ}51'$  latitude North and  $88^{\circ}39'$  longitude East. It known as Shantipally , Kolkata - 700 107, West Bengal. My area has very good biodiversity. Here has many many kind of plants and flowers. Local people love gardening and here has many ponds, Which helps to grow aquatic plant in our locality.



## ➤ METHODS OF DATA COLLECTION:

Preparing a general checklist of all plants encountered in the study area. This would indicate the bio diversity for plants. Discussion with local people so as to elicit information about local plants. Generation of primary data by render taking systematic ecological studies in area.



And dates are collected from online published research articles, published journals and related books. Then the collected dates are minutely observed and a document is then prepared on varies components, bio-diversity and natural resources available in that area under the guidance of teachers.

# ➤ Results and Discussion:-

**After surves in my locality I found various types of flora in my locality. Here it listed below.**

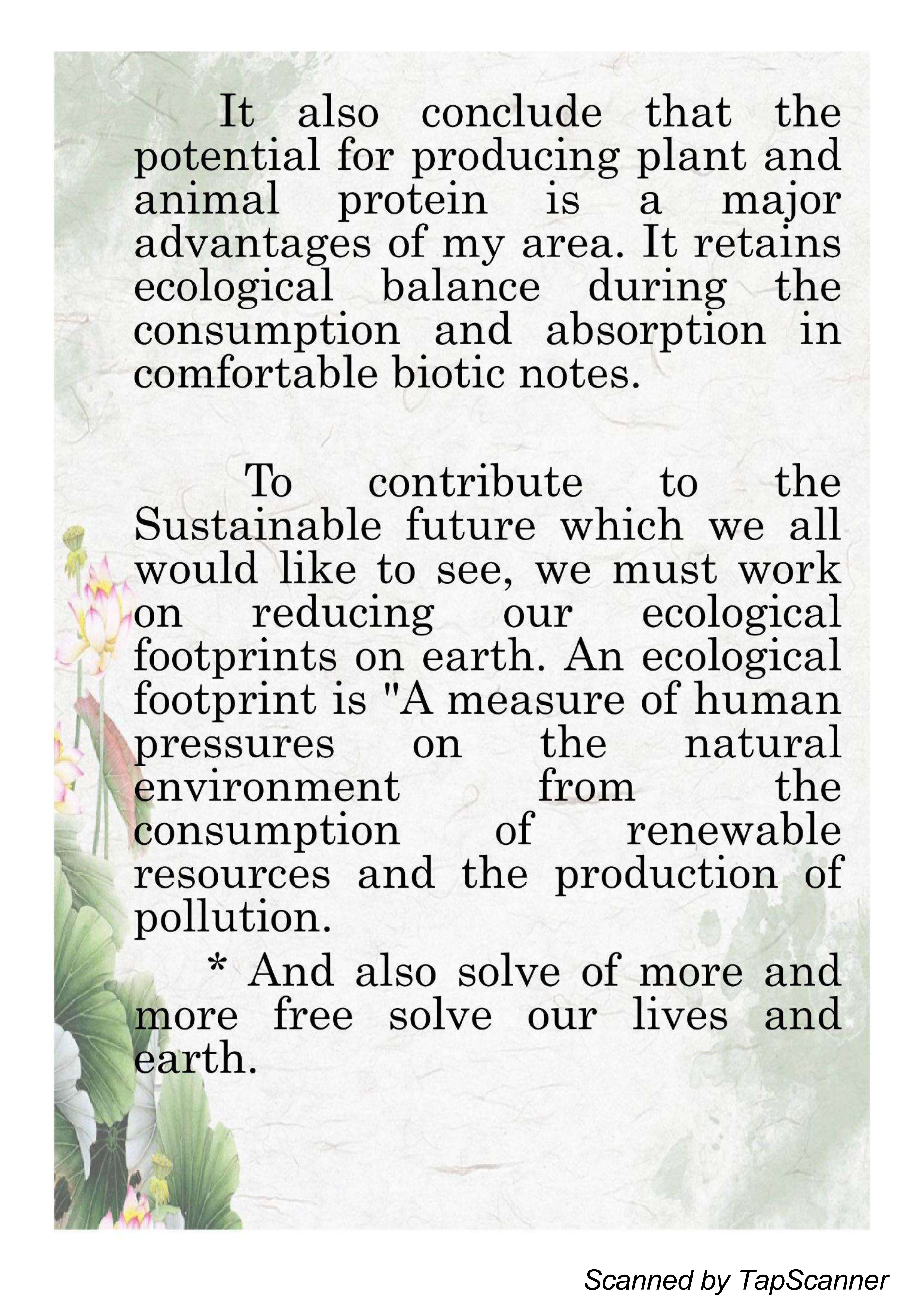
SL NO	COMMON ENGLISH NAME	ZOOLOGIC AL NAME	IMPORTANCE	PIC
(I)	Holy Basil (Known as Tulshi)	<u>Ocimum</u> <u>tenluiflor</u> <u>um</u>	<ul style="list-style-type: none"><li>•It can cure fever, cough.</li><li>•Tulshi leaves are used to treat skin problems.</li><li>• Tulshi is used to treat insect bites.</li><li>• Tulshi also used to treat respiratory problems.</li><li>•Tulshi can stop dandruff and prevent dry scalp.</li></ul>	
(II)	Aloe Vera	<u>Aloe vera</u>	<ul style="list-style-type: none"><li>▪Heals burns</li><li>▪Improve digestive health.</li><li>▪Promotes oral health.</li><li>▪Relievesahal Figures.</li></ul>	

SL NO	COMMON ENGLISH NAME	ZOOLOGICAL NAME	IMPORTANCE	PIC
(iii)	Mango	<u>Mangifera indica</u>	<ul style="list-style-type: none"> <li>▪ It helps to fighting cancer.</li> <li>▪ For healthy eyes.</li> <li>▪ Exporting mango is very proffitable.</li> <li>▪ Mango juice is very healthy product.</li> </ul>	
(iv)	Money plant	<u>Epiremnum aureum</u>	<ul style="list-style-type: none"> <li>▪ Purifies air</li> <li>▪ Acts as on anti radiator.</li> <li>▪ Keeps medicinal benefits.</li> </ul>	
(v)	Banyan tree	<u>Ficus benghalensis</u>	<ul style="list-style-type: none"> <li>▪ Banyan leaves cure rashes</li> <li>▪ Milky latex prevent bleeding piles.</li> <li>▪ Apply paste of aerial roots remove pimple.</li> <li>▪ Boil bark of banyan tree in one cup water. Gargle with this water frequently cure mouth ulcers.</li> </ul>	

SL NO	COMMON ENGLISH NAME	ZOOLOGICAL NAME	IMPORTANCE	PIC
(vi)	Star lotus	<u>Nymphaea nouchali</u>	<ul style="list-style-type: none"> <li>• Fried star lotus is very delicious.</li> </ul>	
(vii)	Vasaka	<u>Justicia adhatoda</u>	<ul style="list-style-type: none"> <li>▪ Remedies cough and cold</li> <li>▪ Promotes gut health.</li> <li>▪ Purifies blood.</li> <li>▪ Prevents and heals ulcers.</li> </ul>	

## ➤ CONCLUSION:-

We conclude that species spatial distributions are directly effected by warming and subsequently climate change. In general terms it has been started by the scientific community that the distribution of species is infact being move in a poleward trend. Within the realm of our study we found the evidence that we did find and cited leads us to distribution of species altered by climatic change.



It also conclude that the potential for producing plant and animal protein is a major advantages of my area. It retains ecological balance during the consumption and absorption in comfortable biotic notes.

To contribute to the Sustainable future which we all would like to see, we must work on reducing our ecological footprints on earth. An ecological footprint is "A measure of human pressures on the natural environment from the consumption of renewable resources and the production of pollution.

\* And also solve of more and more free solve our lives and earth.



- **Acknowledgement:**

I would like to express my special thanks of gratitude to Koly Dey. Tina Mukharjee, Srijita Ghosh (Professors of Scottish Church College ENVS Department) and also thanks to own vice principle Dr. Supratim Das.

My neighbors and my mother and my friends also help me for this project.

## ➤ (References books):-

➤ • Biswas, K.P (1927). "Flora of the Salt Lakes. Calcutta. Journal of Department of science, University of Calcutta, Vol-8.

➤ Environmental studies for Undergraduate Courses Erach Bharucha.

➤ • Trueman's Elementary Biology vol-II for class XII K.N. Bhatia, M.P. Tyagi.

# PROJECT REPORT

## SEMESTER-II

COURSE: AECC2 (ENVIRONMENTAL STUDIES)

PROJECT TITLE: FLORA

College Roll No:- PHSA20F595

CU REGISTRATION NO:-

223-1211-0348-20

CU ROLL NO :- 203223-11-0048



# INTRODUCTION :

- Flora is all the plant life present in a region on time. generally the naturally occurring particular (indigenous) native plants. Sometimes bacteria and fungi are also referred as flora, as in the terms Gut flora or skin flora.

The word flora comes from the Latin name of "Flora", the goddess of plants, flowers and fertility in Roman mythology. The technical term "Flora" is then derived from a metonymy of their fountains at the end of sixteenth century. It was first reseeded in to denote the natural vegetation of an area. Then in **POCTY** seventeenth century "Flora" was used to refer the flowers of an artificial garden.

- Flora may be subdivided below in special environment :

(a) Native Flora: The native and indigenous flora of an area.

(b) Garden Flora : The plants that are deliberately grown by humans agriculture and horticulture.

(c) Weed Flora: Traditionally this classification was applied to plants regarded as undesirable and studied in efforts to control or eradicate them.

## ➤ AIMS AND OBJECTIVES:

- To study plant eco-systems in order to understand sensing and communication mechanisms, which will be used as models for the specification of the plant ante fact interfacing mechanisms.
- To implement strict restrictions on exports of mane plants.
- To pressure all varieties of old and new flora.
- To assess the biodiversity and to understand the resource potential.
- To assess the nature and distribution of vegetation in and around my surrounding area..
  - \* And most important to study the ecological importance of flora.

## • LOCATION OF THE STUDY

### AREA :

My study area located in South Kolkata. This is located towards east side of our township. It situated at  $22^{\circ}51'$  latitude North and  $88^{\circ}39'$  longitude East. It known as Shantipally , Kolkata - 700 107, West Bengal. My area has very good biodiversity. Here has many many kind of plants and flowers. Local people love gardening and here has many ponds, Which helps to grow aquatic plant in our locality.



## ➤ METHODS OF DATA COLLECTION:

Preparing a general checklist of all plants encountered in the study area. This would indicate the bio diversity for plants. Discussion with local people so as to elicit information about local plants. Generation of primary data by render taking systematic ecological studies in area.


And dates are collected from online published research articles, published journals and related books. Then the collected dates are minutely observed and a document is then prepared on varies components, bio-diversity and natural resources available in that area under the guidance of teachers.



# ➤ Results and Discussion:-

**After surves in my locality I found various types of flora in my locality. Here it listed below.**

SL NO	COMMON ENGLISH NAME	ZOOLOGIC AL NAME	IMPORTANCE	PIC
(I)	Holy Basil (Known as Tulshi)	<u>Ocimum</u> <u>tenluiflor</u> <u>um</u>	<ul style="list-style-type: none"><li>•It can cure fever, cough.</li><li>•Tulshi leaves are used to treat skin problems.</li><li>• Tulshi is used to treat insect bites.</li><li>• Tulshi also used to treat respiratory problems.</li><li>•Tulshi can stop dandruff and prevent dry scalp.</li></ul>	
(II)	Aloe Vera	<u>Aloe vera</u>	<ul style="list-style-type: none"><li>▪Heals burns</li><li>▪Improve digestive health.</li><li>▪Promotes oral health.</li><li>▪Relievesahal Figures.</li></ul>	

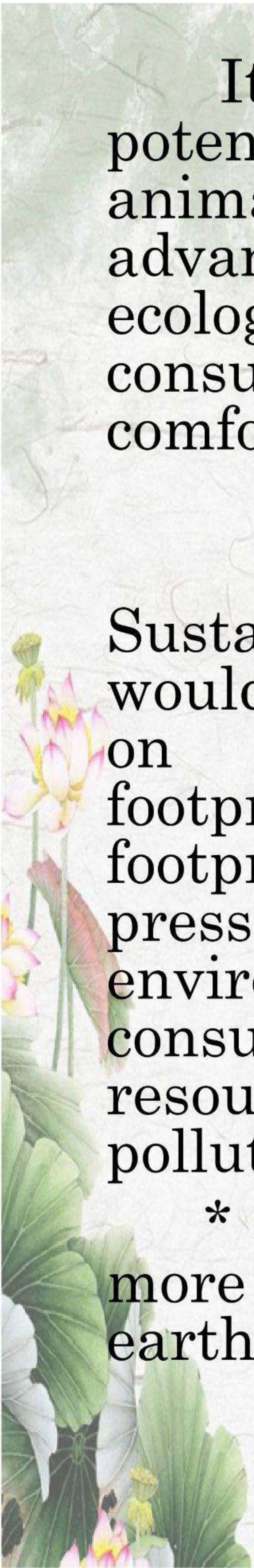


SL NO	COMMON ENGLISH NAME	ZOOLOGICAL NAME	IMPORTANCE	PIC
(iii)	Mango	<u>Mangifera indica</u>	<ul style="list-style-type: none"> <li>▪ It helps to fighting cancer.</li> <li>▪ For healthy eyes.</li> <li>▪ Exporting mango is very proffitable.</li> <li>▪ Mango juice is very healthy product.</li> </ul>	
(iv)	Money plant	<u>Epiremnum aureum</u>	<ul style="list-style-type: none"> <li>▪ Purifies air</li> <li>▪ Acts as on anti radiator.</li> <li>▪ Keeps medicinal benefits.</li> </ul>	
(v)	Banyan tree	<u>Ficus benghalensis</u>	<ul style="list-style-type: none"> <li>▪ Banyan leaves cure rashes</li> <li>▪ Milky latex prevent bleeding piles.</li> <li>▪ Apply paste of aerial roots remove pimple.</li> <li>▪ Boil bark of banyan tree in one cup water. Gargle with this water frequently cure mouth ulcers.</li> </ul>	

SL NO	COMMON ENGLISH NAME	ZOOLOGICAL NAME	IMPORTANCE	PIC
(vi)	Star lotus	<u>Nymphaea nouchali</u>	<ul style="list-style-type: none"> <li>• Fried star lotus is very delicious.</li> </ul>	
(vii)	Vasaka	<u>Justicia adhatoda</u>	<ul style="list-style-type: none"> <li>▪ Remedies cough and cold</li> <li>▪ Promotes gut health.</li> <li>▪ Purifies blood.</li> <li>▪ Prevents and heals ulcers.</li> </ul>	

## ➤ CONCLUSION:-

We conclude that species spatial distributions are directly effected by warming and subsequently climate change. In general terms it has been started by the scientific community that the distribution of species is infact being move in a poleward trend. Within the realm of our study we found the evidence that we did find and cited leads us to distribution of species altered by climatic change.



It also conclude that the potential for producing plant and animal protein is a major advantages of my area. It retains ecological balance during the consumption and absorption in comfortable biotic notes.

To contribute to the Sustainable future which we all would like to see, we must work on reducing our ecological footprints on earth. An ecological footprint is "A measure of human pressures on the natural environment from the consumption of renewable resources and the production of pollution.

\* And also solve of more and more free solve our lives and earth.

- **Acknowledgement:**

I would like to express my special thanks of gratitude to Koly Dey. Tina Mukharjee, Srijita Ghosh (Professors of Scottish Church College ENVS Department) and also thanks to own vice principle Dr. Supratim Das.

My neighbors and my mother and my friends also help me for this project.

## ➤ (References books):-

➤ • Biswas, K.P (1927). "Flora of the Salt Lakes. Calcutta. Journal of Department of science, University of Calcutta, Vol-8.

➤ Environmental studies for Undergraduate Courses Erach Bharucha.

➤ • Trueman's Elementary Biology vol-II for class XII K.N. Bhatia, M.P. Tyagi.

# PROJECT REPORT

## SEMESTER II

COURSE: AECC2 (ENVIRONMENTAL STUDIES)

## ECOSYSTEM

COLLEGE ROLL NUMBER: - PHSA20F593

CU REGISTRATION NUMBER: - 223-1211-0482-20

CU ROLL NUMBER:- 203223-11-0088

Checked  
24 out of  
30

# Acknowledgements

I am extremely grateful to our professors of Environmental Science who gave me the opportunity to do this wonderful project on Ecosystem and various aspects of it. The completion of the project work and doing it would not have been possible without the constant motivation of the HOD of our Physics Department Dr. Jayeeta Chowdhury and my batch mates as well.

Undertaking this project has been beneficial to me in ways more than one. Besides learning time management, perseverance and other basic human skills it helped a lot to know about our environment which protects and feeds us both directly and indirectly. Being a student of Physics honours I do not really get chance very often to study on environmental matters or keep myself updated with the recent happenings in the world related to safeguarding the environment. During the research of it, I felt we all should be a little more conscious about the surroundings around us and give a little more time to admiring nature and learning about it.

Meghamala Banik

# Ecosystem

An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. 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. 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.

## Types of ecosystem

Ecosystems are generally classified into four types. Ecosystems are parts of biomes, which are climatic systems of life and organisms. In the biome's ecosystems, there are living and nonliving environmental factors known as biotic and abiotic. Biotic factors are organisms, plants and animals, and abiotic factors are nonliving environmental factors, such as light, water or gasses in the system.

The four classifications of ecosystem are:

### •Terrestrial ecosystems :

Terrestrial ecosystems are land systems such as forests, deserts, grasslands, tundra and coastal regions. Depending on the biome's climate, more than one terrestrial ecosystem can be present.

### •Lentic ecosystems:

Lentic is a class of aquatic ecosystems that are found on land, such as:

- ponds
- rivers
- lakes
- swamps
- streams

Mostly, lentic ecosystems are described as still bodies of fresh water, and they are smaller ecosystems. One of the requirements of a lentic body of water is that it is exposed to the sun to encourage photosynthesis.

### •Lotic ecosystems:

The lotic systems are moving bodies of water that flow to other bodies of water and eventually to the ocean. These systems can include springs, rivers and streams, or any body of water that flows to marinelike waters or the ocean. Unlike lentic, the lotic systems do not thrive off photosynthesis and can include bodies of fresh- and saltwater.



### ●Artificial ecosystems:

Man-made systems include areas as large as beaches and forests, and those as small as terrariums, for example. Sometimes they are made to replenish the environment, and other times they are to help environmentalists learn. Biodomes, for examples, are closed, artificial ecosystems created for the study of biology.

## Components of an Ecosystem

We can clarify the parts of an ecosystem by listing them under the headings "abiotic" and "biotic".

ABIOTIC COMPONENTS	BIOTIC COMPONENTS
Sunlight	Primary producers
Temperature	Herbivores
Precipitation	Carnivores
Water or moisture	Omnivores
Soil or water chemistry (e.g., P, NO <sub>3</sub> , NH <sub>4</sub> )	Detritivores

Some common examples of ecosystem are ponds, rivers, wetlands, and more

## ▪Examples of ecosystem

### ①Ponds

Pond Ecosystem refers to fresh water ecosystem on which different organisms depend for their survival and to fulfil their nutritional needs as well. The ponds are the water bodies which are usually of 12-15 feet deep in which the sun rays can reach which results into growing of plants down there.

#### ●Types of ponds:

Pond Ecosystem falls in fresh water ecosystem which is further divided into three parts namely littoral zone, open water zone and deep water zones.

The littoral zone is a zone which is an area near the shore where sunlight follows it way down and allows the plants to grow.

Open water zone which actually is well known as pelagic zone. It is that zone where water is neither close to the bottom nor near the shore.

The last is the deep water zone which is the lowest level lying above the sea and below the thermo cline.

Pond Ecosystem can also be differentiated in other way. It is classified in five types which are salt ponds, garden ponds, freshwater ponds, vernal ponds and underground ponds.

Salt ponds are one which are near the sea side and consist brackish water.

Freshwater pool can form anywhere because of rains.

Vernal ponds are those which are created because of depression in the ground and are seasonal.

Lastly, underground ponds which are created near the rocks.



## ● Characteristics

Pond Ecosystem is the balance of fish, bacteria and plants which together support each other. Pond Ecosystem works on ponds which are shallow enough for the sunlight to pass through it. Ponds are wet and are surrounded by artificial and natural banks. The ponds provide inhabitation to wetland plant and animals. Pond works with a combination of three food webs at a time. Vernal type of ponds inhabitant rare and endangered plant species.

## ● Importance

They provide inhabitation to scarce species and support biodiversity much more than any other freshwater habitat. It is a home to lot many species. Ponds work as mini reservoir which helps to drain fields during rain. Ponds recycle the nutrients and reduce the amount of nitrates and phosphates.

## ② Forests

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem and hence has greater species diversity.

## ● Types of forests:

Forest ecosystem has been classified into three major types – tropical forest ecosystem, temperate forest ecosystem and boreal ecosystem.

**Tropical forest ecosystem:** Tropical forests, also known as tropical rainforest, receive almost 100 inches of rain every year. Tropical forests are usually found in latitude between 23.5 degrees North and 23.5 degrees South. The temperature recorded in tropical forests is between 68 degrees and 77 degrees Fahrenheit. Heavy rainfall in the tropical forest leads to poor quality of soil

due to a lack of nutrients and leaching of soil nutrients. The vegetation of the tropical rainforest mostly includes broad-leafed trees that are about 82-115 feet height. Due to dense canopy, the sun finds it quite tough to reach the forest floor. The tropical forest is a home for millions of animals that includes a massive variety of birds, mammals, amphibians, reptiles, etc.

**Temperate forest ecosystem:** Temperate forests are usually found in North America, Eurasia, Japan, etc. Temperate forest receives less rainfall as compared to tropical forests approximately 30-60 inches every year. The winters in the temperate forest quite often experience temperature below freezing point, and in summers, the temperature becomes very high with a high level of humidity. The soil of temperate forest is rich in organic matter that allows a huge variety of vegetation to grow in the temperate forest. The temperate forest provides natural habitat to many animals such as squirrels, deer, black bears, raccoons, coyotes, various birds like warblers, owls, woodpeckers, hawks, etc.

**Boreal forest ecosystem:** The boreal forest is also known as Taiga forests are generally found in Siberia, Northern Asia, Canada, and Scandinavia. Boreal forests receive approximately 15-40 inches precipitation every year. The trees found in boreal forests are the evergreen type, such as pine, fir, spruce, etc. The boreal forest has a dense canopy that hardly allows the sun to reach the forest surface. Some examples of animals that lived in boreal forests are – elk, caribou, lynxes, wolverines, deer, snowshoe hare, moose, wolves, etc.

## ● Characteristics

The forest ecosystem of a particular region depends on the seasonal variation of the country in which the forest falls. The canopy layer is one of the most distinguishing characteristics of a forest ecosystem. The dense canopy layers act as a barrier against wind, rain, snow, etc. to protect various species. The forest ecosystem is home to a huge variety of insects. These insects found thousands of options as their shelter in the forest ecosystem. Hence, these insects get attracted to the natural habitats provided by the forest ecosystem. The forest ecosystem provides the most favorable conditions to various species of birds. As a result, these species get attracted by the forest ecosystem and take shelter on trees.



## ③ Wetland

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. Wetlands play a number of functions, including water purification, water storage, processing of carbon and other nutrients, stabilization of shorelines, and support of plants and animals. Wetlands are also considered the most biologically diverse of all ecosystems, serving as home to a wide range of plant and animal life. Wetlands occur naturally on every continent. The water in wetlands is either freshwater, brackish, or saltwater. The main wetland types are swamp, marsh, bog, and fen; sub-types include mangrove forest, carr, pocosin, floodplains, mire, vernal pool, sink, and many others. Wetlands can be tidal (inundated by tides) or non-tidal.

### ● Dominant Wildlife in Wetlands

Wetlands provide extraordinary wildlife diversity. The dominant wetlands wildlife includes fishes and crustaceans, migrating birds and waterfowl, and some mammal species such as: foxes, deer etc. Turtles, frogs, snakes, and other reptiles and amphibians call wetlands home. Many of these animals provide food for other animals and for people. A number of endangered and threatened wildlife species reside in wetlands.

### ● Importance of protecting Wetlands

Wetland ecology represents a balance between the species that live in wetlands and the environment around them. Flooding shapes the chemical and physical characteristics of wetlands and how much oxygen exists in them. When this delicate balance unravels, wetlands and their denizens suffer. Wetlands provide flood control, storm barriers, clean water and aquifer restoration. They also neutralize bacteria, absorb harmful chemicals and filter pollutants. Wetlands provide foods such as rice, fish, cranberries and other products. Scientists estimate at least 40 percent of the entire world's species resides in wetlands; without healthy wetlands ecosystems, many species on earth would suffer.



## ④ Estuary

An estuary is a partially enclosed body of water formed where fresh water from land meets and mixes with salt water from the ocean. These are areas where both ocean and land contribute to a unique ecosystem. A basic feature is the instability of an **estuary** due to the ebb and flood of the tide. Plant and animal wastes are washed away, sediment is shifted and fresh and salt water are mixed.

Estuaries come in all shapes and sizes and can be called bays, lagoons, harbours, inlets, sounds, wetlands and swamps. Estuaries are unique environments to which plants and animals have specially adapted.

## ● Characteristics

In **estuaries**, the salty ocean mixes with a freshwater river, resulting in brackish water. An **estuary** may also be called a bay, lagoon, sound, or slough. Water continually circulates into and out of an **estuary**.

## ● Importance

**Estuaries** and their surrounding wetlands are also buffer zones. They stabilize shorelines and protect coastal areas, inland habitats, and human communities from floods and storm surges from hurricanes. When flooding **does** occur, **estuaries** often act like huge sponges, soaking up the excess water.



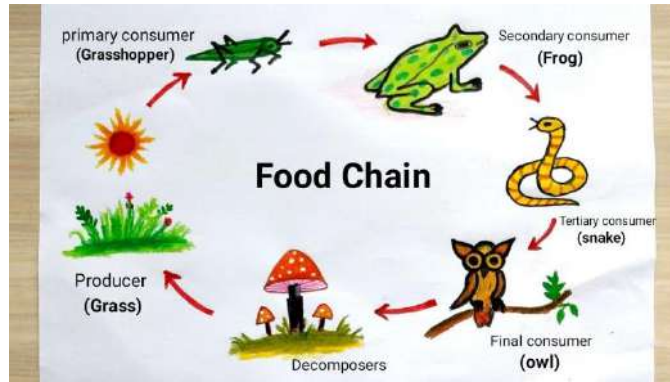
## ■ Important Ecological Concepts:

### ① Food Chain

The sun is the ultimate source of energy on earth. It provides the energy required for all plant life. The plants utilise this energy for the process of photosynthesis, which is used to synthesise their food.

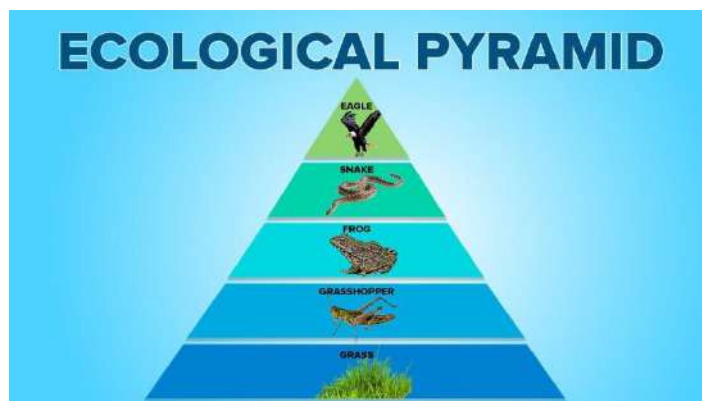
During this biological process, light energy is converted into chemical energy and is passed on through successive levels. The flow of energy from a producer, to a consumer and eventually, to an apex predator or a detritivore is called the food chain.

Dead and decaying matter, along with organic debris, is broken down into its constituents by scavengers. The reducers then absorb these constituents. After gaining the energy, the reducers liberate molecules to the environment, which can be utilised again by the producers.



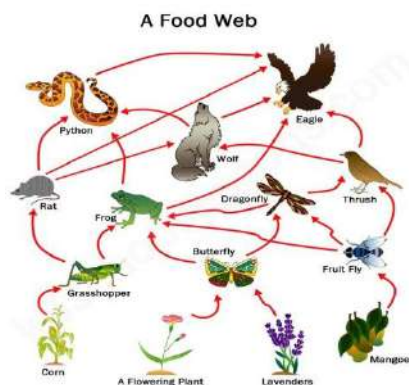
## ② Ecological Pyramids

An ecological pyramid is the graphical representation of the number, energy, and biomass of the successive trophic levels of an ecosystem. The base of the ecological pyramid comprises the producers, followed by primary and secondary consumers. The tertiary consumers hold the apex. In some food chains, the quaternary consumers are at the very apex of the food chain.



## ③ Food Web

Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer.



# Functions of Ecosystem

- ① It regulates the essential ecological processes, supports life systems and renders stability.
- ② It is also responsible for the cycling of nutrients between biotic and abiotic components.
- ③ It maintains a balance among the various trophic levels in the ecosystem.
- ④ It cycles the minerals through the biosphere.
- ⑤ The abiotic components help in the synthesis of organic components that involves the exchange of energy.

## Conclusion

Everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation and many more. Over the past fifty years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fibre and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefitted from this process, rather many have been harmed. So, it is better that care for ecosystem should be taken as one of the major responsibility of every individual for sustainable living of the future generations as well.

# PROJECT REPORT

## SEMESTER II

**COURSE: AECC2 (ENVIRONMENTAL STUDIES)**

## ECOSYSTEM

**COLLEGE ROLL NUMBER: - PHSA20F593**

**CU REGISTRATION NUMBER: - 223-1211-0482-20**

**CU ROLL NUMBER:- 203223-11-0088**



# Acknowledgements

I am extremely grateful to our professors of Environmental Science who gave me the opportunity to do this wonderful project on Ecosystem and various aspects of it. The completion of the project work and doing it would not have been possible without the constant motivation of the HOD of our Physics Department Dr. Jayeeta Chowdhury and my batch mates as well.

Undertaking this project has been beneficial to me in ways more than one. Besides learning time management, perseverance and other basic human skills it helped a lot to know about our environment which protects and feeds us both directly and indirectly. Being a student of Physics honours I do not really get chance very often to study on environmental matters or keep myself updated with the recent happenings in the world related to safeguarding the environment. During the research of it, I felt we all should be a little more conscious about the surroundings around us and give a little more time to admiring nature and learning about it.

Meghamala Banik

# Ecosystem

An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system. 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. 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.

## Types of ecosystem

Ecosystems are generally classified into four types. Ecosystems are parts of biomes, which are climatic systems of life and organisms. In the biome's ecosystems, there are living and nonliving environmental factors known as biotic and abiotic. Biotic factors are organisms, plants and animals, and abiotic factors are nonliving environmental factors, such as light, water or gasses in the system.

The four classifications of ecosystem are:

### •Terrestrial ecosystems :

Terrestrial ecosystems are land systems such as forests, deserts, grasslands, tundra and coastal regions. Depending on the biome's climate, more than one terrestrial ecosystem can be present.

### •Lentic ecosystems:

Lentic is a class of aquatic ecosystems that are found on land, such as:

- ponds
- rivers
- lakes
- swamps
- streams

Mostly, lentic ecosystems are described as still bodies of fresh water, and they are smaller ecosystems. One of the requirements of a lentic body of water is that it is exposed to the sun to encourage photosynthesis.

### •Lotic ecosystems:

The lotic systems are moving bodies of water that flow to other bodies of water and eventually to the ocean. These systems can include springs, rivers and streams, or any body of water that flows to marinelike waters or the ocean. Unlike lentic, the lotic systems do not thrive off photosynthesis and can include bodies of fresh- and saltwater.

### ●Artificial ecosystems:

Man-made systems include areas as large as beaches and forests, and those as small as terrariums, for example. Sometimes they are made to replenish the environment, and other times they are to help environmentalists learn. Biodomes, for examples, are closed, artificial ecosystems created for the study of biology.

## Components of an Ecosystem

We can clarify the parts of an ecosystem by listing them under the headings "abiotic" and "biotic".

ABIOTIC COMPONENTS	BIOTIC COMPONENTS
Sunlight	Primary producers
Temperature	Herbivores
Precipitation	Carnivores
Water or moisture	Omnivores
Soil or water chemistry (e.g., P, NO <sub>3</sub> , NH <sub>4</sub> )	Detritivores

Some common examples of ecosystem are ponds, rivers, wetlands, and more

## ▪Examples of ecosystem

### ①Ponds

Pond Ecosystem refers to fresh water ecosystem on which different organisms depend for their survival and to fulfil their nutritional needs as well. The ponds are the water bodies which are usually of 12-15 feet deep in which the sun rays can reach which results into growing of plants down there.

### ●Types of ponds:

Pond Ecosystem falls in fresh water ecosystem which is further divided into three parts namely littoral zone, open water zone and deep water zones.

The littoral zone is a zone which is an area near the shore where sunlight follows it way down and allows the plants to grow.

Open water zone which actually is well known as pelagic zone. It is that zone where water is neither close to the bottom nor near the shore.

The last is the deep water zone which is the lowest level lying above the sea and below the thermo cline.

Pond Ecosystem can also be differentiated in other way. It is classified in five types which are salt ponds, garden ponds, freshwater ponds, vernal ponds and underground ponds.

Salt ponds are one which are near the sea side and consist brackish water.

Freshwater pool can form anywhere because of rains.

Vernal ponds are those which are created because of depression in the ground and are seasonal.

Lastly, underground ponds which are created near the rocks.



## ● Characteristics

Pond Ecosystem is the balance of fish, bacteria and plants which together support each other. Pond Ecosystem works on ponds which are shallow enough for the sunlight to pass through it. Ponds are wet and are surrounded by artificial and natural banks. The ponds provide inhabitation to wetland plant and animals. Pond works with a combination of three food webs at a time. Vernal type of ponds inhabitant rare and endangered plant species.

## ● Importance

They provide inhabitation to scarce species and support biodiversity much more than any other freshwater habitat. It is a home to lot many species. Ponds work as mini reservoir which helps to drain fields during rain. Ponds recycle the nutrients and reduce the amount of nitrates and phosphates.

## ② Forests

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem and hence has greater species diversity.

## ● Types of forests:

Forest ecosystem has been classified into three major types – tropical forest ecosystem, temperate forest ecosystem and boreal ecosystem.

**Tropical forest ecosystem:** Tropical forests, also known as tropical rainforest, receive almost 100 inches of rain every year. Tropical forests are usually found in latitude between 23.5 degrees North and 23.5 degrees South. The temperature recorded in tropical forests is between 68 degrees and 77 degrees Fahrenheit. Heavy rainfall in the tropical forest leads to poor quality of soil

due to a lack of nutrients and leaching of soil nutrients. The vegetation of the tropical rainforest mostly includes broad-leafed trees that are about 82-115 feet height. Due to dense canopy, the sun finds it quite tough to reach the forest floor. The tropical forest is a home for millions of animals that includes a massive variety of birds, mammals, amphibians, reptiles, etc.

**Temperate forest ecosystem:** Temperate forests are usually found in North America, Eurasia, Japan, etc. Temperate forest receives less rainfall as compared to tropical forests approximately 30-60 inches every year. The winters in the temperate forest quite often experience temperature below freezing point, and in summers, the temperature becomes very high with a high level of humidity. The soil of temperate forest is rich in organic matter that allows a huge variety of vegetation to grow in the temperate forest. The temperate forest provides natural habitat to many animals such as squirrels, deer, black bears, raccoons, coyotes, various birds like warblers, owls, woodpeckers, hawks, etc.

**Boreal forest ecosystem:** The boreal forest is also known as Taiga forests are generally found in Siberia, Northern Asia, Canada, and Scandinavia. Boreal forests receive approximately 15-40 inches precipitation every year. The trees found in boreal forests are the evergreen type, such as pine, fir, spruce, etc. The boreal forest has a dense canopy that hardly allows the sun to reach the forest surface. Some examples of animals that lived in boreal forests are – elk, caribou, lynxes, wolverines, deer, snowshoe hare, moose, wolves, etc.

## ● Characteristics

The forest ecosystem of a particular region depends on the seasonal variation of the country in which the forest falls. The canopy layer is one of the most distinguishing characteristics of a forest ecosystem. The dense canopy layers act as a barrier against wind, rain, snow, etc. to protect various species. The forest ecosystem is home to a huge variety of insects. These insects found thousands of options as their shelter in the forest ecosystem. Hence, these insects get attracted to the natural habitats provided by the forest ecosystem. The forest ecosystem provides the most favorable conditions to various species of birds. As a result, these species get attracted by the forest ecosystem and take shelter on trees.



## ③ Wetland

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. Wetlands play a number of functions, including water purification, water storage, processing of carbon and other nutrients, stabilization of shorelines, and support of plants and animals. Wetlands are also considered the most biologically diverse of all ecosystems, serving as home to a wide range of plant and animal life. Wetlands occur naturally on every continent. The water in wetlands is either freshwater, brackish, or saltwater. The main wetland types are swamp, marsh, bog, and fen; sub-types include mangrove forest, carr, pocosin, floodplains, mire, vernal pool, sink, and many others. Wetlands can be tidal (inundated by tides) or non-tidal.

### ● Dominant Wildlife in Wetlands

Wetlands provide extraordinary wildlife diversity. The dominant wetlands wildlife includes fishes and crustaceans, migrating birds and waterfowl, and some mammal species such as: foxes, deer etc. Turtles, frogs, snakes, and other reptiles and amphibians call wetlands home. Many of these animals provide food for other animals and for people. A number of endangered and threatened wildlife species reside in wetlands.

### ● Importance of protecting Wetlands

Wetland ecology represents a balance between the species that live in wetlands and the environment around them. Flooding shapes the chemical and physical characteristics of wetlands and how much oxygen exists in them. When this delicate balance unravels, wetlands and their denizens suffer. Wetlands provide flood control, storm barriers, clean water and aquifer restoration. They also neutralize bacteria, absorb harmful chemicals and filter pollutants. Wetlands provide foods such as rice, fish, cranberries and other products. Scientists estimate at least 40 percent of the entire world's species resides in wetlands; without healthy wetlands ecosystems, many species on earth would suffer.



## ④ Estuary

An estuary is a partially enclosed body of water formed where fresh water from land meets and mixes with salt water from the ocean. These are areas where both ocean and land contribute to a unique ecosystem. A basic feature is the instability of an **estuary** due to the ebb and flood of the tide. Plant and animal wastes are washed away, sediment is shifted and fresh and salt water are mixed.

Estuaries come in all shapes and sizes and can be called bays, lagoons, harbours, inlets, sounds, wetlands and swamps. Estuaries are unique environments to which plants and animals have specially adapted.

## ● Characteristics

In **estuaries**, the salty ocean mixes with a freshwater river, resulting in brackish water. An **estuary** may also be called a bay, lagoon, sound, or slough. Water continually circulates into and out of an **estuary**.

## ● Importance

**Estuaries** and their surrounding wetlands are also buffer zones. They stabilize shorelines and protect coastal areas, inland habitats, and human communities from floods and storm surges from hurricanes. When flooding **does** occur, **estuaries** often act like huge sponges, soaking up the excess water.



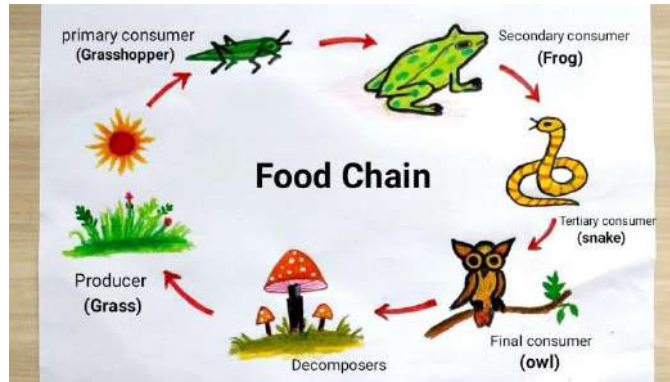
## ■ Important Ecological Concepts:

### ① Food Chain

The sun is the ultimate source of energy on earth. It provides the energy required for all plant life. The plants utilise this energy for the process of photosynthesis, which is used to synthesise their food.

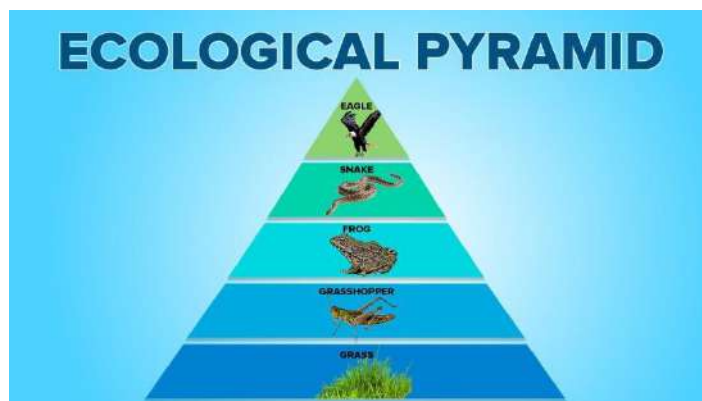
During this biological process, light energy is converted into chemical energy and is passed on through successive levels. The flow of energy from a producer, to a consumer and eventually, to an apex predator or a detritivore is called the food chain.

Dead and decaying matter, along with organic debris, is broken down into its constituents by scavengers. The reducers then absorb these constituents. After gaining the energy, the reducers liberate molecules to the environment, which can be utilised again by the producers.



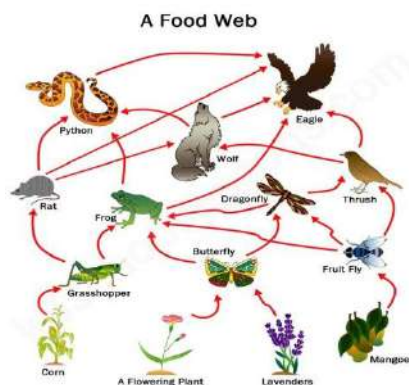
## ② Ecological Pyramids

An ecological pyramid is the graphical representation of the number, energy, and biomass of the successive trophic levels of an ecosystem. The base of the ecological pyramid comprises the producers, followed by primary and secondary consumers. The tertiary consumers hold the apex. In some food chains, the quaternary consumers are at the very apex of the food chain.



## ③ Food Web

Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer.





# Functions of Ecosystem

- ① It regulates the essential ecological processes, supports life systems and renders stability.
- ② It is also responsible for the cycling of nutrients between biotic and abiotic components.
- ③ It maintains a balance among the various trophic levels in the ecosystem.
- ④ It cycles the minerals through the biosphere.
- ⑤ The abiotic components help in the synthesis of organic components that involves the exchange of energy.

## Conclusion

Everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation and many more. Over the past fifty years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fibre and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefitted from this process, rather many have been harmed. So, it is better that care for ecosystem should be taken as one of the major responsibility of every individual for sustainable living of the future generations as well.

# PROJECT REPORT

SEMESTER II

COURSE: AECC2 (Environmental Studies)

Project Title : Study of Ecosystem of Ponds

Checked  
24 out of  
30

College Roll Number : PHSA20F604

CU Registration Number : 223-1211-049620

CU Roll Number : 203223-11-0093

## Introduction :

An ecosystem is a region with a specific and recognizable landscape from such as forest , grassland , desert , wetland , coastal area. The nature of ecosystem is based on its geographical features. It is also controlled by climatic conditions such as the amount of the sunlight , rainfall , temperature . In short , the living community of plants and animals in area together with the non-living components of the environment such as soil , air and water , constitute the eco system.

Ecosystems are divided into terrestrial or land based ecosystem and aquatic ecosystems in water. In this project we will be discussing about the eco system of ponds which is a part of the aquatic ecosystem.

Ponds are an integral component of the hydrological system; and perform diverse roles in the biosphere. These small aquatic ecosystem types disproportionately show large intensity of many ecological processes and perform diverse roles in the biosphere.

A pond is a dynamic and ever-changing community of plants and animals. Ponds may be natural, year-round, or seasonal, or they may be human-influenced in that ditches and dikes provide, hold or bring water to an impoundment. These ponds become more natural year after year . A pond ecosystem refers to the fresh water ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually ponds are shallow (hardly 15-20 ft ) water bodies in which sunlight can reach to its bottom , permitting the plants to grow there. Pond is the simplest aquatic ecosystem to observe .

## Pond Ecosystem:

A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges and throughout. However, it is often difficult to classify the differences between a pond and a lake, since the two terms are artificial and the ecosystems really exist on a continuum. Generally, in a pond, the temperature changes with the air temperature and is relatively uniform. Lakes are similar to ponds, but because they are larger, temperature layering or stratification takes place in summer and winter, and these layers turnover in spring and fall. Ponds get their energy from the sun. As with other ecosystems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide and water to organic compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

There are differences in a pond that is temporary and has water only in the monsoon, and a larger tank or lake that is an aquatic ecosystem throughout the year. Most ponds become dry after the rains are over and are covered by terrestrial plants for the rest of the year. When a pond begins to fill during the rains, its life forms such as the algae and microscopic animals, aquatic insects, snails, and worms come out of the floor of the pond where they have remained dormant in the dry phase. Gradually more complex animals such as crabs, frogs and fish return to the pond. The vegetation in the water consists of floating weeds and rooted vegetation on the periphery which grow on the muddy floor under water and emerge out of the surface of the water. As the pond fills in the monsoon a large number of food chains are formed. Algae is eaten by microscopic animals, which are in turn eaten by small fish on which larger carnivorous fish depend. These are in turn eaten by birds such as kingfishers, herons and birds of prey. Aquatic insects, worms and snails feed on the waste material excreted by animals and the dead or decaying plant and animal matter. They act on the detritus, which is broken down into nutrients which aquatic plants can absorb, thus completing the nutrient cycle in the pond. The temporary ponds begin to dry after the rains and the surrounding grasses and terrestrial plants spread into the moist mud that is exposed. Animals such as frogs, snails and worms remain dormant in the mud, awaiting the next monsoon.

A pond ecosystem is a system of organisms that live together in a pond. A pond ecosystem can be defined in three ways:

1. A closed community of organisms in a body of water.
2. An enclosed body of water that houses numerous different creatures.
3. A biological system that includes water and plant and animal life interacting with each other.

## ➤ Types of pond ecosystem:

Ponds can come in many different forms, and they all have their own differentiating characteristics. Below, you will find a discussion of some of the key types of pond ecosystem.

### **1. Salt ponds.**

Salt ponds contain brackish (i.e. salty) water and can occur close to the sea side where waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools. It is also possible to find salt ponds inland, thanks to the presence of brackish streams created through streams flowing through salty rocks.

### **2. Garden ponds.**

These artificially created ponds can contain ornamental plant and animal species that come from all over the world (i.e. non native species).

### **3. Freshwater pools:**

Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground. They can be home to fish, birds, amphibians, crustaceans and many other kinds of wildlife.

#### 4. Vernal pools.

Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they appear and at other times of the year will be relatively deserted – one example for instance is a seasonal oasis in the desert. These types of pond ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of year.

#### 5. Underground ponds.

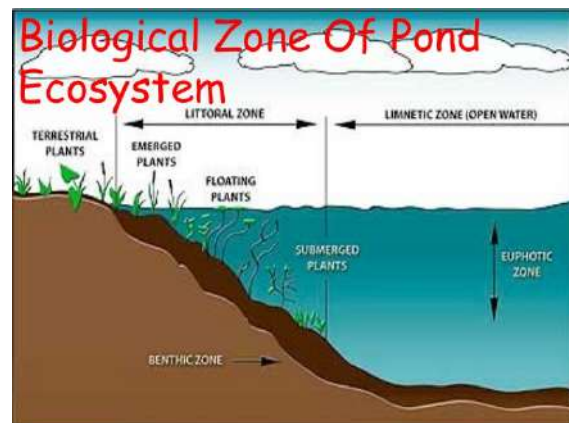
Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens and so on.

### ➤ Biodiversity of a pond ecosystem:

A typical pond has distinct zones of biological communities linked to the physical structure of the pond. (Figure below) The **littoral zone** is the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants (macrophytes) to grow. Light levels of about 1% or less of surface values usually define this depth. The 1% light level also defines the euphotic zone of the lake, which is the layer from the surface down to the depth where light levels become too low for photosynthesizers. In most lakes, the sunlit euphotic zone occurs within the epilimnion.

However, in unusually transparent ponds, photosynthesis may occur well below the thermocline into the perennially cold hypolimnion. For example, in western Lake Superior near Duluth, MN, summertime algal photosynthesis and growth can persist to depths of at least 25 meters, while the mixed layer, or epilimnion, only extends down to about 10 meters. Ultra-oligotrophic Lake Tahoe, CA/NV, is so transparent that algal growth historically extended to over 100 meters, though its mixed layer only extends to about 10 meters in summer. Unfortunately, inadequate management of the Lake Tahoe basin since about 1960 has led to a significant loss of transparency due to increased algal growth and increased sediment inputs from stream and shoreline erosion. The higher plants in the littoral zone, in addition to being a food source and a substrate for algae and invertebrates, provide a habitat for fish and other organisms that is very different from the open water environment.

The **limnetic zone** is the open water area where light does not generally penetrate all the way to the bottom. The bottom sediment, known as the benthic zone, has a surface layer abundant with organisms. This upper layer of sediments may be mixed by the activity of the



benthic organisms that live there, often to a depth of 2- 5 cm (several inches) in rich organic sediments. Most of the organisms in the benthic zone are invertebrates, such as Dipteran insect larvae (midges, mosquitoes, black flies, etc.) or small crustaceans. The productivity of this zone largely depends upon the organic content of the sediment, the amount of physical structure, and in some cases upon the rate of fish predation. Sandy substrates contain relatively little organic matter (food) for organisms and poor protection from predatory fish. Higher plant growth is typically sparse in sandy sediment, because the sand is unstable and nutrient deficient. A rocky bottom has a high diversity of potential habitats offering protection (refuge) from predators, substrate for attached algae (periphyton on rocks), and pockets of organic "ooze" (food). A flat mucky bottom offers abundant food for benthic organisms but is less protected and may have a lower diversity of structural habitats, unless it is colonized by higher plants.

### ▪ *Producers*

- Phytoplankton, literally "wandering plants," are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants—they are protists!

- Periphytic algae are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.

- Submerged plants grow completely under water.

- Floating plants include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.

- Emergent plants are rooted in shallow water but their stems and leaves are above water most of the time.

- Shore plants grow in wet soil at the edge of the pond.



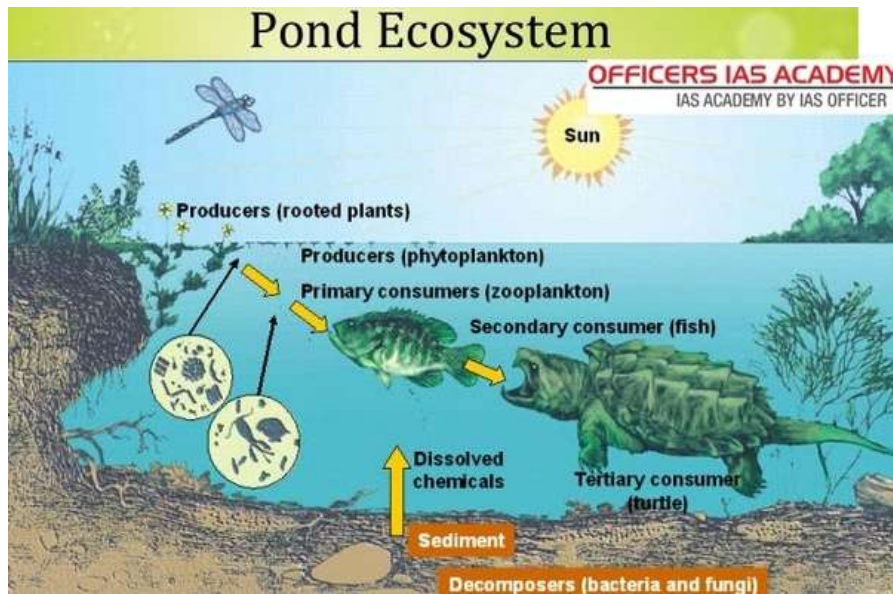
### ▪ *Consumers*

- Zooplankton are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.

- Invertebrates include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

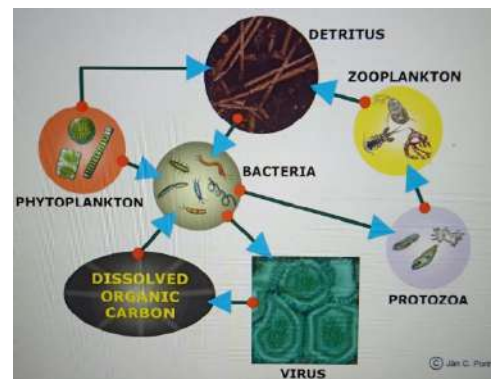


- Vertebrates are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles.



- *Decomposers*

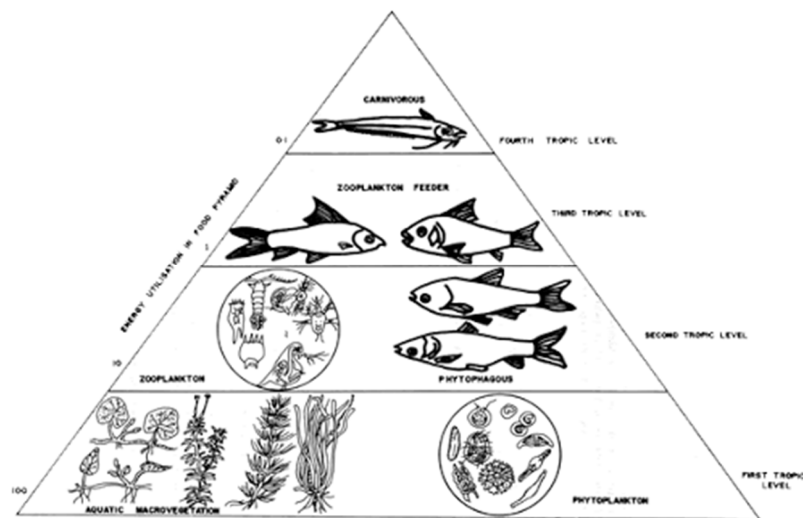
Animal waste and dead and decaying plants and animals form detritus on the bottom of the pond. Decomposers, also known as detritivores, are bacteria and other organisms that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide.



The Food Chain of a Pond Ecosystem is described below:

- Primary Consumers are the herbivores that depend on the producers for food - examples are tadpoles , snails, very tiny fish
- Secondary Consumers are the organisms which depend on the primary consumers for food- examples are medium sized fish.
- Tertiary Consumers are the organisms which can feed on the primary and the secondary consumer –examples are the duck, crane.

- Top Consumers or the predators, which include the osprey, fish hawk, and humans.



### ➤ Importance Of Pond Ecosystem:

Pond Ecosystem has a great significance. They provide inhabitation to scarce species and support biodiversity much more than any other freshwater habitat. It is a home to lot many species. In the midst of landscapes the farmland ponds can provide us wildlife which is not a small thing. Every pond has a story to narrate about different people who visit them, be it for fishing or for soaking cart wheels. Ponds work as mini reservoir which help to drain fields during rain. Ponds recycle the nutrients and reduce the amount of nitrates and phosphates. Ponds are usually man made and are dug for different utilities of mankind. They provide drinking water during dry weather and vegetation to animals. They are not just important for quenching thirst or providing inhabitation but also to add beauty to the mother nature. It touches our heart and we feel calm and close to nature.

### ➤ Brief description of a pond ecosystem near the place I live:

Many pond ecosystems can be found in Jalpaiguri the place where I live . There's a small pond near my house which is quite rich in biodiversity. From small insects to big fishes have been living in it. It is a great source for the locals of the supply of their daily food. It has a great importance in our locality. But some people tend to misuse it like they wash dishes , clothes in its water which causes algal bloom in it. Many fishes have died last year due to this but the locals have come up with a solution of cleaning the pond which is a very good initiative.





### ➤ Threats to Pond Ecosystem:

Ponds are threatened by many things including storm water runoff, pollutants and pesticides, hydrocarbons, invasive species, and climate change. Storm water runoff collects chemicals, pesticide, and petrochemicals dumping into ponds and lakes, altering ph balance and bringing toxins that can kill fish and other living organisms. Similarly pesticides and other chemicals used in the growth of crops can find its way into ponds and lakes killing fish and altering the balance of this freshwater eco system. Hydrocarbons including gas and oil from motor vehicles (boats), oil spills, leaks and runoff from washing cars can be toxic to plants, animals and humans. Aquatic invasive species can attach themselves to the bottom of boats or animals and disrupt the existing ecosystem. If the invasive species overpopulates it can choke out the native species consuming all of the available food sources. This can result in murky and smelly water and alter the quality of the drinking water.

Climate change affects the quantity of water that feeds a pond or lake. A warming of temperature can impact the species living in the lake causing an imbalance such as algae to overwhelm the other species. It can cause the water to become cloudy, and can also increase evaporation. If the temperatures remain elevated for long periods of time cold water species may relocate or die. Warmer temperatures also cause an increase in UV radiation which also threatens ponds and lakes by killing off species.

### ➤ Conservation:

There are so many ways to protect ponds . Conserving water is really important and not just in taking shorter showers or not leaving the water faucet running when washing dishes or brushing teeth. For an illuminating look at the amount of water that goes into producing a pair of jeans, chicken dinner. We need to read narrative about the hidden amounts of water that go into producing readily available items that we may be completely unaware, produced by The Nature Conservancy. Choosing environmentally friendly chemicals, fertilizers and pesticides, dumping paint, solvents or other products down the drain will help. Fixing oil leaks in our cars and dispose of vehicle fluids at designated places. Washing our car at a commercial car wash instead of on the street. Rain can wash these pollutants into storm drains and eventually it ends up in our water supply. When removing a boat from the water allow it to dry before moving it to another body of water. Ride a bike, use public transportation, walk, or carpool whenever possible. And volunteer with a community group that protects ponds .

### ➤ 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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions.

Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems. What steps might you take in your daily life to preserve and safeguard the beautiful pools and ponds of the world for future generations to enjoy.

## ACKNOWLEDGEMENT

I am grateful to all the professors of Environmental Science of Scottish Church College for their guidance and support. I am highly obliged to Dr. Jayeeta Chowdhury , HOD of Physics, Scottish Church College for her constant guidance and supervision. I would also like to express my gratitude towards my batchmates for their help .

Ahana Bandyopadhyay

# PROJECT REPORT

SEMESTER II

COURSE: AECC2 (Environmental Studies)

Project Title : Study of Ecosystem of Ponds

College Roll Number : PHSA20F604

CU Registration Number : 223-1211-049620

CU Roll Number : 203223-11-0093

## Introduction :

An ecosystem is a region with a specific and recognizable landscape from such as forest , grassland , desert , wetland , coastal area. The nature of ecosystem is based on its geographical features. It is also controlled by climatic conditions such as the amount of the sunlight , rainfall , temperature . In short , the living community of plants and animals in area together with the non-living components f the environment such as soil , air and water , constitute the eco system.

Ecosystems are divided into terrestrial or land based ecosystem and aquatic ecosystems in water. In this project we will be discussing about the eco system of ponds wich is a part of the aquatic ecosystem.

Ponds are an integral component of the hydrological system; and perform diverse roles in the biosphere. These small aquatic ecosystem types disproportionately show large intensity of many ecological processes and perform diverse roles in the biosphere.

A pond is a dynamic and ever-changing community of plants and animals. Ponds may be natural, year-round, or seasonal, or they may be human-influenced in that ditches and dikes provide, hold or bring water to an impoundment. These ponds become more natural year after year . A pond ecosystem refers to the fresh water ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually ponds are shallow (hardly 15-20 ft ) water bodies in which sunlight can reach to its bottom , permitting the plants to grow there. Pond is the simplest aquatic ecosystem to observe .

## Pond Ecosystem:

A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges and throughout. However, it is often difficult to classify the differences between a pond and a lake, since the two terms are artificial and the ecosystems really exist on a continuum. Generally, in a pond, the temperature changes with the air temperature and is relatively uniform. Lakes are similar to ponds, but because they are larger, temperature layering or stratification takes place in summer and winter, and these layers turnover in spring and fall. Ponds get their energy from the sun. As with other ecosystems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide and water to organic compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

There are differences in a pond that is temporary and has water only in the monsoon, and a larger tank or lake that is an aquatic ecosystem throughout the year. Most ponds become dry after the rains are over and are covered by terrestrial plants for the rest of the year. When a pond begins to fill during the rains, its life forms such as the algae and microscopic animals, aquatic insects, snails, and worms come out of the floor of the pond where they have remained dormant in the dry phase. Gradually more complex animals such as crabs, frogs and fish return to the pond. The vegetation in the water consists of floating weeds and rooted vegetation on the periphery which grow on the muddy floor under water and emerge out of the surface of the water. As the pond fills in the monsoon a large number of food chains are formed. Algae is eaten by microscopic animals, which are in turn eaten by small fish on which larger carnivorous fish depend. These are in turn eaten by birds such as kingfishers, herons and birds of prey. Aquatic insects, worms and snails feed on the waste material excreted by animals and the dead or decaying plant and animal matter. They act on the detritus, which is broken down into nutrients which aquatic plants can absorb, thus completing the nutrient cycle in the pond. The temporary ponds begin to dry after the rains and the surrounding grasses and terrestrial plants spread into the moist mud that is exposed. Animals such as frogs, snails and worms remain dormant in the mud, awaiting the next monsoon.

A pond ecosystem is a system of organisms that live together in a pond. A pond ecosystem can be defined in three ways:

1. A closed community of organisms in a body of water.
2. An enclosed body of water that houses numerous different creatures.
3. A biological system that includes water and plant and animal life interacting with each other.

## ➤ Types of pond ecosystem:

Ponds can come in many different forms, and they all have their own differentiating characteristics. Below, you will find a discussion of some of the key types of pond ecosystem.

### **1. Salt ponds.**

Salt ponds contain brackish (i.e. salty) water and can occur close to the sea side where waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools. It is also possible to find salt ponds inland, thanks to the presence of brackish streams created through streams flowing through salty rocks.

### **2. Garden ponds.**

These artificially created ponds can contain ornamental plant and animal species that come from all over the world (i.e. non native species).

### **3. Freshwater pools:**

Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground. They can be home to fish, birds, amphibians, crustaceans and many other kinds of wildlife.

#### 4. Vernal pools.

Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they appear and at other times of the year will be relatively deserted – one example for instance is a seasonal oasis in the desert. These types of pond ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of year.

#### 5. Underground ponds.

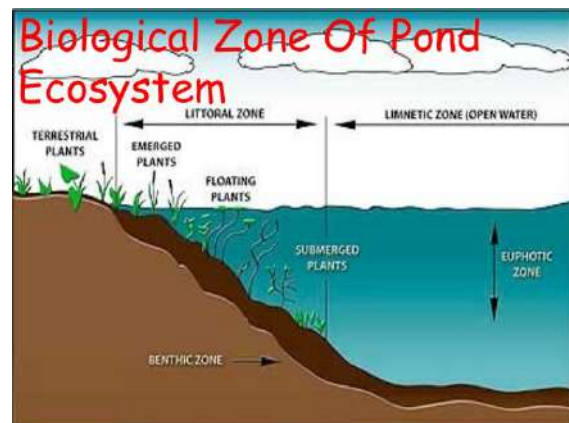
Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens and so on.

### ➤ Biodiversity of a pond ecosystem:

A typical pond has distinct zones of biological communities linked to the physical structure of the pond. (Figure below) The **littoral zone** is the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants (macrophytes) to grow. Light levels of about 1% or less of surface values usually define this depth. The 1% light level also defines the euphotic zone of the lake, which is the layer from the surface down to the depth where light levels become too low for photosynthesizers. In most lakes, the sunlit euphotic zone occurs within the epilimnion.

However, in unusually transparent ponds, photosynthesis may occur well below the thermocline into the perennially cold hypolimnion. For example, in western Lake Superior near Duluth, MN, summertime algal photosynthesis and growth can persist to depths of at least 25 meters, while the mixed layer, or epilimnion, only extends down to about 10 meters. Ultra-oligotrophic Lake Tahoe, CA/NV, is so transparent that algal growth historically extended to over 100 meters, though its mixed layer only extends to about 10 meters in summer. Unfortunately, inadequate management of the Lake Tahoe basin since about 1960 has led to a significant loss of transparency due to increased algal growth and increased sediment inputs from stream and shoreline erosion. The higher plants in the littoral zone, in addition to being a food source and a substrate for algae and invertebrates, provide a habitat for fish and other organisms that is very different from the open water environment.

The **limnetic zone** is the open water area where light does not generally penetrate all the way to the bottom. The bottom sediment, known as the benthic zone, has a surface layer abundant with organisms. This upper layer of sediments may be mixed by the activity of the



benthic organisms that live there, often to a depth of 2- 5 cm (several inches) in rich organic sediments. Most of the organisms in the benthic zone are invertebrates, such as Dipteran insect larvae (midges, mosquitoes, black flies, etc.) or small crustaceans. The productivity of this zone largely depends upon the organic content of the sediment, the amount of physical structure, and in some cases upon the rate of fish predation. Sandy substrates contain relatively little organic matter (food) for organisms and poor protection from predatory fish. Higher plant growth is typically sparse in sandy sediment, because the sand is unstable and nutrient deficient. A rocky bottom has a high diversity of potential habitats offering protection (refuge) from predators, substrate for attached algae (periphyton on rocks), and pockets of organic "ooze" (food). A flat mucky bottom offers abundant food for benthic organisms but is less protected and may have a lower diversity of structural habitats, unless it is colonized by higher plants.

### ▪ *Producers*

- Phytoplankton, literally "wandering plants," are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants—they are protists!

- Periphytic algae are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.

- Submerged plants grow completely under water.

- Floating plants include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.

- Emergent plants are rooted in shallow water but their stems and leaves are above water most of the time.

- Shore plants grow in wet soil at the edge of the pond.



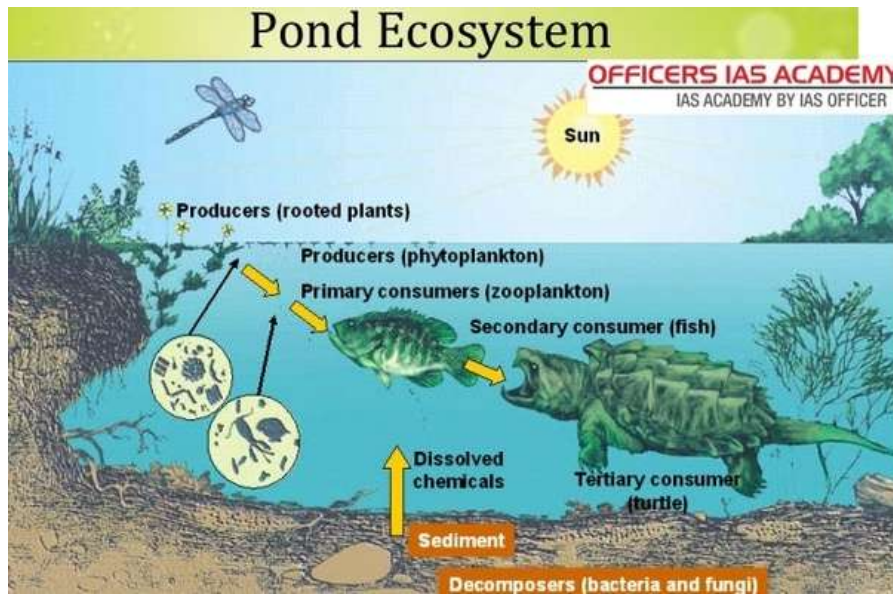
### ▪ *Consumers*

- Zooplankton are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.

- Invertebrates include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

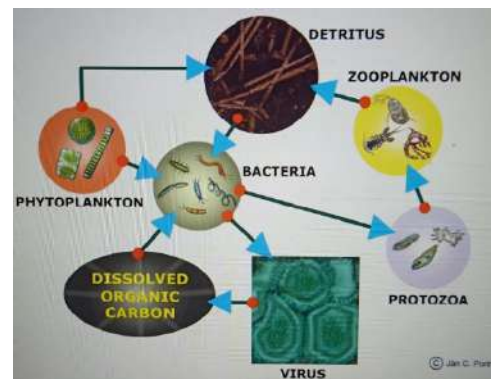


- Vertebrates are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles.



- *Decomposers*

Animal waste and dead and decaying plants and animals form detritus on the bottom of the pond. Decomposers, also known as detritivores, are bacteria and other organisms that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide.

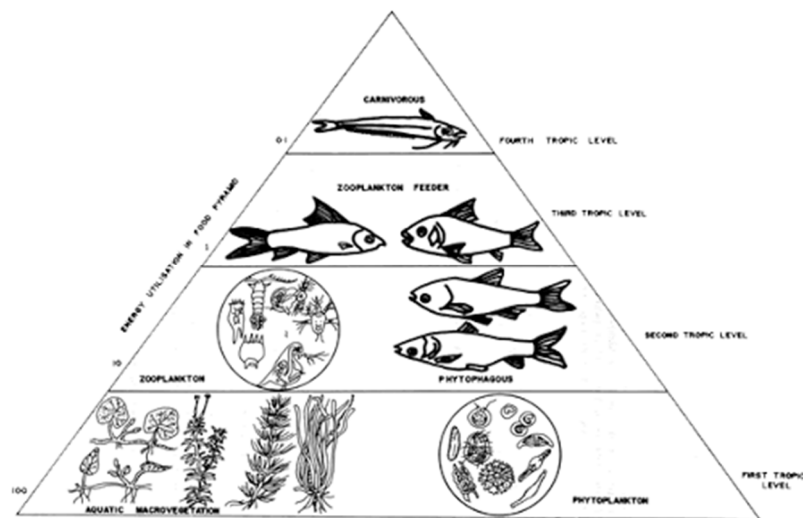


The Food Chain of a Pond Ecosystem is described below:

- Primary Consumers are the herbivores that depend on the producers for food - examples are tadpoles , snails, very tiny fish
- Secondary Consumers are the organisms which depend on the primary consumers for food- examples are medium sized fish.
- Tertiary Consumers are the organisms which can feed on the primary and the secondary consumer –examples are the duck, crane.



- Top Consumers or the predators, which include the osprey, fish hawk, and humans.



### ➤ Importance Of Pond Ecosystem:

Pond Ecosystem has a great significance. They provide inhabitation to scarce species and support biodiversity much more than any other freshwater habitat. It is a home to lot many species. In the midst of landscapes the farmland ponds can provide us wildlife which is not a small thing. Every pond has a story to narrate about different people who visit them, be it for fishing or for soaking cart wheels. Ponds work as mini reservoir which help to drain fields during rain. Ponds recycle the nutrients and reduce the amount of nitrates and phosphates. Ponds are usually man made and are dug for different utilities of mankind. They provide drinking water during dry weather and vegetation to animals. They are not just important for quenching thirst or providing inhabitation but also to add beauty to the mother nature. It touches our heart and we feel calm and close to nature.

### ➤ Brief description of a pond ecosystem near the place I live:

Many pond ecosystems can be found in Jalpaiguri the place where I live . There's a small pond near my house which is quite rich in biodiversity. From small insects to big fishes have been living in it. It is a great source for the locals of the supply of their daily food. It has a great importance in our locality. But some people tend to misuse it like they wash dishes , clothes in its water which causes algal bloom in it. Many fishes have died last year due to this but the locals have come up with a solution of cleaning the pond which is a very good initiative.



### ➤ Threats to Pond Ecosystem:

Ponds are threatened by many things including storm water runoff, pollutants and pesticides, hydrocarbons, invasive species, and climate change. Storm water runoff collects chemicals, pesticide, and petrochemicals dumping into ponds and lakes, altering ph balance and bringing toxins that can kill fish and other living organisms. Similarly pesticides and other chemicals used in the growth of crops can find its way into ponds and lakes killing fish and altering the balance of this freshwater eco system. Hydrocarbons including gas and oil from motor vehicles (boats), oil spills, leaks and runoff from washing cars can be toxic to plants, animals and humans. Aquatic invasive species can attach themselves to the bottom of boats or animals and disrupt the existing ecosystem. If the invasive species overpopulates it can choke out the native species consuming all of the available food sources. This can result in murky and smelly water and alter the quality of the drinking water.

Climate change affects the quantity of water that feeds a pond or lake. A warming of temperature can impact the species living in the lake causing an imbalance such as algae to overwhelm the other species. It can cause the water to become cloudy, and can also increase evaporation. If the temperatures remain elevated for long periods of time cold water species may relocate or die. Warmer temperatures also cause an increase in UV radiation which also threatens ponds and lakes by killing off species.

### ➤ Conservation:

There are so many ways to protect ponds . Conserving water is really important and not just in taking shorter showers or not leaving the water faucet running when washing dishes or brushing teeth. For an illuminating look at the amount of water that goes into producing a pair of jeans, chicken dinner. We need to read narrative about the hidden amounts of water that go into producing readily available items that we may be completely unaware, produced by The Nature Conservancy. Choosing environmentally friendly chemicals, fertilizers and pesticides, dumping paint, solvents or other products down the drain will help. Fixing oil leaks in our cars and dispose of vehicle fluids at designated places. Washing our car at a commercial car wash instead of on the street. Rain can wash these pollutants into storm drains and eventually it ends up in our water supply. When removing a boat from the water allow it to dry before moving it to another body of water. Ride a bike, use public transportation, walk, or carpool whenever possible. And volunteer with a community group that protects ponds .

### ➤ 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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions.

Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems. What steps might you take in your daily life to preserve and safeguard the beautiful pools and ponds of the world for future generations to enjoy.

## ACKNOWLEDGEMENT

I am grateful to all the professors of Environmental Science of Scottish Church College for their guidance and support. I am highly obliged to Dr. Jayeeta Chowdhury , HOD of Physics, Scottish Church College for her constant guidance and supervision. I would also like to express my gratitude towards my batchmates for their help .

Ahana Bandyopadhyay

# PROJECT REPORT

**SEMESTER – II**

**COURSE: - AECC 2 (Environmental Studies)**

**NAME OF PROJECT:-**

**Study of ecosystems- Pond, River, Wetland, Forest, Estuary and Agro ecosystem.**

**Collage roll no: - PHSA20M574**

**CU Registration No: - 223-11110236-20**

**CU Roll No: - 203223-21-0014**

Checked  
24 out of  
30

## 4. STUDY OF ECOSYSTEMS- POND, RIVER, WETLAND, FOREST, ESTUARY AND AGRO ECOSYSTEM.

**Ecosystem:-** The word "ecosystem" was first introduced by Sir Arthur Tansley.

**Definition:** - "Ecosystem" was defined in 1935 by Sir Arthur Tansley as: the whole system (in the sense of physics) including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome-the **habitat** factors in the widest sense.

Ecosystems are controlled both by living and non-living factors. Non-living factors such as climate, the parent material which forms the soil and topography, control the overall structure of an ecosystem. On the other hand, living organisms maintain the nutrient cycle.

**Types:** - Natural Ecosystem can be divided into mainly two division:

1. Terrestrial Ecosystem: - A terrestrial ecosystem is a land-based community of organisms and the interactions of biotic and abiotic components in a given area.  
It can be sub-divided in: -
  1. Forest Ecosystem
  2. Grassland Ecosystem
  3. Desert Ecosystem
  4. Tundra Ecosystem etc.
2. Aquatic Ecosystem: - An aquatic ecosystem is an ecosystem in a body of water. Communities of organisms that are dependent on each other and on their environment live in aquatic system.  
It can be sub-divided in: -
  1. Marine ecosystem
  2. Large marine ecosystem
  3. Freshwater ecosystem
  4. Lake ecosystem
  5. River ecosystem Wetland

**Target Of Ecological Study:** - These are resources that people depend upon directly and are easy to quantify in economic terms such as:

- Consumptive Use Value - Non-market value of fruit, fodder, firewood, etc. that are used by people who collect them from their surrounds.]
- Productive Use Value - Commercial value of timber, fish, medicinal plants, etc. that people collect for sale.
- Non-consumptive use value - scientific research, bird-watching, ecotourism, etc.
- Option value - maintaining options for the future, so that by preserving them one could reap economic benefits in the future.

Hence, our given assignment is to discuss about: -

- Pond
- River
- Wetland
- Forest
- Estuary
- Agro ecosystems.

# POND ECOSYSTEM

**Definition:** - A pond or lake ecosystem includes biotic (living) plants, animals and micro-organisms, as well as abiotic (non-living) physical and chemical interactions. Pond and lake ecosystems are prime example of lentic (stationary or relatively still water) ecosystems.

Especially in India, a plenty of ponds throughout the land. Mainly rain water fills these. These ponds are may be Natural or Artificial both.

**Type of Pond Ecosystem:** - can be subdivided, as-

- Salt Pond
- Garden Pond
- Freshwater pool
- Vernal pool
- Underground pool



**Elements of Pond Ecosystem:** - Pond Ecosystems are a self-dependent ecosystem, as it contains all the elements:

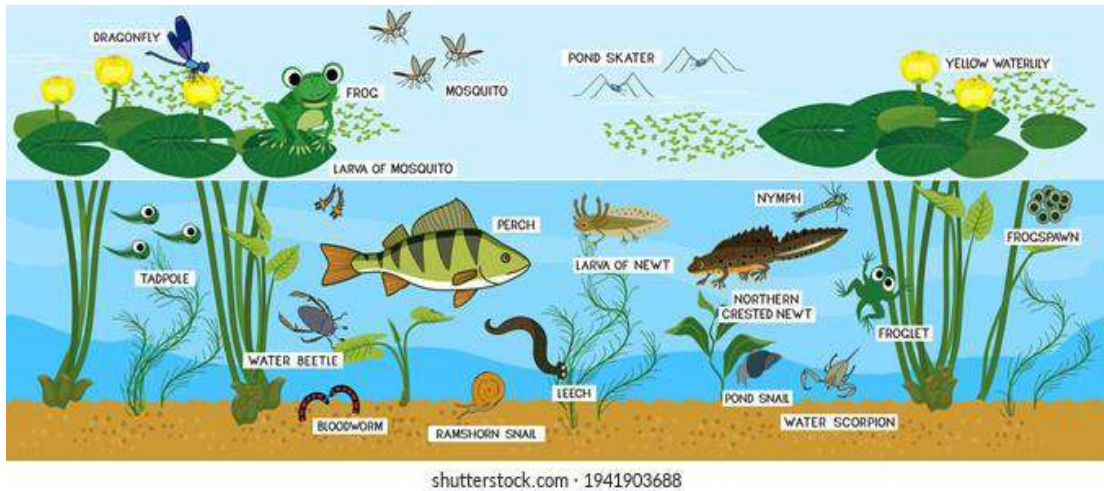
- ✚ **Primary Producers:** - Phytoplankton, Periphytic algae, Submerged plants, Emergent plants, Shore plants are mainly producers of a typical pond.
- ✚ **Consumers:** - In a typical pond consumer are Zooplanktons, Vertebrates (fish, frogs, salamanders, and turtles), Invertebrates.
- ✚ **Decomposers:** - Decomposers (detritivores) are bacteria and some other organisms that break down detritus into material that can be used by primary producers.

**Importance Of Pond Ecosystem:** - Pond Ecosystem play an important role in World Environment.

- **Ubiquity:** - Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world. It is very abundant Ecosystem.
- **Source of hydration:** - Many numbers of organisms live in pond. Even many do not live in the pond ecosystem, although many species of animals will come to pond ecosystems whenever they need a drink. Humans can also use these ecosystems as a source of water for drinking and agricultural purpose.
- **Economical Advantage:** - Pisciculture is an important economy of countries like India. It is a source of water for irrigation. Jute industry use these.
- **Biodiversity:** - Ponds are treasures of biodiversity. A huge number of aquatic plants and animals are found in ponds.
  - ✚ Ponds typically contain three broad categories of phytoplankton - (filamentous phytoplankton, macroscopic multi-branched phytoplankton and unicellular phytoplankton) . Some frequent zooplanktons are -Protozoa, Rotifera, Cladocera, Copepoda, Ostracoda etc.
  - ✚ Some frequent algae are: Blue green algae, Bryozoas, Maskgrass , Filamentous algae, Golden algae, Nitella , Planktonic algae etc.
  - ✚ A lot of insects are found in ponds, such as : Mayfly Larvae, Dragonfly Larvae, Water Strider, Damselfly larvae, Water bug, Water boatmen, Caddishfly larvae, Backswimmer etc.
  - ✚ Some of the submerged oxygenating plants are Callitriche, Ceratophyllum, Elodea, Ranunculus, Vallisneria etc.



- ✚ A lot of fishes, amphibians, snakes are found in ponds. In some cases, may present. Some of birds are directly the part of it, as they collect their food from pond.



So, by analysing these roles of ponds we can conclude that, The Pond ecosystem are too much important for the environment and human civilization.

## RIVER ECOSYSTEM

**Definition:** - River ecosystem includes biotic (living) plants, animals and micro-organisms, as well as abiotic (non-living) physical and chemical interactions between them, in flowing water of river; since it is a Lotic (Flowing or Dynamic) Aquatic Ecosystem.

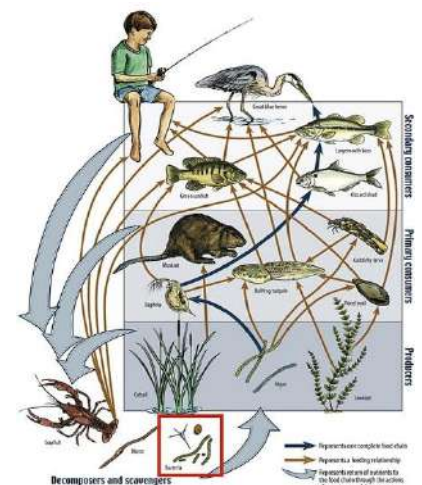


- Rivers are generally originated from two sources. As, from Iceberg and Rain water. Sometimes sea water become the source of river (eg- Rivers of Sundarbans)
- Speed of flow vary from river to river, and corresponding biodiversity change.
- Water may be fresh, brackish or slated. It also may be cold or hot.

Depending upon these and on some more factors nature of river system changes.

**Elements of River Ecosystem:** -Elements of River ecosystems are:

- ✚ **Primary Producers:** - Phytoplankton and periphyton, mosses and liverworts are the most significant sources of primary production in most rivers.
- ✚ **Consumers:** - The micro consumers of rivers are the herbivores, predators and parasites. The decomposers or micro consumers are the worms, bacteria, fungi, fishes, larvae, insects etc.
- ✚ **Decomposers:** - bacteria and fungi are on the bottom of rivers



**Importance of River Ecosystem:** -Rivers contains Producers to decomposers, all the elements. River make it's basin as a prolific land, which produces most of the agricultural products and most of the forests are gathered around the river basin.

- **Source Of Water:** - Among fresh water (3% of total) 0.49% water contains by river. Human Civilization and most of the forests are collect water from rivers. It completes the water cycle. It is a large source of drinking water.
- **Economic:** - From ancient age, Human civilization has been gathered around many river basins. Fishery, Transportation, Hydroelectric projects, Dam (for water supply), are some of economical application of river.
- **Biodiversity:** - Rivers contain a lot of Freshwater biodiversity, in it's long path. Some of them are:
  1. Some of phytoplanktons are Blue green algae, green algae, Miozoa, Bacillariophyta, Cyanobacteria etc.
  2. Protozoa, Cnidaria, Mollusca, Annelida, Crustacea, Bryozoa, Brachiopoda, Chaetognatha, Rotifera, Cladocera, Copepoda Ostracoda are some of frequent Zooplanktons.
  3. Among the arthropods some of are spiders, scorpions, centipedes, millipedes, butterflies, wasps, rhinoceros beetles, ponerine ants, mantids, walking sticks.
  4. A lot of aquatic birds, many fishes, snakes, crocodiles, turtles, river dolphins are found.

The Ganga River is home of many species as well as of some rare species. These include the Gangetic Dolphin, three species of Otters, the Critically Endangered Gharial (*Gavialis gangeticus*), Muger or Indian marsh crocodile, Estuarine crocodile and at least 12 species of freshwater turtles (including the Critically Endangered Batagur kachuga), 143 different freshwater fish species; belonging to 11 orders (including the Critically Endangered Ganges shark, Gangetic stingray, Golden mahseer and Hilsa).

Amazon river basin is the biggest rain forest, which is called "Lungs of Earth". Most number of species including some endangered and endemic species are present there.



## WETLAND ECOSYSTEM

**Definition:** -An ecosystem that arises when inundation by water produces soils dominated by anaerobic and aerobic processes, which, in turn, forces the biota, particularly rooted plants, to adapt to flooding.

Wetlands occur naturally on every continent. The water in wetlands is either freshwater, brackish, or saltwater.

**Types:** - The main wetland types are: swamp, marsh, bog, and fen; sub-types include mangrove forest, carr, pocosin, floodplains, mire, vernal pool, sink etc.



**Source Of Water:** - Sources of hydrological flows into wetlands are predominantly precipitation, surface water, groundwater, tidal water etc.



Water flows out of wetlands by evapotranspiration, surface runoff, and subsurface water outflow.

**Biota of Wet Land:** -The most important factor affecting the biota is the duration of flooding. Other important factors include fertility and salinity. Biota may vary within a wetland due to season or recent flood regimes.

Page | 6

- **Flora:** - Four main groups of hydrophytes, of wetland systems throughout the world-

- Submerged wetland vegetation can grow in saline and fresh-water conditions. Some species have underwater flowers, while others have long stems to allow the flowers to reach the surface. Examples include seagrasses and eelgrass.
- Floating water plants or floating vegetation is usually small, like arrow arum (*Peltandra virginica*)
- Trees and shrubs, comprise much of the cover in saturated soils, qualify those areas in most cases as swamps. The upland boundary of swamps is determined partly by water levels. Some swamps can be dominated by a single species, such as silver maple swamps around the Great Lakes. There also have large numbers of different tree species. Examples include cypress (*Taxodium*) and mangrove.



- **Algae:** - Algae are diverse plant-like organisms that can vary in size, colour, and shape. There are three main groups of algae:
  - Plankton are algae which are microscopic, free-floating algae. Plankton are the basis of the food web and are responsible for primary production in the ocean using photosynthesis to make food.
  - Filamentous algae are long strands of algae cells that form floating mats.
  - *Chara* and *Nitella* algae are upright algae that look like a submerged plant with roots.

- **Fauna:** - Some of animal species are-

- Fish are more dependent on wetland ecosystems than any other type of habitat. Tropical fish species need mangroves for critical hatchery and nursery grounds and the coral reef system for food.
- Insects and invertebrates total more than half of the 100,000 known animal species in wetlands. Insects and invertebrates can be submerged in the water or soil, on the surface, and in the atmosphere. Many insects inhabit in the water, soil, and the atmosphere at different life stages.
- Reptiles such as alligators, snakes, turtles, crocodiles are common in wetlands of some regions. A lot of amphibians are found in wet lands.
- A large number of birds as Herons, Grebes, Coots, Ibis, Rail, Ducks, Spoonbills, Godwit etc.
- Mammals include numerous small and medium-sized species such as voles, bats, and platypus in addition to large herbivorous and apex species such as the beaver, coypu, swamp rabbit, Florida panther, and moose.



**Use of Wet Land:** - Use of Wet Land may be multipurposed.

- a. Wet Lands Can be used for water storage in prevention of flood.

- b. Wetland systems are directly linked to groundwater and a crucial regulator of both the quantity and quality of ground water.
- c. Wet Lands are able to sink carbon and convert greenhouse gas to solid plant material through the process of Photosynthesis.
- d. Wetlands cycle both sediments and nutrients balancing terrestrial and aquatic ecosystems. A natural function of wetland vegetation is the up-take, storage, and (for nitrate) the removal of nutrients from the surrounding soil and water.

## FOREST ECOSYSTEM

**Definition:** - A forest ecosystem is a dynamic complex of plant, animal and micro-organism communities and their abiotic environment interacting as a functional unit, where trees are a key component of the system.

**Types:** - Forest Ecosystem can be classified in mainly three sub-divisions:

- ❖ Temperate Forest
- ❖ Taiga Forest
- ❖ Tropical rain forest, Ecosystems.



**Elements:** - The elements of the forest ecosystems are:

1. The Forest Ecosystem is mainly consists of trees, which are Producers. Trees, bushes, climber, mosses, ferns are mainly in producer category.
2. Opossums, deer, rodents, snail, fish, birds, and bears are some of primary consumers. Actually, they take the plants(producers) directly.
3. The secondary consumers are foxes, raccoons, bears, timber wolves, mountain lions, bobcats, cougars; which eat primary consumers. They are carnivore.
4. Apart from bacteria, ants and termites are important decomposers. Millipedes and earthworms also help to break down dead matter.

**Biota:** - Forest is a large source Biodiversity:

● **Flora:** - Different types of flora are-

1. Lichen, moss, ferns, wildflowers and other small plants can be found on the forest floor. Shrubs and bushes fill in the middle level and Hardwood trees like maple, oak, birch, magnolia, sweet gum, beech etc.
2. Needleleaf, coniferous (gymnosperm) trees are the dominant plants of the taiga biome. A very few species in four main genera are found: the evergreen spruce (*Picea*), fir (*Abies*), and pine (*Pinus*), and the deciduous larch or tamarack (*Larix*).
3. In Alpine Tundra Forest perennial grasses, sedges, forbs, cushion plants, mosses, and lichens are most frequent flora of Tundra Forest.
4. Lagerstroemia, Acacia, Lannea community is the richest for both tree and herb strata, whereas Shorea, Buchanania community is the richest among vascular, in dry Tropical Forest.
5. Some plants of tropical rain forests are, Epiphytes, Bromeliads, Orchids, variety of Palm, Lilies, Rubber, Bougainvillea, types of Bamboo, oak, Tualang, Strangler Figs, Pitcher plants, Heliconia, Kapok, Durian are some of frequent plants of Moist Tropical Forest. Tropical rain forest are the biggest source of biodiversity.



Most of the Mega Biodiversity Hotspots are located at these regions. Such as Amazon Rain Forest, Congo rainforest, Daintree Rainforest, rainforests of Sumatra and Borneo.

● **Fauna:** - Fauna of Forests Ecosystems are: -

1. In Tropical Rain Forest, Frequent animals are Mammals (Monkeys, Bats, Possums, Kangaroos, Tigers, Foxes etc.), Birds (African Gray Parrot, Australian King Parrot, Eagles, Hummingbirds etc.), Insects (Beetles, Ants, Spiders, Butterflies, Grasshoppers, Caterpillars etc.), Reptiles and Amphibians (Snakes, Frogs, Geckos, Komodo Dragons, Chameleon etc.), Aquatics (Eels, Piranhas, various fish).
2. Tropical dry forests are home to a wide variety of wildlife including monkeys, large cats, parrots, various rodents, and ground dwelling birds.
3. Tundra wildlife includes small mammals—such as Norway lemmings, arctic hares, and arctic ground squirrels and large mammals, such as caribou. These animals build up stores of fat to sustain and insulate them through the winter.
4. Mammals living in the taiga include foxes, lynxes, bears, minks, squirrels, grey wolves, caribou, reindeers mice etc. During the harsh winter, the majority of these mammals live within the forest. Most birds of Taiga, migrate south during winter, while two species (European red crossbill and the white-winged crossbill) have adapted to resist this season. Some others are ants, wood wasps, xylophagous beetles flies, butterfly larvae, moths etc.



**Uses Of Forest Ecosystem:** - We depend on forests for our survival, from the air we breathe to the wood we use. Besides providing habitats for animals and livelihoods for humans, forests also offer watershed protection, prevent soil erosion and mitigate climate change.

- I. Along with oceans Forests provide the most percentage of oxygen to nature.
- II. Absorbing harmful greenhouse gasses that produce climate change. In tropical forests alone, a quarter of a trillion tons of carbon is stored in above and below ground biomass.
- III. Providing goods such as timber, food, fuel and bioproducts, medicines, wax, honey.
- IV. Protecting watersheds and reducing or slowing the amount of erosion and chemicals that reach waterways.
- V. Serving as a buffer in natural disasters like flood and rainfalls.
- VI. Providing habitat to more than half of the world's land-based species.
- VII. It provides a good natural beauty, for tourism.



## ESTUARY ECOSYSTEM

The word "estuary" is derived from the Latin word '*aestuarium*' meaning tidal inlet of the sea, which in itself is derived from the term '*aestus*', meaning tide.

**Definition:** - A semi-enclosed body of water connected to the sea as far as the tidal limit or the salt intrusion limit and receiving freshwater runoff; however, the freshwater inflow may not be perennial, the connection to the sea may be closed for part of the year and tidal influence may be negligible.

**Types:** -Estuaries can be subdivided into some divisions:

1. Bar-built Estuaries form when a shallow lagoon or bay is protected from the ocean by a sand bar, sand delta or barrier island.
2. Tectonic estuaries are caused by the folding or faulting of land surfaces.
3. Coastal plain estuaries are formed by the sea level rising and filling an existing river valley.
4. Fjords and rias are U-shaped valleys formed by glacial action. Fjords are found in areas with long histories of glacier activity.

- Barrier enclosed lagoons e.g., Tairua
  - River mouth estuaries e.g., Mokau
  - Coastal embayments e.g., Coromandel Harbour
  - Drowned river valleys e.g., Raglan
  - A semi enclosed bay e.g., Firth of Thames
- Are some of the examples of Estuaries.



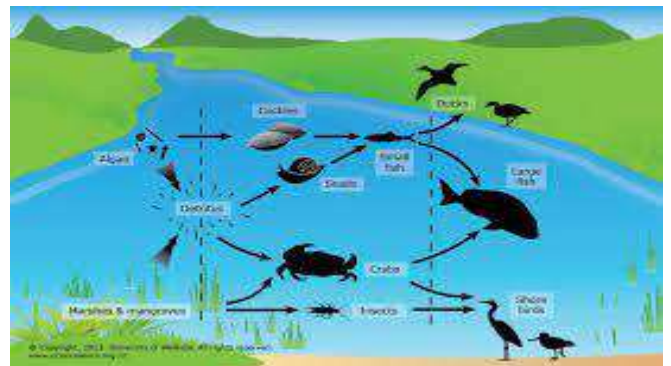
**Characteristic:** - Estuary Ecosystem have some

unique character:

- ✚ In these both ocean and land contribute to a unique ecosystem and fresh and salt water are mixed. A basic feature is the instability of an estuary due to the ebb and flood of the tide.
- ✚ Estuaries provide a calm refuge from the open sea for millions of plants and animals.
- ✚ The diversity of habitats enclosed in estuaries supports enormous abundance and diversity of species. A lot of visiting species are found here.
- ✚ Estuaries are among the most productive environments on earth. Extremely rich in organic matter and nutrients.

**Biodiversity:** - Estuaries enclose a diverse range of habitats from subtidal areas to intertidal areas. Truly estuarine species complete their whole life cycle within the transitional waters.

- ❖ Some of among Estuary plants are: Douglas Aster, Eelgrass, Fathen Saltbush, Gumweed, Pickleweed, Red Algae, Saltgrass, Sea Lettuce, Seaside Arrowgrass, Tufted Hairgrass etc.
- ❖ Some small Creatures are: Bent-nosed Clam, Blood Star, Brooding Sea Lugworm Purple Shore Crab, Scallop, Skeleton, Shrimp, Stalked Jellyfish, Sunflower Star etc.
- ❖ Among Mammals are Harbour Seal, River Otter etc.
- ❖ Damsel fly, Green Darner are some of insects.
- ❖ A lot of birds are found here, as: American Coot, American Wigeon, Black-bellied Plover, Black Brant, Bald Eagle, Canada Goose, Caspian Tern, Common Goldeneye, Great-blue Heron, Lesser Yellowlegs, Peregrine Falcon, Red-breasted Merganser, Western Gull etc.
- ❖ Some of Fishes are Bay Pipefish, Chinook Salmon, Chum Salmon, Cutthroat Trout, Pacific Sculpin, Shiner Perch, Starry Flounder etc.



**Importance & Use:** - Estuary are of enormous importance to environment and civilization:

- Many marine organisms, depend on estuaries at some point during their development. For Biological productivity, estuaries provide ideal areas for migratory birds to rest and refuel during their long journeys.

- Estuaries can filter out sediments and pollutants from rivers and streams before they flow into the ocean. Healthy estuaries can absorb surges of water from storms, floods, and tides, protecting our homes and communities. They help prevent soil erosion.
- Estuaries offer good fishing grounds for the fisherman as the water column is shallow. About 75% of commercial fish are caught from estuaries.
- It plays an important role in transportation, as it connects river and sea.

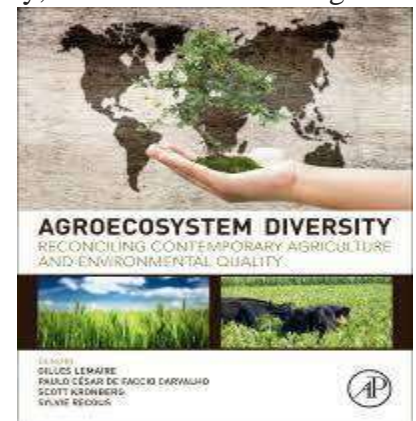
## AGRO ECOSYSTEM

Agro Ecosystem is a typical example of Artificial Ecosystem.

**Definition:** - An Agro ecosystem is the basic unit of study in agroecology, and is somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity, and includes the living and non-living components involved in that unit as well as their interactions.

Agro ecosystems are mainly man-made ecosystem, because:

- A farmer favours a plant species, and remove all other animal or plant species which damage it.
- Energy intake employed by men in the form of machinery, fertilizers, pesticides, selected seeds, processings.
- Biomass, which is removed when harvested makes the ecosystem an open system, which means it depends from external processes to reintroduce fertilizing substances suitable to nourish a new growth and development process of organic material (plants). A natural ecosystem, instead, self-fertilizes as the biomass remains in its original setting.



### Utilization: -

- ✚ Forest gardens are probably the world's oldest and most resilient agroecosystem. Forest gardens originated in prehistoric times. In the gradual process of a family improving their immediate environment, useful tree and vine species were identified, protected and improved whilst undesirable species were eliminated. Eventually superior foreign species were selected and incorporated into the family's garden.
- ✚ Some major organizations are hailing farming within agroecosystems as the way forward for mainstream agriculture. Current farming methods have resulted in over-stretched water resources, high levels of erosion and reduced soil fertility. Therefore, how critically water, land and ecosystem resources are used to boost crops, must to be considered.
- ✚ One of the major efforts of disciplines (agroecology) is to promote management styles that blur the distinction between agroecosystems and "natural" ecosystems, both by decreasing the impact of agriculture (increasing the biological and trophic complexity of the agricultural system as well as decreasing the nutrient inputs/outflow) and by increasing awareness that "downstream" effects extend agroecosystems beyond the boundaries of the farm.



# PROJECT REPORT

**SEMESTER – II**

**COURSE: - AECC 2 (Environmental Studies)**

**NAME OF PROJECT:-**

**Study of ecosystems- Pond, River, Wetland, Forest, Estuary and Agro ecosystem.**

**Collage roll no: - PHSA20M574**

**CU Registration No: - 223-11110236-20**

**CU Roll No: - 203223-21-0014**

## 4. STUDY OF ECOSYSTEMS- POND, RIVER, WETLAND, FOREST, ESTUARY AND AGRO ECOSYSTEM.

**Ecosystem:-** The word "ecosystem" was first introduced by Sir Arthur Tansley.

**Definition:** - "Ecosystem" was defined in 1935 by Sir Arthur Tansley as: the whole system (in the sense of physics) including not only the organism-complex, but also the whole complex of physical factors forming what we call the environment of the biome-the **habitat** factors in the widest sense.

Ecosystems are controlled both by living and non-living factors. Non-living factors such as climate, the parent material which forms the soil and topography, control the overall structure of an ecosystem. On the other hand, living organisms maintain the nutrient cycle.

**Types:** - Natural Ecosystem can be divided into mainly two division:

1. Terrestrial Ecosystem: - A terrestrial ecosystem is a land-based community of organisms and the interactions of biotic and abiotic components in a given area.  
It can be sub-divided in: -
  1. Forest Ecosystem
  2. Grassland Ecosystem
  3. Desert Ecosystem
  4. Tundra Ecosystem etc.
2. Aquatic Ecosystem: - An aquatic ecosystem is an ecosystem in a body of water. Communities of organisms that are dependent on each other and on their environment live in aquatic system.  
It can be sub-divided in: -
  1. Marine ecosystem
  2. Large marine ecosystem
  3. Freshwater ecosystem
  4. Lake ecosystem
  5. River ecosystem Wetland

**Target Of Ecological Study:** - These are resources that people depend upon directly and are easy to quantify in economic terms such as:

- Consumptive Use Value - Non-market value of fruit, fodder, firewood, etc. that are used by people who collect them from their surrounds.]
- Productive Use Value - Commercial value of timber, fish, medicinal plants, etc. that people collect for sale.
- Non-consumptive use value - scientific research, bird-watching, ecotourism, etc.
- Option value - maintaining options for the future, so that by preserving them one could reap economic benefits in the future.

Hence, our given assignment is to discuss about: -

- Pond
- River
- Wetland
- Forest
- Estuary
- Agro ecosystems.

# POND ECOSYSTEM

**Definition:** - A pond or lake ecosystem includes biotic (living) plants, animals and micro-organisms, as well as abiotic (non-living) physical and chemical interactions. Pond and lake ecosystems are prime example of lentic (stationary or relatively still water) ecosystems.

Especially in India, a plenty of ponds throughout the land. Mainly rain water fills these. These ponds are may be Natural or Artificial both.

**Type of Pond Ecosystem:** - can be subdivided, as-

- Salt Pond
- Garden Pond
- Freshwater pool
- Vernal pool
- Underground pool



**Elements of Pond Ecosystem:** - Pond Ecosystems are a self-dependent ecosystem, as it contains all the elements:

- ✚ **Primary Producers:** - Phytoplankton, Periphytic algae, Submerged plants, Emergent plants, Shore plants are mainly producers of a typical pond.
- ✚ **Consumers:** - In a typical pond consumer are Zooplanktons, Vertebrates (fish, frogs, salamanders, and turtles), Invertebrates.
- ✚ **Decomposers:** - Decomposers (detritivores) are bacteria and some other organisms that break down detritus into material that can be used by primary producers.

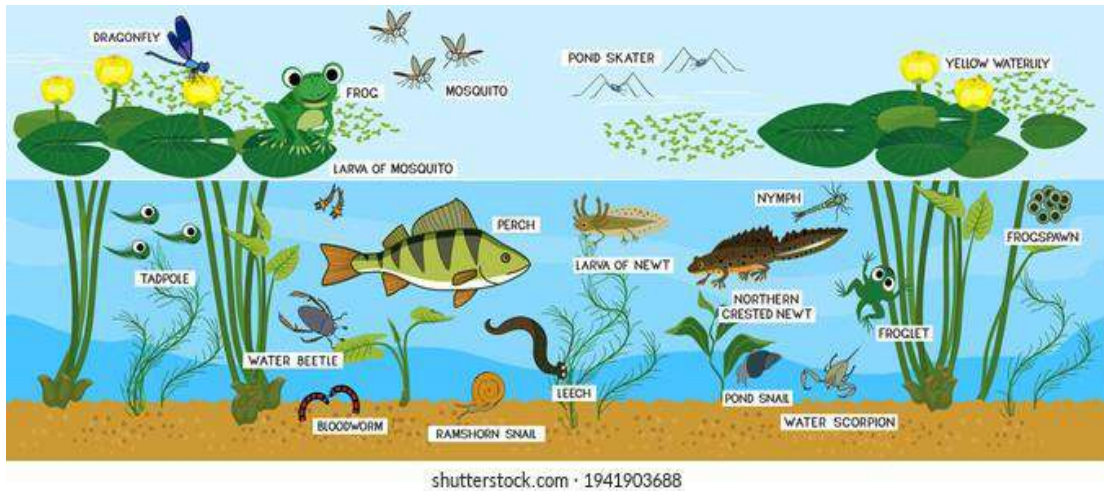
**Importance Of Pond Ecosystem:** - Pond Ecosystem play an important role in World Environment.

- **Ubiquity:** - Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world. It is very abundant Ecosystem.
- **Source of hydration:** - Many numbers of organisms live in pond. Even many do not live in the pond ecosystem, although many species of animals will come to pond ecosystems whenever they need a drink. Humans can also use these ecosystems as a source of water for drinking and agricultural purpose.
- **Economical Advantage:** - Pisciculture is an important economy of countries like India. It is a source of water for irrigation. Jute industry use these.
- **Biodiversity:** - Ponds are treasures of biodiversity. A huge number of aquatic plants and animals are found in ponds.
  - ✚ Ponds typically contain three broad categories of phytoplankton - (filamentous phytoplankton, macroscopic multi-branched phytoplankton and unicellular phytoplankton) . Some frequent zooplanktons are -Protozoa, Rotifera, Cladocera, Copepoda, Ostracoda etc.
  - ✚ Some frequent algae are: Blue green algae, Bryozoas, Maskgrass , Filamentous algae, Golden algae, Nitella , Planktonic algae etc.
  - ✚ A lot of insects are found in ponds, such as : Mayfly Larvae, Dragonfly Larvae, Water Strider, Damselfly larvae, Water bug, Water boatmen, Caddishfly larvae, Backswimmer etc.
  - ✚ Some of the submerged oxygenating plants are Callitriche, Ceratophyllum, Elodea, Ranunculus, Vallisneria etc.





- ✚ A lot of fishes, amphibians, snakes are found in ponds. In some cases, may present. Some of birds are directly the part of it, as they collect their food from pond.



So, by analysing these roles of ponds we can conclude that, The Pond ecosystem are too much important for the environment and human civilization.

## RIVER ECOSYSTEM

**Definition:** - River ecosystem includes biotic (living) plants, animals and micro-organisms, as well as abiotic (non-living) physical and chemical interactions between them, in flowing water of river; since it is a Lotic (Flowing or Dynamic) Aquatic Ecosystem.

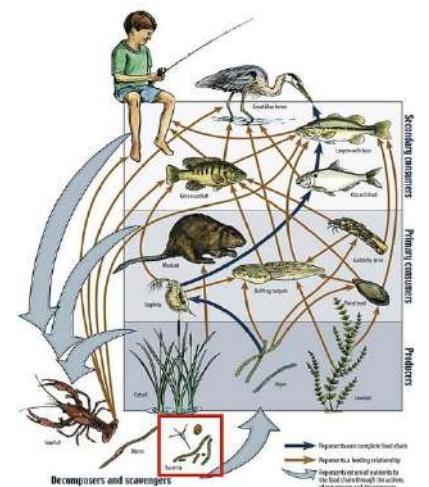


- Rivers are generally originated from two sources. As, from Iceberg and Rain water. Sometimes sea water become the source of river (eg- Rivers of Sundarbans)
- Speed of flow vary from river to river, and corresponding biodiversity change.
- Water may be fresh, brackish or slated. It also may be cold or hot.

Depending upon these and on some more factors nature of river system changes.

**Elements of River Ecosystem:** -Elements of River ecosystems are:

- ✚ **Primary Producers:** - Phytoplankton and periphyton, mosses and liverworts are the most significant sources of primary production in most rivers.
- ✚ **Consumers:** - The micro consumers of rivers are the herbivores, predators and parasites. The decomposers or micro consumers are the worms, bacteria, fungi, fishes, larvae, insects etc.
- ✚ **Decomposers:** - bacteria and fungi are on the bottom of rivers



**Importance of River Ecosystem:** -Rivers contains Producers to decomposers, all the elements. River make it's basin as a prolific land, which produces most of the agricultural products and most of the forests are gathered around the river basin.

- **Source Of Water:** - Among fresh water (3% of total) 0.49% water contains by river. Human Civilization and most of the forests are collect water from rivers. It completes the water cycle. It is a large source of drinking water.
- **Economic:** - From ancient age, Human civilization has been gathered around many river basins. Fishery, Transportation, Hydroelectric projects, Dam (for water supply), are some of economical application of river.
- **Biodiversity:** - Rivers contain a lot of Freshwater biodiversity, in it's long path. Some of them are:
  1. Some of phytoplanktons are Blue green algae, green algae, Miozoa, Bacillariophyta, Cyanobacteria etc.
  2. Protozoa, Cnidaria, Mollusca, Annelida, Crustacea, Bryozoa, Brachiopoda, Chaetognatha, Rotifera, Cladocera, Copepoda Ostracoda are some of frequent Zooplanktons.
  3. Among the arthropods some of are spiders, scorpions, centipedes, millipedes, butterflies, wasps, rhinoceros beetles, ponerine ants, mantids, walking sticks.
  4. A lot of aquatic birds, many fishes, snakes, crocodiles, turtles, river dolphins are found.

The Ganga River is home of many species as well as of some rare species. These include the Gangetic Dolphin, three species of Otters, the Critically Endangered Gharial (*Gavialis gangeticus*), Muggor or Indian marsh crocodile, Estuarine crocodile and at least 12 species of freshwater turtles (including the Critically Endangered Batagur kachuga), 143 different freshwater fish species; belonging to 11 orders (including the Critically Endangered Ganges shark, Gangetic stingray, Golden mahseer and Hilsa).

Amazon river basin is the biggest rain forest, which is called "Lungs of Earth". Most number of species including some endangered and endemic species are present there.



## WETLAND ECOSYSTEM

**Definition:** -An ecosystem that arises when inundation by water produces soils dominated by anaerobic and aerobic processes, which, in turn, forces the biota, particularly rooted plants, to adapt to flooding.

Wetlands occur naturally on every continent. The water in wetlands is either freshwater, brackish, or saltwater.

**Types:** - The main wetland types are: swamp, marsh, bog, and fen; sub-types include mangrove forest, carr, pocosin, floodplains, mire, vernal pool, sink etc.



**Source Of Water:** - Sources of hydrological flows into wetlands are predominantly precipitation, surface water, groundwater, tidal water etc.

Water flows out of wetlands by evapotranspiration, surface runoff, and subsurface water outflow.

**Biota of Wet Land:** -The most important factor affecting the biota is the duration of flooding. Other important factors include fertility and salinity. Biota may vary within a wetland due to season or recent flood regimes.

Page | 6

- **Flora:** - Four main groups of hydrophytes, of wetland systems throughout the world-

- Submerged wetland vegetation can grow in saline and fresh-water conditions. Some species have underwater flowers, while others have long stems to allow the flowers to reach the surface. Examples include seagrasses and eelgrass.
- Floating water plants or floating vegetation is usually small, like arrow arum (*Peltandra virginica*)
- Trees and shrubs, comprise much of the cover in saturated soils, qualify those areas in most cases as swamps. The upland boundary of swamps is determined partly by water levels. Some swamps can be dominated by a single species, such as silver maple swamps around the Great Lakes. There also have large numbers of different tree species. Examples include cypress (*Taxodium*) and mangrove.



- **Algae:** - Algae are diverse plant-like organisms that can vary in size, colour, and shape. There are three main groups of algae:
  - Plankton are algae which are microscopic, free-floating algae. Plankton are the basis of the food web and are responsible for primary production in the ocean using photosynthesis to make food.
  - Filamentous algae are long strands of algae cells that form floating mats.
  - *Chara* and *Nitella* algae are upright algae that look like a submerged plant with roots.

- **Fauna:** - Some of animal species are-

- Fish are more dependent on wetland ecosystems than any other type of habitat. Tropical fish species need mangroves for critical hatchery and nursery grounds and the coral reef system for food.
- Insects and invertebrates total more than half of the 100,000 known animal species in wetlands. Insects and invertebrates can be submerged in the water or soil, on the surface, and in the atmosphere. Many insects inhabit in the water, soil, and the atmosphere at different life stages.
- Reptiles such as alligators, snakes, turtles, crocodiles are common in wetlands of some regions. A lot of amphibians are found in wet lands.
- A large number of birds as Herons, Grebes, Coots, Ibis, Rail, Ducks, Spoonbills, Godwit etc.
- Mammals include numerous small and medium-sized species such as voles, bats, and platypus in addition to large herbivorous and apex species such as the beaver, coypu, swamp rabbit, Florida panther, and moose.



**Use of Wet Land:** - Use of Wet Land may be multipurposed.

- a. Wet Lands Can be used for water storage in prevention of flood.

- b. Wetland systems are directly linked to groundwater and a crucial regulator of both the quantity and quality of ground water.
- c. Wet Lands are able to sink carbon and convert greenhouse gas to solid plant material through the process of Photosynthesis.
- d. Wetlands cycle both sediments and nutrients balancing terrestrial and aquatic ecosystems. A natural function of wetland vegetation is the up-take, storage, and (for nitrate) the removal of nutrients from the surrounding soil and water.

## FOREST ECOSYSTEM

**Definition:** - A forest ecosystem is a dynamic complex of plant, animal and micro-organism communities and their abiotic environment interacting as a functional unit, where trees are a key component of the system.

**Types:** - Forest Ecosystem can be classified in mainly three sub-divisions:

- ❖ Temperate Forest
- ❖ Taiga Forest
- ❖ Tropical rain forest, Ecosystems.



**Elements:** - The elements of the forest ecosystems are:

1. The Forest Ecosystem is mainly consists of trees, which are Producers. Trees, bushes, climber, mosses, ferns are mainly in producer category.
2. Opossums, deer, rodents, snail, fish, birds, and bears are some of primary consumers. Actually, they take the plants(producers) directly.
3. The secondary consumers are foxes, raccoons, bears, timber wolves, mountain lions, bobcats, cougars; which eat primary consumers. They are carnivore.
4. Apart from bacteria, ants and termites are important decomposers. Millipedes and earthworms also help to break down dead matter.

**Biota:** - Forest is a large source Biodiversity:

● **Flora:** - Different types of flora are-

1. Lichen, moss, ferns, wildflowers and other small plants can be found on the forest floor. Shrubs and bushes fill in the middle level and Hardwood trees like maple, oak, birch, magnolia, sweet gum, beech etc.
2. Needleleaf, coniferous (gymnosperm) trees are the dominant plants of the taiga biome. A very few species in four main genera are found: the evergreen spruce (*Picea*), fir (*Abies*), and pine (*Pinus*), and the deciduous larch or tamarack (*Larix*).
3. In Alpine Tundra Forest perennial grasses, sedges, forbs, cushion plants, mosses, and lichens are most frequent flora of Tundra Forest.
4. Lagerstroemia, Acacia, Lannea community is the richest for both tree and herb strata, whereas Shorea, Buchanania community is the richest among vascular, in dry Tropical Forest.
5. Some plants of tropical rain forests are, Epiphytes, Bromeliads, Orchids, verity of Palm, Liles, Rubber, Bougainvillea, types of Bamboo, oak, Tualang, Strangler Figs, Pitcher plants, Heliconia, Kapok, Durian are some of frequent plants of Moist Tropical Forest. Tropical rain forest are the biggest source of biodiversity.



Most of the Mega Biodiversity Hotspots are located at these regions. Such as Amazon Rain Forest, Congo rainforest, Daintree Rainforest, rainforests of Sumatra and Borneo.

● **Fauna:** - Fauna of Forests Ecosystems are: -

1. In Tropical Rain Forest, Frequent animals are Mammals (Monkeys, Bats, Possums, Kangaroos, Tigers, Foxes etc.), Birds (African Gray Parrot, Australian King Parrot, Eagles, Hummingbirds etc.), Insects (Beetles, Ants, Spiders, Butterflies, Grasshoppers, Caterpillars etc.), Reptiles and Amphibians (Snakes, Frogs, Geckos, Komodo Dragons, Chameleon etc.), Aquatics (Eels, Piranhas, various fish).
2. Tropical dry forests are home to a wide variety of wildlife including monkeys, large cats, parrots, various rodents, and ground dwelling birds.
3. Tundra wildlife includes small mammals—such as Norway lemmings, arctic hares, and arctic ground squirrels and large mammals, such as caribou. These animals build up stores of fat to sustain and insulate them through the winter.
4. Mammals living in the taiga include foxes, lynxes, bears, minks, squirrels, grey wolves, caribou, reindeers mice etc. During the harsh winter, the majority of these mammals live within the forest. Most birds of Taiga, migrate south during winter, while two species (European red crossbill and the white-winged crossbill) have adapted to resist this season. Some others are ants, wood wasps, xylophagous beetles flies, butterfly larvae, moths etc.



**Uses Of Forest Ecosystem:** - We depend on forests for our survival, from the air we breathe to the wood we use. Besides providing habitats for animals and livelihoods for humans, forests also offer watershed protection, prevent soil erosion and mitigate climate change.

- I. Along with oceans Forests provide the most percentage of oxygen to nature.
- II. Absorbing harmful greenhouse gasses that produce climate change. In tropical forests alone, a quarter of a trillion tons of carbon is stored in above and below ground biomass.
- III. Providing goods such as timber, food, fuel and bioproducts, medicines, wax, honey.
- IV. Protecting watersheds and reducing or slowing the amount of erosion and chemicals that reach waterways.
- V. Serving as a buffer in natural disasters like flood and rainfalls.
- VI. Providing habitat to more than half of the world's land-based species.
- VII. It provides a good natural beauty, for tourism.



## ESTUARY ECOSYSTEM

The word "estuary" is derived from the Latin word '*aestuarium*' meaning tidal inlet of the sea, which in itself is derived from the term '*aestus*', meaning tide.

**Definition:** - A semi-enclosed body of water connected to the sea as far as the tidal limit or the salt intrusion limit and receiving freshwater runoff; however, the freshwater inflow may not be perennial, the connection to the sea may be closed for part of the year and tidal influence may be negligible.

**Types:** -Estuaries can be subdivided into some divisions:

1. Bar-built Estuaries form when a shallow lagoon or bay is protected from the ocean by a sand bar, sand delta or barrier island.
2. Tectonic estuaries are caused by the folding or faulting of land surfaces.
3. Coastal plain estuaries are formed by the sea level rising and filling an existing river valley.
4. Fjords and rias are U-shaped valleys formed by glacial action. Fjords are found in areas with long histories of glacier activity.

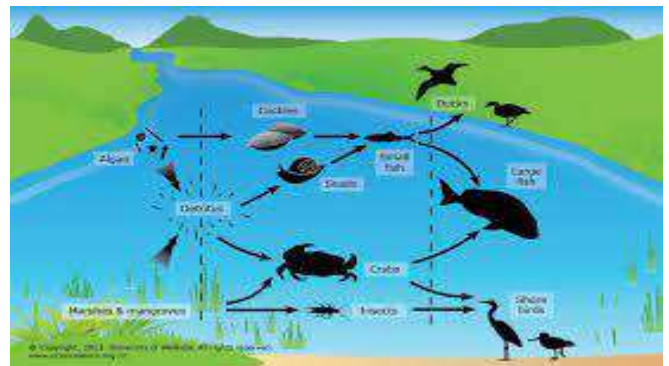


- Barrier enclosed lagoons e.g., Tairua
  - River mouth estuaries e.g., Mokau
  - Coastal embayments e.g., Coromandel Harbour
  - Drowned river valleys e.g., Raglan
  - A semi enclosed bay e.g., Firth of Thames
- Are some of the examples of Estuaries.

**Characteristic:** - Estuary Ecosystem have some unique character:

- ✚ In these both ocean and land contribute to a unique ecosystem and fresh and salt water are mixed. A basic feature is the instability of an estuary due to the ebb and flood of the tide.
- ✚ Estuaries provide a calm refuge from the open sea for millions of plants and animals.
- ✚ The diversity of habitats enclosed in estuaries supports enormous abundance and diversity of species. A lot of visiting species are found here.
- ✚ Estuaries are among the most productive environments on earth. Extremely rich in organic matter and nutrients.

**Biodiversity:** - Estuaries enclose a diverse range of habitats from subtidal areas to intertidal areas. Truly estuarine species complete their whole life cycle within the transitional waters.



- ❖ Some of among Estuary plants are: Douglas Aster, Eelgrass, Fathen Saltbush, Gumweed, Pickleweed, Red Algae, Saltgrass, Sea Lettuce, Seaside Arrowgrass, Tufted Hairgrass etc.
- ❖ Some small Creatures are: Bent-nosed Clam, Blood Star, Brooding Sea Lugworm Purple Shore Crab, Scallop, Skeleton, Shrimp, Stalked Jellyfish, Sunflower Star etc.
- ❖ Among Mammals are Harbour Seal, River Otter etc.
- ❖ Damsel fly, Green Darner are some of insects.
- ❖ A lot of birds are found here, as: American Coot, American Wigeon, Black-bellied Plover, Black Brant, Bald Eagle, Canada Goose, Caspian Tern, Common Goldeneye, Great-blue Heron, Lesser Yellowlegs, Peregrine Falcon, Red-breasted Merganser, Western Gull etc.
- ❖ Some of Fishes are Bay Pipefish, Chinook Salmon, Chum Salmon, Cutthroat Trout, Pacific Sculpin, Shiner Perch, Starry Flounder etc.



**Importance & Use:** - Estuary are of enormous importance to environment and civilization:

- Many marine organisms, depend on estuaries at some point during their development. For Biological productivity, estuaries provide ideal areas for migratory birds to rest and refuel during their long journeys.

- Estuaries can filter out sediments and pollutants from rivers and streams before they flow into the ocean. Healthy estuaries can absorb surges of water from storms, floods, and tides, protecting our homes and communities. They help prevent soil erosion.
- Estuaries offer good fishing grounds for the fisherman as the water column is shallow. About 75% of commercial fish are caught from estuaries.
- It plays an important role in transportation, as it connects river and sea.

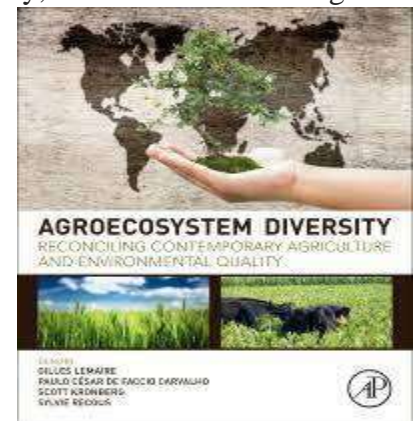
## AGRO ECOSYSTEM

Agro Ecosystem is a typical example of Artificial Ecosystem.

**Definition:** - An Agro ecosystem is the basic unit of study in agroecology, and is somewhat arbitrarily defined as a spatially and functionally coherent unit of agricultural activity, and includes the living and non-living components involved in that unit as well as their interactions.

Agro ecosystems are mainly man-made ecosystem, because:

- A farmer favours a plant species, and remove all other animal or plant species which damage it.
- Energy intake employed by men in the form of machinery, fertilizers, pesticides, selected seeds, processings.
- Biomass, which is removed when harvested makes the ecosystem an open system, which means it depends from external processes to reintroduce fertilizing substances suitable to nourish a new growth and development process of organic material (plants). A natural ecosystem, instead, self-fertilizes as the biomass remains in its original setting.



### Utilization: -

- ✚ Forest gardens are probably the world's oldest and most resilient agroecosystem. Forest gardens originated in prehistoric times. In the gradual process of a family improving their immediate environment, useful tree and vine species were identified, protected and improved whilst undesirable species were eliminated. Eventually superior foreign species were selected and incorporated into the family's garden.
- ✚ Some major organizations are hailing farming within agroecosystems as the way forward for mainstream agriculture. Current farming methods have resulted in over-stretched water resources, high levels of erosion and reduced soil fertility. Therefore, how critically water, land and ecosystem resources are used to boost crops, must to be considered.
- ✚ One of the major efforts of disciplines (agroecology) is to promote management styles that blur the distinction between agroecosystems and "natural" ecosystems, both by decreasing the impact of agriculture (increasing the biological and trophic complexity of the agricultural system as well as decreasing the nutrient inputs/outflow) and by increasing awareness that "downstream" effects extend agroecosystems beyond the boundaries of the farm.



PROJECT REPORT

SEMESTER II

COURSE : AECC 2(ENVIRONMENTAL STUDIES)

PROJECT TITLE : STUDY OF COMMON  
PLANTS,INSECTS,FISH,BIRDS,MAMMALS AND BASIC PRINCIPLES OF  
IDENTIFICATION

Checked  
25 out of  
30

COLLEGE ROLL NO. : PHS20M576

CU REGISTRATION NO. : 223-1111-0241-20

CU ROLL NO. : 203223-21-0019

2020-2021



# STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRINCIPLE OF IDENTIFICATION

## ❖ INTRODUCTION :

**Biodiversity** is the biological variety and variability of life on earth. Biodiversity is a measure of variation at the genetic, species, and ecosystem level. The word Biodiversity was first used by the great scientist "Walter G. Rosen" in 1986.

A **Biodiversity Hotspot** is a region with a high level of endemic species that have experienced great habitat loss. The term hotspot was introduced in 1988 by "Norman Myers". While hotspots are spread all over the world, the majority are forest areas and most are located in the tropics.

Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future as a primary result of deforestation.

**Plants** are critical to other life on this planet because they form the basis of all food webs by Photosynthesis. 'plants' are divided into several kind of kingdoms such as Protista, Fungi and Plantae. **Insects** are a class in the phylum Arthropoda. They are the largest group of animal on earth and also the first animals capable of flight. **Fishes** are a class in the phylum Chordata. They are aquatic, craniate, gill-bearing animals that lack limbs with digits. **Birds** are a group of warm-blooded Vertebrates constituting the class Aves. They are ready visitors that visit frequently from place to place even from continent to another continent. **Mammals** (from Latin *mamma*, 'breast') are a group of Vertebrates constituting the class Mammalia. We all belong to this class. They all are linked together by Food-Chain.

## ❖ AIMS AND OBJECTIVES :

In this project I observe some common plants, insects, birds, fishes and mammals around us and know about their basic principle of identification. By this project, my main aim is to raise the awareness about the Biodiversity and that about the advantages to conserve them to the people.

## ❖ AREA OF STUDY :

The area of my study and observation is at village Kotra near Shyampur, Howrah of West Bengal in India.

## ❖ Method of Study :

To make this project, I use internet collect information about plants, insects, fish, birds and Mammals and their basic identification.

Date : 22/06/2021

Time : 10.00 am

## ❖ REVIEW OF WORKS :

IUCN; International Union for Conservation of Nature and Natural Resources, is an international organization working in the field of nature conservation and sustainable use of natural resources was formed in 1948. The Indian Board of Wildlife was formed in India in 1952 on the recommendation of this organization. The WWF or World Wild Life Fund for Nature was later formed in 1961. Subsequently, the Biodiversity Board was set up in West Bengal to document the biodiversity of different parts of the state and to facilitate the conservation of endangered plants and animals. The West Bengal Biodiversity Board has already recorded the biodiversity of several areas.

## ❖ OBSERVATION :

- A. Plants
- B. Insects
- C. Fishes
- D. Birds
- E. Mammals

**A. PLANTS:** Among very few plants I introduce ,

● **MARGOSA TREE**

- **Scientific Name** : *Azadirachta indica*
- **Vernacular Name** : Neem, Kadu-limb

➤ **Source** :

The Leaves, bark, fruits, and seeds are used as a drug or medicine.

➤ **Family and Distribution** :

Meliaceae, it is native of Borma but grown all over India. In Sangola Taluka neem is found in large scale in rural and urban places. Some important places like Narale, Sangola, Spinning mill, Hatid, Walegaon, Andhalgaon, Wasteland of sangola, it is recorded in garden , school and colleges, Akola and Mangewadi etc.

➤ **Chemical composition** :

The alkaloids are the main active principles. They are nimbin, nimbinin, nimbidine, nimbosterine and nimbecin etc. Fatty acid present in the plant and seed contain 40 to 45 % fixed oil. Those things Are very much needed in Our life for immunity .



➤ **Uses** :

The leaves are Carminative, Expectorent, anthelmintic, diuretic and insecticidal to kill insect in various vegetables or crops. 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. Gum is stimulant, demulcent tonic and used in debility. Often we are in village many people use small tiny branch as a brush and toothpaste that is also good for our teeth.

**B. INSECTS** : Among very few Insects I introduce,

● **MOSQUITO**

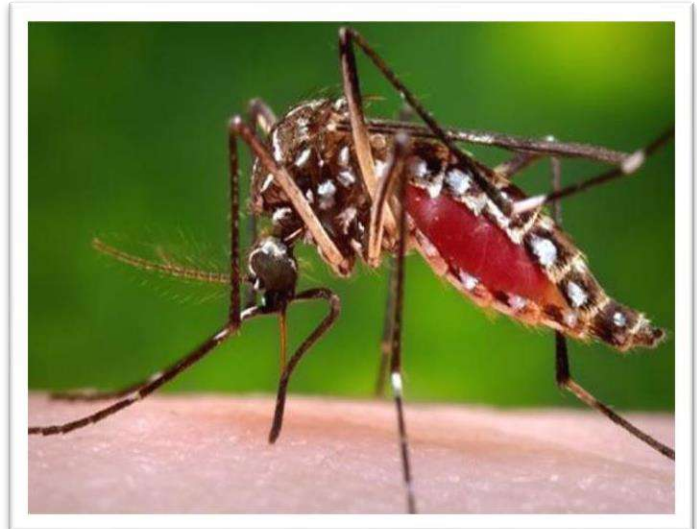
➤ **Types** :

There are about 170 different types of mosquitoes in North America alone. In India there are mainly about 3 kinds of mosquitoes such as *Aedes aegypti* , Anopheles, and culex. These pests are part of the same family as houseflies and fruit flies, because they all have

two clear, veined wings. Best known as a summer pest, Mosquitoes can develop from egg to adult within 10 to 14 days .

➤ **Identification** :

✚ Size	: 1/4" to 3/8"
✚ Shape	: Narrow, oval
✚ Colour	: Pale brown with whitish stripes across abdomen
✚ Legs	: 6
✚ Wings	: Yes
✚ Antenna	: Yes
✚ Common Name	: Mosquito
✚ Kingdom	: Animalia
✚ Phylum	: Arthropoda
✚ Class	: Insecta
✚ Order	: Diptera
✚ Family	: Culicidae
✚ Species	: varies



➤ **Diet** :

We usually say, "I have been Bitten by a mosquito", but this is not Completely true. Mosquitoes do not Bite. Female mosquitoes feed on plant nectar and blood. They need the protein to reproduce. To get to the blood , they pierce our skin with their "Proboscis" and suck our blood. Male mosquitoes feed exclusively on plant nectars. Mosquitoes are busiest at night and will fly upto 14 miles for a blood meal. They hunt for food by detecting body heat and Carbon Di-oxide, the gas we breathe out.

➤ **Habitat** :

Mosquitoes breed in soft, moist soil or stagnant water sources such as storm drains, old tires, children's wading pools and birdbaths.

➤ **Impact** :

Mosquitoes spread diseases such as West Nile Virus , Malaria, Phayleria and Dengue fever.

➤ **Prevention** :

- I. Replace all stagnant water at least once a week.
- II. Remove trash from around any standing water.
- III. When sleeping outdoors or in areas where mosquitoes populations are heavy, surround your bed with "Mosquito Net".

C. **FISHES** : Among very few fishes I introduce,

● **ROHU FISH**

- The **rohu, rui, or roho labeo** (*Labeo rohita*) is a species of fish of the carp family, found in rivers in South Asia. It is a large omnivore and extensively used in aquaculture.
- **Scientific Name** : *Labeo rohita*
- **Local Name** : rui or rohu

- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Actinopterygii
- **Order** : Cypriniformes
- **Family** : Cyprinidae



➤ **Habitat** :

The rohu occurs in rivers throughout much of northern and central and eastern India, Nepal and Bangladesh. It has been introduced into some of the rivers of Peninsular India and Sri Lanka. It is abundantly found in fresh water in ponds, lakes, rivers and reservoirs.

➤ **Diet** :

It is chiefly vegetarian and bottom feeders but young fry feed on zooplankton. Juveniles and adults show a strong positive selection for phytoplankton, vegetable debris and aquatic plants and a negative selection for all zooplanktonic organisms .

➤ **Reproduction** :

Rohu reach sexual maturity between two and five years of age. They generally spawn during the monsoon season, keeping to the middle of flooded rivers above tidal reach.

➤ **Uses** :

The rohu is an important aquacultured freshwater species mostly used as food.

**D. BIRDS** : Among very few birds I introduce,

● **INDIAN RING-NECKED PARROT**

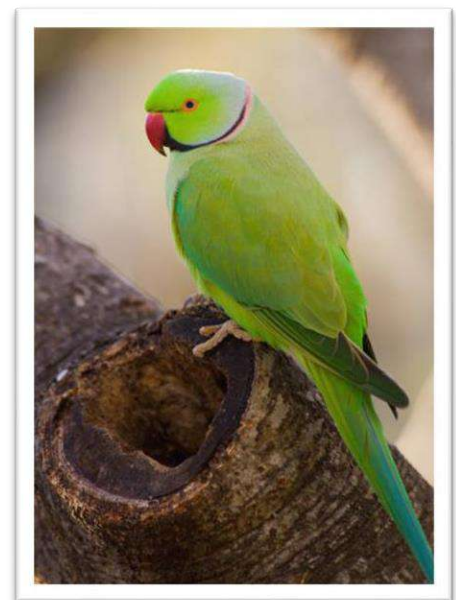
- **Common English Name** : Parrot or Indian ring-necked parrot
- **Bengali Name** : Tiya or Moyna
- **Scientific Name** : *Psittacula krameria*
- **Colour** : Blue, Green
- **Size** : Medium
- **Life span** : Upto 30 years
- **Sound** : Vocal communicator and Whistler.

➤ **Distribution** :

Indian sub-continent. All parts of plain lands.

➤ **Characters** :

Very punctual and social bird. The Indian ring-necked parrot is not a shy bird, and does best with an owner who appreciates an outgoing companion that is not afraid to demand what it wants! Indian ring-necks can also be quite talkative.



➤ **Diet** :

In the wild, rose-ringed parakeets usually feed on buds, fruits, vegetables, nuts, berries, and seeds. In India, they feed on cereal grains, and during winter also on pigeon peas.

➤ **Reproduction** :

In north-west India, Indian rose-ringed parakeets form pairs from September to December. They do not have life mates and often breed with another partner during the following breeding season.

## E. MAMMALS : Among very few mammals I introduce,

### ● COW

- Cows and bulls, are large domesticated cloven-hooved herbivores. They are a prominent modern member of the subfamily Bovinae, are the most widespread species of the genus *Bos*, and are most commonly classified collectively as *Bos taurus*.



- **Scientific name:** *Bos taurus*
- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Mammalia
- **Order** : Artiodactyla
- **Family** : Bovidae
- **Lifespan** : 18 – 22 years
- **Gestation period** : 283 days
- **Mass: Male:** 1,100 kg (Adult, Bull), Female: 720 kg (Adult, Cow).

- **Habitat :**

Cows are domesticated cattle and they can survive in a variety of habitats including the grasslands and other habitats where they have enough vegetation to eat.

- **Diet :**

Most cattle in the US have a fodder that is composed of at least some forage (grass, legumes, or silage). In fact, most beef cattle are raised on pasture from birth in the spring until autumn (7 to 9 months). For pastured animals, grass is usually the forage that composes the majority of their diet.

- **Height and Weight :**

Cows average 385 kg in weight and 130 cm in height; bulls weigh 545 kg on average, with a height of 140 cm. At birth, calves weigh about 20 kg. The average milk yield for the Gir is 1590 kg per lactation, with a record production of 3182 kg at 4.5% fat in India.

- **Usage :**

Cow as Cattle are commonly raised as livestock for meat (beef or veal), for milk and for hides, which are used to make leather. They are used as riding animals and draft animals (oxen or bullocks, which pull carts, plows and other implements). Another product of cattle is their dung, which can be used to create manure or fuel.

### ● DOG

- The domestic dog (*Canis familiaris* or *Canis lupus familiaris*) is a domesticated descendant of the wolf. The dog derived from an ancient, extinct wolf, and the modern grey wolf is the dog's nearest living relative. The dog was the first species to be domesticated. Their long association with humans has led dogs to be uniquely adapted to human behavior, leading to a large number of domestic individuals and the ability to thrive on a starch-rich diet that would be inadequate for other canids.

- **Scientific Name:** *Canis familiaris*

- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Mammalia
- **Order** : Carnivora
- **Family** : Canidae
- **Life Span** : 10 to 13 years



➤ **Diet** :

. Dogs have been described as omnivores. Compared to wolves, dogs from agricultural societies have extra copies of amylase and other genes involved in starch digestion that contribute to an increased ability to thrive on a starch-rich diet. Similar to humans, some dog breeds produce amylase in their saliva and are classified as having a high starch diet. However, more like cats and less like other omnivores, dogs can only produce bile acid with taurine and they cannot produce vitamin D, which they obtain from animal flesh. Also, more like cats, dogs require arginine to maintain its nitrogen balance. These nutritional requirements place dogs halfway between carnivores and omnivores

➤ **Reproduction** :

In domestic dogs, sexual maturity happens around six months to one year for both males and females, although this can be delayed and is the time at which female dogs will have their first estrous cycle. They will experience subsequent estrous cycles semiannually, during which the body prepares for pregnancy. At the peak of the cycle, females will become estrus, mentally and physically receptive to copulation. Fertilization typically occurs two to five days after ovulation. An average litter consists of about six puppies.

➤ **Duties and Roles with humans** :

- I. Dog intelligence is the dog's ability to perceive information and retain it as knowledge for applying to solve problems. Studies of two dogs suggest that dogs can learn by inference and have advanced memory skills.
- II. Dog behavior is the internally coordinated responses (actions or inactions) of the domestic dog (individuals or groups) to internal and external stimuli.
- III. Dog communication is how dogs convey information to other dogs, understand messages from humans and translate the information that dogs are transmitting.
- IV. A vast range of commodity forms aims to transform a pet dog into an ideal companion.
- V. Dogs have lived and worked with humans in many role. People often enter their dogs in competitions, such as breed-conformation shows or sports, including racing.
- VI. Dog meat is consumed in some East Asian countries, including Korea, China, Vietnam and the Philippines, which dates back to antiquity.
- VII. Dogs suffer from the same common disorders as humans; these include cancer, diabetes, heart disease and neurologic disorders. Their pathology is similar to humans, as is their response to treatment and their outcomes.

❖ **CONCLUSION** :

The flora and fauna of our region is very significant. Here are just a few examples.

From this list we can get a partial idea of the biodiversity of our region. Plants have been used in India since time immemorial and hunting has been practiced since the beginning of civilization. At present the demand and circulation of Ayurvedic treatment is very much increasing. Besides, biodiversity is being destroyed under the pressure of population and civilization. In addition, due to the unscientific use of plants, many plants are endangered today. They need to be saved. They cultivate rare and important plants in their own homes. Can be easily saved. Even by making the common people aware, it is possible

to save the animals like snakes, geese etc. without killing them. The number of animals in the region is increasing by counting. The number of plants is decreasing every day due to rapid urbanization. As a result, the number of tree-dwelling animals (birds, reptiles, mammals, etc.) is also declining. It is important to save the animals that have been found in very small numbers in our study without delay. Balancing biodiversity is crucial for a healthy environment. Our duty is to make citizens aware of the need to conserve biodiversity. Also need the aware about Afforestation . If we all are not aware about that then we all are going to destroy our healthy Earth ourself.

❖ **ACKNOWLEDGEMENTS :**

I would like to thank my teacher, Dr. Jayeeta Chowdhuri, for selecting the project and for supervising and giving necessary instructions at all times. Thank you to my classmates for their support and web advice.

❖ **REFERENCE :**

- I. Wikipedia
- II. Environmental Studies book by Erach Bharucha .



PROJECT REPORT

SEMESTER II

COURSE : AECC 2(ENVIRONMENTAL STUDIES)

PROJECT TITLE : STUDY OF COMMON  
PLANTS,INSECTS,FISH,BIRDS,MAMMALS AND BASIC PRINCIPLES OF  
IDENTIFICATION

COLLEGE ROLL NO. : PHS20M576

CU REGISTRATION NO. : 223-1111-0241-20

CU ROLL NO. : 203223-21-0019

2020-2021



# STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRINCIPLE OF IDENTIFICATION

## ❖ INTRODUCTION :

**Biodiversity** is the biological variety and variability of life on earth. Biodiversity is a measure of variation at the genetic, species, and ecosystem level. The word Biodiversity was first used by the great scientist "Walter G. Rosen" in 1986.

A **Biodiversity Hotspot** is a region with a high level of endemic species that have experienced great habitat loss. The term hotspot was introduced in 1988 by "Norman Myers". While hotspots are spread all over the world, the majority are forest areas and most are located in the tropics.

Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future as a primary result of deforestation.

**Plants** are critical to other life on this planet because they form the basis of all food webs by Photosynthesis. 'plants' are divided into several kind of kingdoms such as Protista, Fungi and Plantae. **Insects** are a class in the phylum Arthropoda. They are the largest group of animal on earth and also the first animals capable of light. **Fishes** are a class in the phylum Chordata. They are aquatic, craniate, gill-bearing animals that lack limbs with digits. **Birds** are a group of warm-blooded Vertebrates constituting the class Aves. They are ready visitors that visit frequently from place to place even from continent to another continent. **Mammals** (from Latin *mamma*, 'breast') are a group of Vertebrates constituting the class Mammalia. We all belong to this class. They all are linked together by Food-Chain.

## ❖ AIMS AND OBJECTIVES :

In this project I observe some common plants, insects, birds, fishes and mammals around us and know about their basic principle of identification. By this project, my main aim is to raise the awareness about the Biodiversity and that about the advantages to conserve them to the people.

## ❖ AREA OF STUDY :

The area of my study and observation is at village Kotra near Shyampur, Howrah of West Bengal in India.

## ❖ Method of Study :

To make this project, I use internet collect information about plants, insects, fish, birds and Mammals and their basic identification.

Date : 22/06/2021

Time : 10.00 am

## ❖ REVIEW OF WORKS :

IUCN; International Union for Conservation of Nature and Natural Resources, is an international organization working in the field of nature conservation and sustainable use of natural resources was formed in 1948. The Indian Board of Wildlife was formed in India in 1952 on the recommendation of this organization. The WWF or World Wild Life Fund for Nature was later formed in 1961. Subsequently, the Biodiversity Board was set up in West Bengal to document the biodiversity of different parts of the state and to facilitate the conservation of endangered plants and animals. The West Bengal Biodiversity Board has already recorded the biodiversity of several areas.

## ❖ OBSERVATION :

- A. Plants
- B. Insects
- C. Fishes
- D. Birds
- E. Mammals

**A. PLANTS:** Among very few plants I introduce ,

● **MARGOSA TREE**

- **Scientific Name** : *Azadirachta indica*
- **Vernacular Name** : Neem, Kadu-limb

➤ **Source** :

The Leaves, bark, fruits, and seeds are used as a drug or medicine.

➤ **Family and Distribution** :

Meliaceae, it is native of Borma but grown all over India. In Sangola Taluka neem is found in large scale in rural and urban places. Some important places like Narale, Sangola, Spinning mill, Hatid, Walegaon, Andhalgaon, Wasteland of sangola, it is recorded in garden , school and colleges, Akola and Mangewadi etc.

➤ **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. Those things Are very much needed in Our life for immunity .



➤ **Uses** :

The leaves are Carminative, Expectorent, anthelmintic, diuretic and insecticidal to kill insect in various vegetables or crops. 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. Gum is stimulant, demulcent tonic and used in debility. Often we are in village many people use small tiny branch as a brush and toothpaste that is also good for our teeth.

**B. INSECTS** : Among very few Insects I introduce,

● **MOSQUITO**

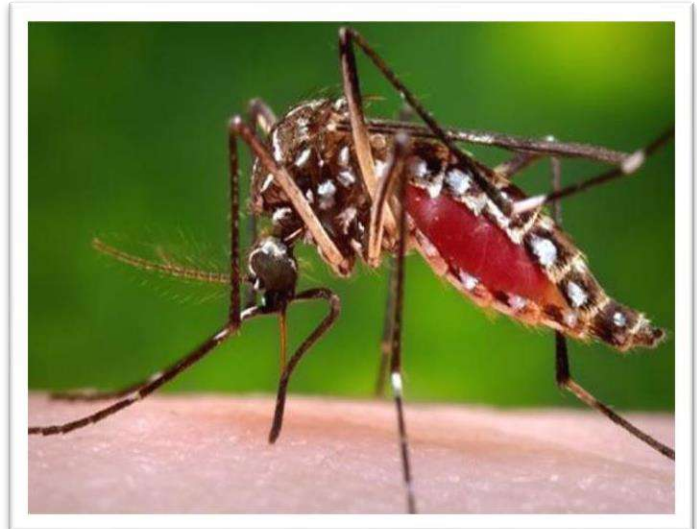
➤ **Types** :

There are about 170 different types of mosquitoes in North America alone. In India there are mainly about 3 kinds of mosquitoes such as *Aedes aegypti* , Anopheles, and culex. These pests are part of the same family as houseflies and fruit flies, because they all have

two clear, veined wings. Best known as a summer pest, Mosquitoes can develop from egg to adult within 10 to 14 days .

➤ **Identification :**

✚ Size	: 1/4" to 3/8"
✚ Shape	: Narrow, oval
✚ Colour	: Pale brown with whitish stripes across abdomen
✚ Legs	: 6
✚ Wings	: Yes
✚ Antenna	: Yes
✚ Common Name	: Mosquito
✚ Kingdom	: Animalia
✚ Phylum	: Arthropoda
✚ Class	: Insecta
✚ Order	: Diptera
✚ Family	: Culicidae
✚ Species	: varies



➤ **Diet :**

We usually say, "I have been Bitten by a mosquito", but this is not Completely true. Mosquitoes do not Bite. Female mosquitoes feed on plant nectar and blood. They need the protein to reproduce. To get to the blood , they pierce our skin with their "Proboscis" and suck our blood. Male mosquitoes feed exclusively on plant nectars. Mosquitoes are busiest at night and will fly upto 14 miles for a blood meal. They hunt for food by detecting body heat and Carbon Di-oxide, the gas we breathe out.

➤ **Habitat :**

Mosquitoes breed in soft, moist soil or stagnant water sources such as storm drains, old tires, children's wading pools and birdbaths.

➤ **Impact :**

Mosquitoes spread diseases such as West Nile Virus , Malaria, Phayleria and Dengue fever.

➤ **Prevention :**

- I. Replace all stagnant water at least once a week.
- II. Remove trash from around any standing water.
- III. When sleeping outdoors or in areas where mosquitoes populations are heavy, surround your bed with "Mosquito Net".

C. **FISHES** : Among very few fishes I introduce,

● **ROHU FISH**

- The **rohu, rui, or roho labeo** (*Labeo rohita*) is a species of fish of the carp family, found in rivers in South Asia. It is a large omnivore and extensively used in aquaculture.
- **Scientific Name** : *Labeo rohita*
- **Local Name** : rui or rohu

- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Actinopterygii
- **Order** : Cypriniformes
- **Family** : Cyprinidae



➤ **Habitat** :

The rohu occurs in rivers throughout much of northern and central and eastern India, Nepal and Bangladesh. It has been introduced into some of the rivers of Peninsular India and Sri Lanka. It is abundantly found in fresh water in ponds, lakes, rivers and reservoirs.

➤ **Diet** :

It is chiefly vegetarian and bottom feeders but young fry feed on zooplankton. Juveniles and adults show a strong positive selection for phytoplankton, vegetable debris and aquatic plants and a negative selection for all zooplanktonic organisms .

➤ **Reproduction** :

Rohu reach sexual maturity between two and five years of age. They generally spawn during the monsoon season, keeping to the middle of flooded rivers above tidal reach.

➤ **Uses** :

The rohu is an important aquacultured freshwater species mostly used as food.

**D. BIRDS** : Among very few birds I introduce,

● **INDIAN RING-NECKED PARROT**

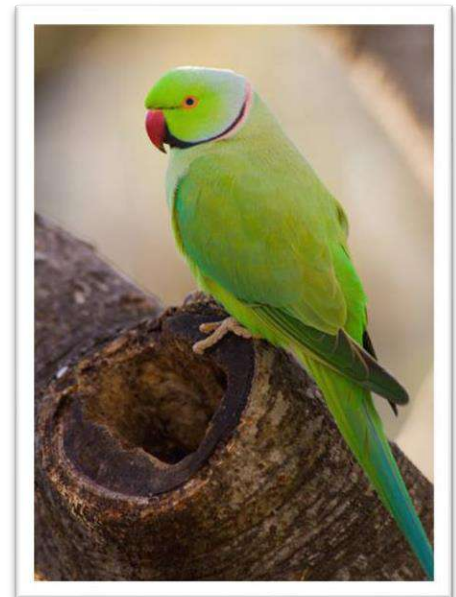
- **Common English Name** : Parrot or Indian ring-necked parrot
- **Bengali Name** : Tiya or Moyna
- **Scientific Name** : *Psittacula krameria*
- **Colour** : Blue, Green
- **Size** : Medium
- **Life span** : Upto 30 years
- **Sound** : Vocal communicator and Whistler.

➤ **Distribution** :

Indian sub-continent. All parts of plain lands.

➤ **Characters** :

Very punctual and social bird. The Indian ring-necked parrot is not a shy bird, and does best with an owner who appreciates an outgoing companion that is not afraid to demand what it wants! Indian ring-necks can also be quite talkative.



➤ **Diet** :

In the wild, rose-ringed parakeets usually feed on buds, fruits, vegetables, nuts, berries, and seeds. In India, they feed on cereal grains, and during winter also on pigeon peas.

➤ **Reproduction** :

In north-west India, Indian rose-ringed parakeets form pairs from September to December. They do not have life mates and often breed with another partner during the following breeding season.

## E. MAMMALS : Among very few mammals I introduce,

### ● COW

- Cows and bulls, are large domesticated cloven-hooved herbivores. They are a prominent modern member of the subfamily Bovinae, are the most widespread species of the genus *Bos*, and are most commonly classified collectively as *Bos taurus*.



- **Scientific name:** *Bos taurus*
- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Mammalia
- **Order** : Artiodactyla
- **Family** : Bovidae
- **Lifespan** : 18 – 22 years
- **Gestation period** : 283 days
- **Mass: Male:** 1,100 kg (Adult, Bull), Female: 720 kg (Adult, Cow).

- **Habitat :**

Cows are domesticated cattle and they can survive in a variety of habitats including the grasslands and other habitats where they have enough vegetation to eat.

- **Diet :**

Most cattle in the US have a fodder that is composed of at least some forage (grass, legumes, or silage). In fact, most beef cattle are raised on pasture from birth in the spring until autumn (7 to 9 months). For pastured animals, grass is usually the forage that composes the majority of their diet.

- **Height and Weight :**

Cows average 385 kg in weight and 130 cm in height; bulls weigh 545 kg on average, with a height of 140 cm. At birth, calves weigh about 20 kg. The average milk yield for the Gir is 1590 kg per lactation, with a record production of 3182 kg at 4.5% fat in India.

- **Usage :**

Cow as Cattle are commonly raised as livestock for meat (beef or veal), for milk and for hides, which are used to make leather. They are used as riding animals and draft animals (oxen or bullocks, which pull carts, plows and other implements). Another product of cattle is their dung, which can be used to create manure or fuel.

### ● DOG

- The domestic dog (*Canis familiaris* or *Canis lupus familiaris*) is a domesticated descendant of the wolf. The dog derived from an ancient, extinct wolf, and the modern grey wolf is the dog's nearest living relative. The dog was the first species to be domesticated. Their long association with humans has led dogs to be uniquely adapted to human behavior, leading to a large number of domestic individuals and the ability to thrive on a starch-rich diet that would be inadequate for other canids.

- **Scientific Name:** *Canis familiaris*

- **Kingdom** : Animalia
- **Phylum** : Chordata
- **Class** : Mammalia
- **Order** : Carnivora
- **Family** : Canidae
- **Life Span** : 10 to 13 years



➤ **Diet** :

. Dogs have been described as omnivores. Compared to wolves, dogs from agricultural societies have extra copies of amylase and other genes involved in starch digestion that contribute to an increased ability to thrive on a starch-rich diet. Similar to humans, some dog breeds produce amylase in their saliva and are classified as having a high starch diet. However, more like cats and less like other omnivores, dogs can only produce bile acid with taurine and they cannot produce vitamin D, which they obtain from animal flesh. Also, more like cats, dogs require arginine to maintain its nitrogen balance. These nutritional requirements place dogs halfway between carnivores and omnivores

➤ **Reproduction** :

In domestic dogs, sexual maturity happens around six months to one year for both males and females, although this can be delayed and is the time at which female dogs will have their first estrous cycle. They will experience subsequent estrous cycles semiannually, during which the body prepares for pregnancy. At the peak of the cycle, females will become estrus, mentally and physically receptive to copulation. Fertilization typically occurs two to five days after ovulation. An average litter consists of about six puppies.

➤ **Duties and Roles with humans** :

- I. Dog intelligence is the dog's ability to perceive information and retain it as knowledge for applying to solve problems. Studies of two dogs suggest that dogs can learn by inference and have advanced memory skills.
- II. Dog behavior is the internally coordinated responses (actions or inactions) of the domestic dog (individuals or groups) to internal and external stimuli.
- III. Dog communication is how dogs convey information to other dogs, understand messages from humans and translate the information that dogs are transmitting.
- IV. A vast range of commodity forms aims to transform a pet dog into an ideal companion.
- V. Dogs have lived and worked with humans in many role. People often enter their dogs in competitions, such as breed-conformation shows or sports, including racing.
- VI. Dog meat is consumed in some East Asian countries, including Korea, China, Vietnam and the Philippines, which dates back to antiquity.
- VII. Dogs suffer from the same common disorders as humans; these include cancer, diabetes, heart disease and neurologic disorders. Their pathology is similar to humans, as is their response to treatment and their outcomes.

❖ **CONCLUSION** :

The flora and fauna of our region is very significant. Here are just a few examples.

From this list we can get a partial idea of the biodiversity of our region. Plants have been used in India since time immemorial and hunting has been practiced since the beginning of civilization. At present the demand and circulation of Ayurvedic treatment is very much increasing. Besides, biodiversity is being destroyed under the pressure of population and civilization. In addition, due to the unscientific use of plants, many plants are endangered today. They need to be saved. They cultivate rare and important plants in their own homes. Can be easily saved. Even by making the common people aware, it is possible

to save the animals like snakes, geese etc. without killing them. The number of animals in the region is increasing by counting. The number of plants is decreasing every day due to rapid urbanization. As a result, the number of tree-dwelling animals (birds, reptiles, mammals, etc.) is also declining. It is important to save the animals that have been found in very small numbers in our study without delay. Balancing biodiversity is crucial for a healthy environment. Our duty is to make citizens aware of the need to conserve biodiversity. Also need the aware about Afforestation . If we all are not aware about that then we all are going to destroy our healthy Earth ourself.

❖ **ACKNOWLEDGEMENTS :**

I would like to thank my teacher, Dr. Jayeeta Chowdhuri, for selecting the project and for supervising and giving necessary instructions at all times. Thank you to my classmates for their support and web advice.

❖ **REFERENCE :**

- I. Wikipedia
- II. Environmental Studies book by Erach Bharucha .



# PROJECT REPORT

SEMESTER II

COURSE : AECC 2 (Environmental Science)

Project Title

Visit to a local polluted site - Industrial .

Checked  
25 out of

College Roll No. **30** SA20M577

CU Registration No. - 223-1111-0244-20

CU Roll Number - 203223-21-0021



## ACKNOWLEDGEMENT

I would like to thank my subject teachers of AECC ENVS for providing me with adequate study materials for this topic, and encouraging me to do this project systematically. I would like to thank our departmental HOD J.C. ma'am for guiding me to do the project with no mistake. I would also like to thank my father and mother, because without their timely help and guidance, it was impossible for me to do this project.

# INDEX

- (i) Introduction → (2)
- (ii) Types of Environmental pollution → (3)
- (iii) Introduction to myself and the environment in which I live. → (4)
- (iv) Objectives → (6)
- (v) Methodology → (7)
- (vi) Location → (7)
- (vii) Observations → (8)
- (viii) Causes → (11)
- (ix) Remedy → (12)
- (x) Summary and conclusion → (13)

## Introduction :

In this project work we'll share our experience of visiting a local place which can be agricultural, industrial, etc. But that place is polluted and it is causing harmful effects on the animals living around it and also on the natural environment of that place. But for understanding these results it is needed to understand that what is environment and what is environmental pollution and what is effect of it on the environment. So first we need to know that what is environment. The conditions in which we live, work, etc is called our environment. In this project work we'll mainly consider the natural environment of any place and effects on it. The natural environment or natural world consists of all the living and non-living things occurring naturally. Meaning in this case not artificial. The environment encompasses the interaction of all living species, climate, weather and natural resources that affect human survival or economic activities. The natural environment can be distinguished by-

Complete ecological units that function as natural systems without massive civilized human intervention, including all vegetation, microorganisms, soil, rocks, atmosphere, and natural phenomena.

na that occur within their boundaries and their nature.

### Environmental Pollution:

Before going in the discussion of environmental pollution, we must

know that what is 'Pollution'. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light pollutants. The components of pollution can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9-million people worldwide. Major forms of pollution include air pollution, light pollution, litter, noise pollution, plastic pollution, soil contamination, radioactive-contamination, thermal pollution, visual pollution and water pollution.

### Types of Environmental Pollution:

There are many kinds of environmental

pollution which effect the environment of any certain area and the flora and fauna living in that certain area. In this project work we'll be considering only on 3 types of pollution. (i) Soil pollution, (ii) Water Pollution and (iii) Air pollution.

These kinds of pollution can disturb the pH level of water and soil and can make it unhealthy.

Introduction to myself and the environment in which

I live :

Hello; myself Sagnik Majumder and I live in the small town of Maynaguri which is situated in the district of Jalpaiguri in west bengal. As I told earlier Maynaguri is a small town which is growing continuously to become bigger. So naturally there are diverse rural, agricultural and industrial activities. The area of Maynaguri Block is about  $530.6 \text{ Km}^2$ . It's often called the 'Gateway of Doars'. The population density of Maynaguri is nearly about  $35500/\text{Km}^2$  (according to census 2011). There is a river flowing across Maynaguri which is often named as 'Zanda' or 'Dharla'. This river cuts Maynaguri Block into two parts. There are two market places in the town Maynaguri. Those are 'Old Market' and 'New Market'. They are situated in the river bank of Zanda river. The natural environment of Maynaguri and Doars is quite pleasant. It's not a Megatown so we can notice many trees and also many kind of animals. AQI (Air Quality Index) of this area naturally -

lies between 12 to 33, which is very healthy. But there are also problems. And those problems have increased rapidly in some of the passed months.

In the whole territory of the city, we have many factories. We've factories of soap, brick, soft drinks, muni, rice, etc, etc. There is one rural hospital in maynaguri which is also situated near the Zanda river. Technically we can call the Zanda river, the lifeline of the city. There are many fish and meat markets which are situated just on the bank of the river Zanda. And these various factors are causing severe problems for the people living near those places and also for all the flora and fauna which are habitat of those places. The drinking water of the whole Maynaguri Block, is extracted from the Zanda river. It's purified & then supplied in various parts of the block. And as a final result we can easily understand by reading the upper paragraphs that how much the Zanda river is important for the people of Maynaguri. So it is very much needed to save this river from pollution.

## Objectives :

- (i) To identify the major reasons, extent and type of the pollution near the visited site.
- (ii) To identify the adverse effect of pollution in that vicinity.
- (iii) To explore the extent of pollution in the given specified region.
- (iv) To study the present situation of environment.
- (v) To study the visible effects of pollution.
- (vi) To study about the direct and indirect causes of pollution.
- (vii) To formulate the possible strategies in order to control various pollution.
- (viii) To suggest control measures to minimize pollution.
- (ix) To aware the people for the controlling of the pollution.
- (x) To study the mentality of the local inhabitants about this problem.

Methodology:

Firstly we visited around the polluted Zanda river site. Further analysis will be done by mainly two methods ;

A. Primary Method :

The polluted site was properly observed and information was gathered up.

B. Secondary Method :

Different literary books and journals related to pollution were consulted. Internet sites were also cited and desk study was done for, obtaining different information about the polluted place.

Location of the chosen spot :

Place : Near old market , Maynaguri, West Bengal , 735224.

Latitude : 88.8229° East

Longitude : 26.5671° North

Plus Code : HR8F+R5 Maynaguri, West Bengal

Nearest NH : Near NH 717.



Observations :

Maynaguri, Jalpaiguri, 29th June, 2021 :

We made a group of 8 friends and visited

the predestined place on 29th June. We reached the spot at about 10 a.m in the morning. Sufficient masks and sanitisers were carried by us. The fixed spot was between the fish market and Zanda river bank. As, we reached the spot we realised that the space was filled up with horrible bad smell of all the rubbish and litter which were dumped and piled up at that area from the past many months. We saw there that scales of fishes of the whole fish market, the bowels and fetters of hen and bowels of he-goat and she goats all were thrown away there. All the scales of fish and remaining parts of fish, all those, things are dumped at that place from the fish market on daily basis. And following the same way the remaining parts of various animals were left and piled-up there without any arrangement for the decomposition of those rubbish. Similarly from the vegetable market all the plastics, rotten vegetables are left on that place in same way. Many big thermocol containers which were thrown from fish markets were also can be noticed there on large number. The therm-

thermo cool containers are used for storing fishes on low temperature for long periods of time. Dirty rotten, garbages were causing very bad smell there. The smell can be smelt from long distance. A huge number of pig with many piglets were wandering there. Noticeable amount of rubbish was falling in the river water and mixing with water. And these were the problems which we noticed by just looking at that place. And overall condition of natural environment was described in the upper portion of the report.

Now about the problems. Some of the problems were told before. The bad odour of that place was a big problem. The rubbish like rotten vegetables, bowels of animals, fish scales, plastics were falling and mixing in the Zarda river water. Which were causing water pollution. Those harmful objects like plastics and pieces of thermo cool was falling in the water and we can say surely that its harmful for the inhabitants of the river water of that area. After some certain amount of days the local people set fire on those thermo cool boxes. Cause those are piled up there in a huge number. From that fire very much unhealthy black smoke comes out and

Covers the whole maynaguri old market and the sky of whole Maynaguri main town. This undoubtedly causes huge amount of air pollution. This black, smoke is filled up with significant amount of greenhouse gases like  $\text{CO}_2$ ,  $\text{SO}_2$ ,  $\text{SO}_4$ ,  $\text{NO}$ , etc. This should definitely contribute a part in the Global Warming. In the neighbouring area there is a slum area. The people living there free there domestic pigs in this area in the morning. The pigs and piglets wander in the spotted area for the whole daytime. They turned up the rubbish for the whole day on daily basis and mix the rubbish element with soil by their feet. The thermocol and plastic carrybags are non-biodegradable. Once they are mixed with soil, they remain unchanged during the next hundreds of years. The soil of the area is getting downgraded and barren and unfertile for this type of soil pollution on daily basis. Then we noted down the causes of the problems in that area and then we also pointed out that what can be the remedial activities for stopping environmental pollution in that certain area, permanently.

a) Cause of Problems :

a) The river bank is used as an infinite dumping ground.

b) The rubbish of vegetable market like plastic and rotten vegetables are dumped there.

c) Rubbish of fish markets and meat markets are dumped on daily basis and unconsciously at the place. The rubbishes are fish scales, thermocol containers, animal bowels, etc.

d) The thermocol containers are set on fire after some certain amount of days.

e) The domestic pigs and piglets are set free intentionally daily during the whole day.

f) The local peoples are unconscious about the pollution and also they have no idea that what bad effect the natural environment is suffering due to pollution in the area.

g) Above all the local municipality corporation is completely unconscious and unaware about this problem. They are'nt taking any measures.

- ⑥ Remedy :
- ① The major cause of pollution is human behaviour. It should be changed.
  - ② Proper selection and management of dumping sites.
  - ③ Application of '3R' principle. : Recycle, Reduce, Reuse.
  - ④ Awareness programs should be arranged for the local slum area inhabitants.
  - ⑤ Management of dustbins by municipality by several places.
  - ⑥ Proper process arrangement for recycling of the thermocol boxes.
  - ⑦ Immediately the setting of fire in the thermocol boxes should be stopped.
  - ⑧ Usage of biodegradable plastics should be increased.
  - ⑨ Cremation by the side of the river should be prohibited.
  - ⑩ fish scales, bowels and dead bodies of animals should be disposed at a distance from the water.
  - ⑪ Cleaning campaign must be launched.
  - ⑫ Solid wastes must be reuse and recycle.
  - ⑬ Public awareness programme against water pollution.

- ④ Strict government acts must be passed.
- ⑤ The local PS should be more active to stop these activities.

Summary and Conclusion :

Our nature and natural environment is very precious. The natural resources are supporting our lives and the existance of human being. The visited locality is undergoing rapid pollution because what most of the people fail to realize that they will never truly destroy natural resources and they will remain forever. This trend is creating more and more pollution in the environment. So there is utmost need of changing peoples thought about their activities. Thus, we neccommendations for the solution for the pollution of natural environment.



# PROJECT REPORT

SEMESTER II

COURSE : AECC 2 (Environmental Science)

Project Title

Visit to a local polluted site - Industrial .

College Roll No - PHSA20M577

CU Registration No. - 223-1111-0244-20

CU Roll Number - 203223-21-0021

## ACKNOWLEDGEMENT

I would like to thank my subject teachers of AECC ENVS for providing me with adequate study materials for this topic, and encouraging me to do this project systematically. I would like to thank our departmental HOD J.C. ma'am for guiding me to do the project with no mistake. I would also like to thank my father and mother, because without their timely help and guidance, it was impossible for me to do this project.



# INDEX

- (i) Introduction → (2)
- (ii) Types of Environmental pollution → (3)
- (iii) Introduction to myself and the environment in which I live. → (4)
- (iv) Objectives → (6)
- (v) Methodology → (7)
- (vi) Location → (7)
- (vii) Observations → (8)
- (viii) Causes → (11)
- (ix) Remedy → (12)
- (x) Summary and conclusion → (13)

## Introduction :

In this project work we'll share our experience of visiting a local place which can be agricultural, industrial, etc. But that place is polluted and it is causing harmful effects on the animals living around it and also on the natural environment of that place. But for understanding these results it is needed to understand that what is environment and what is environmental pollution and what is effect of it on the environment. So first we need to know that what is environment. The conditions in which we live, work, etc is called our environment. In this project work we'll mainly consider the natural environment of any place and effects on it. The natural environment or natural world consists of all the living and non-living things occurring naturally. Meaning in this case not artificial. The environment encompasses the interaction of all living species, climate, weather and natural resources that affect human survival or economic activities. The natural environment can be distinguished by-

Complete ecological units that function as natural systems without massive civilized human intervention, including all vegetation, microorganisms, soil, rocks, atmosphere, and natural phenomena.

na that occur within their boundaries and their nature.

### Environmental Pollution:

Before going in the discussion of environmental pollution, we must

know that what is 'Pollution'. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat or light pollutants. The components of pollution can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9-million people worldwide. Major forms of pollution include air pollution, light pollution, litter, noise pollution, plastic pollution, soil contamination, radioactive-contamination, thermal pollution, visual pollution and water pollution.

### Types of Environmental Pollution:

There are many kinds of environmental

pollution which effect the environment of any certain area and the flora and fauna living in that certain area. In this project work we'll be considering only on 3 types of pollution. (i) Soil pollution, (ii) Water Pollution and (iii) Air pollution.

These kinds of pollution can disturb the pH level of water and soil and can make it unhealthy.

Introduction to myself and the environment in which

I live :

Hello; myself Sagnik Majumder and I live in the small town of Maynaguri which is situated in the district of Jalpaiguri in west bengal. As I told earlier Maynaguri is a small town which is growing continuously to become bigger. So naturally there are diverse rural, agricultural and industrial activities. The area of Maynaguri Block is about  $530.6 \text{ Km}^2$ . It's often called the 'Gateway of Doars'. The population density of Maynaguri is nearly about  $35500/\text{Km}^2$  (according to census 2011). There is a river flowing across Maynaguri which is often named as 'Zanda' or 'Dharla'. This river cuts Maynaguri Block into two parts. There are two market places in the town Maynaguri. Those are 'Old Market' and 'New Market'. They are situated in the river bank of Zanda river. The natural environment of Maynaguri and Doars is quite pleasant. It's not a Megatown so we can notice many trees and also many kind of animals. AQI (Air Quality Index) of this area naturally -

lies between 12 to 33, which is very healthy. But there are also problems. And those problems have increased rapidly in some of the passed months.

In the whole territory of the city, we have many factories. We've factories of soap, brick, soft drinks, muni, rice, etc, etc. There is one rural hospital in maynaguri which is also situated near the Zanda river. Technically we can call the Zanda river, the lifeline of the city. There are many fish and meat markets which are situated just on the bank of the river Zanda. And these various factors are causing severe problems for the people living near those places and also for all the flora and fauna which are habitat of those places. The drinking water of the whole Maynaguri Block, is extracted from the Zanda river. It's purified & then supplied in various parts of the block. And as a final result we can easily understand by reading the upper paragraphs that how much the Zanda river is important for the people of Maynaguri. So it is very much needed to save this river from pollution.

## Objectives :

- (i) To identify the major reasons, extent and type of the pollution near the visited site.
- (ii) To identify the adverse effect of pollution in that vicinity.
- (iii) To explore the extent of pollution in the given specified region.
- (iv) To study the present situation of environment.
- (v) To study the visible effects of pollution.
- (vi) To study about the direct and indirect causes of pollution.
- (vii) To formulate the possible strategies in order to control various pollution.
- (viii) To suggest control measures to minimize pollution.
- (ix) To aware the people for the controlling of the pollution.
- (x) To study the mentality of the local inhabitants about this problem.

Methodology:

Firstly we visited around the polluted Zanda river site. Further analysis will be done by mainly two methods ;

A. Primary Method :

The polluted site was properly observed and information was gathered up.

B. Secondary Method :

Different literary books and journals related to pollution were consulted. Internet sites were also cited and desk study was done for, obtaining different information about the polluted place.

Location of the chosen spot :

Place : Near old market , Maynaguri, West Bengal , 735224.

Latitude : 88.8229° East

Longitude : 26.5671° North

Plus Code : HR8F+R5 Maynaguri, West Bengal

Nearest NH : Near NH 717.

Observations :

Maynaguri, Jalpaiguri, 29th June, 2021 :

We made a group of 8 friends and visited

the predestined place on 29th June. We reached the spot at about 10 a.m in the morning. Sufficient masks and sanitisers were carried by us. The fixed spot was between the fish market and Zanda river bank. As, we reached the spot we realised that the space was filled up with horrible bad smell of all the rubbish and litter which were dumped and piled up at that area from the past many months. We saw there that scales of fishes of the whole fish market, the bowels and fetters of hen and bowels of he-goat and she goats all were thrown away there. All the scales of fish and remaining parts of fish, all those, things are dumped at that place from the fish market on daily basis. And following the same way the remaining parts of various animals were left and piled-up there without any arrangement for the decomposition of those rubbish. Similarly from the vegetable market all the plastics, rotten vegetables are left on that place in same way. Many big thermocol containers which were thrown from fish markets were also can be noticed there on large number. The therm-



thermo cool containers are used for storing fishes on low temperature for long periods of time. Dirty rotten, garbages were causing very bad smell there. The smell can be smelt from long distance. A huge number of pig with many piglets were wandering there. Noticeable amount of rubbish was falling in the river water and mixing with water. And these were the problems which we noticed by just looking at that place. And overall condition of natural environment was described in the upper portion of the report.

Now about the problems. Some of the problems were told before. The bad odour of that place was a big problem. The rubbish like rotten vegetables, bowels of animals, fish scales, plastics were falling and mixing in the Zarda river water. Which were causing water pollution. Those harmful objects like plastics and pieces of thermo cool was falling in the water and we can say surely that its harmful for the inhabitants of the river water of that area. After some certain amount of days the local people set fire on those thermo cool boxes. Cause those are piled up there in a huge number. From that fire very much unhealthy black smoke comes out and

Covers the whole maynaguri old market and the sky of whole Maynaguri main town. This undoubtedly causes huge amount of air pollution. This black, smoke is filled up with significant amount of greenhouse gases like  $\text{CO}_2$ ,  $\text{SO}_2$ ,  $\text{SO}_4$ ,  $\text{NO}$ , etc. This should definitely contribute a part in the Global Warming. In the neighbouring area there is a slum area. The people living there free there domestic pigs in this area in the morning. The pigs and piglets wander in the spotted area for the whole daytime. They turned up the rubbish for the whole day on daily basis and mix the rubbish element with soil by their feet. The thermocol and plastic carrybags are non-biodegradable. Once they are mixed with soil, they remain unchanged during the next hundreds of years. The soil of the area is getting downgraded and barren and unfertile for this type of soil pollution on daily basis. Then we noted down the causes of the problems in that area and then we also pointed out that what can be the remedial activities for stopping environmental pollution in that certain area, permanently.

a) Cause of Problems :

a) The river bank is used as an infinite dumping ground.

b) The rubbish of vegetable market like plastic and rotten vegetables are dumped there.

c) Rubbish of fish markets and meat markets are dumped on daily basis and unconsciously at the place. The rubbishes are fish scales, thermocol containers, animal bowels, etc.

d) The thermocol containers are set on fire after some certain amount of days.

e) The domestic pigs and piglets are set free intentionally daily during the whole day.

f) The local peoples are unconscious about the pollution and also they have no idea that what bad effect the natural environment is suffering due to pollution in the area.

g) Above all the local municipality corporation is completely unconscious and unaware about this problem. They are'nt taking any measures.

- ⑥ Remedy :
- ① The major cause of pollution is human behaviour. It should be changed.
  - ② Proper selection and management of dumping sites.
  - ③ Application of '3R' principle. : Recycle, Reduce, Reuse.
  - ④ Awareness programs should be arranged for the local slum area inhabitants.
  - ⑤ Management of dustbins by municipality by several places.
  - ⑥ Proper process arrangement for recycling of the thermocol boxes.
  - ⑦ Immediately the setting of fire in the thermocol boxes should be stopped.
  - ⑧ Usage of biodegradable plastics should be increased.
  - ⑨ Cremation by the side of the river should be prohibited.
  - ⑩ Fish scales, bowels and dead bodies of animals should be disposed at a distance from the water.
  - ⑪ Cleaning campaign must be launched.
  - ⑫ Solid wastes must be reuse and recycle.
  - ⑬ Public awareness programme against water pollution.

- ④ Strict government acts must be passed.
- ⑤ The local PS should be more active to stop these activities.

### Summary and Conclusion :

Our nature and natural environment is very precious. The natural resources are supporting our lives and the existence of human being. The visited locality is undergoing rapid pollution because what most of the people fail to realize that they will never truly destroy natural resources and they will remain forever. This trend is creating more and more pollution in the environment. So there is utmost need of changing peoples thought about their activities. Thus, we recommendations for the solution for the pollution of natural environment.

————— X —————

Checked  
26 out of  
30

# **PROJECT REPORT**

**SEMESTER II**

**COURSE : AECC2 (Environmental Studies)**

**Project Title : VISIT TO A LOCAL POLLUTED SITE**



**College Roll No. : PHSA20M578**

**CU Registration No. : 223-1111-0257-20**

**CU Roll No. : 203223-21-0029**

**Type of the Study : Study of Pollutions at a Solid Waste Polluted Site .**

**Place of the Study : Garbage Dumping Site**

**Locality : Urban**

**Location : Bhairab Dutta Lane, Salkia, Howrah – 711106**

### **INTRODUCTION:**

Garbage dumping sites are the common sources of environmental pollutions in urban as well as rural areas. The main reason of this problem is basically due to excessive increase of population in our country, so the over utilisation of everyday non-biodegradable consumer goods, and lack of awareness about the daily household solid waste management system among the common people as well as. Our main concern is the management process of the huge amount of garbage produced everyday, as the process has so many drawbacks and that is the cause of environmental pollution in various ways.

Apart from environmental concern, improper handling of the garbage leads to various types of health hazards, as garbage is a source of various types of micro-organisms causing various types of diseases.



In this survey, I have studied an urban garbage dumping site and tried to find the causes for different types of environmental pollution from that site.

### **Sources of the Garbage :**

The garbage that comes in this ground are mainly collected from local households in Howrah Municipal Corporation area, and the industrial areas nearby.

### **Serving people :**

Around 3 Lakh people per day in Howrah Municipal Corporation area.

### **Garbage Collection Process :**

The garbage collection process is -



### **Different Types of the Garbage :**

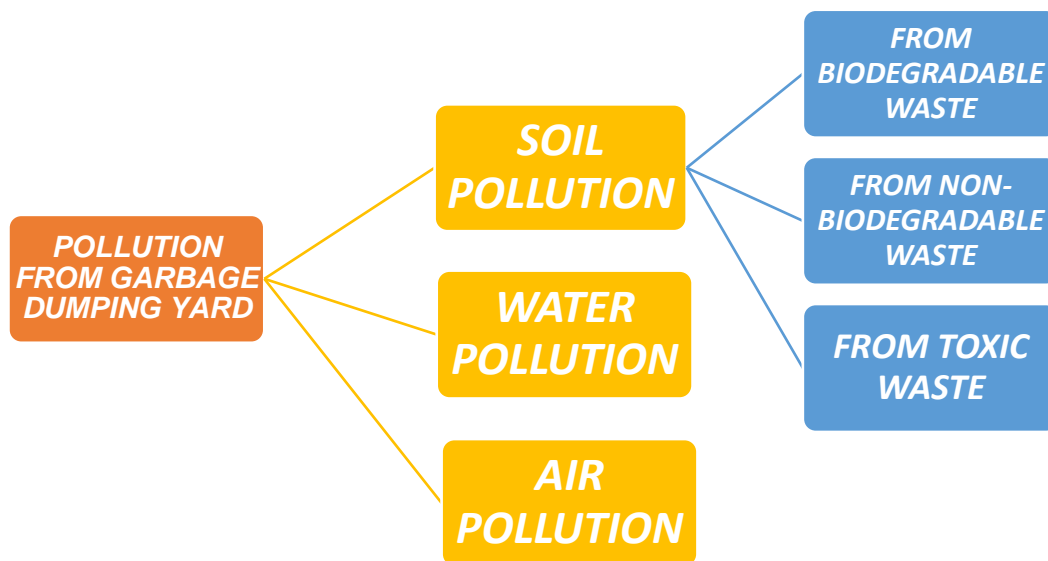
The various types of garbages dumped can be categorised generally into three types. These are –

- Biodegradable
- Non-Biodegradable
- Toxic





## Types of Pollutions from Dumping Yard :



### Soil Pollution :

Soil pollution is one of the major concerns from dumping yard. Contamination of pollutants such as – Biodegradable, Non-Biodegradable and Toxic, decreases the quality of soil. Good microbes that keeps the soil rich and fertile are killed because of the contamination. Along with that, soil pollution leads directly to water pollution.

In this site, we have observed soil pollution created by Biodegradable, Non-Biodegradable and Toxic pollutants.



- **Biodegradable Pollutants :**

This type of pollutants; such as vegetables residue, animal waste, bodies and body parts of dead organisms and biodegradable plastic etc. gradually degrades in soil over time, but contaminates soil with bacteria, fungus and viruses of infectious diseases. In this place, garbage including human and animal waste, body parts are openly dumped in ground, that's why the soil of this place is getting polluted badly.

- **Non-Biodegradable Pollutants :**

Nowadays, the deepest concern of environment is caused by Non-Biodegradable Pollutants; such as polythene packets, plastic materials, parts of electronic appliances etc. These are being dumped at this dumping ground uncontrollably. As these type of pollutants don't get consumed by the microbes in the soil, they remain in the soil infinitely. These causes death of good micro organisms of soil and decreases fertility of the soil permanently.

- **Toxic Pollutants :**

These type of pollutants are considered as the most dangerous for environment. These are mostly Non-Biodegradable pollutants; and most of the sources of these pollutants are Industrial sites and hospitals. Some of these pollutants are – Mercury, Lead, medical solutions, chemical components, disposable injection syringes, vials etc. These hazardous pollutants are very much harmful to the living organisms because from soil, it directly contaminates to water and the consumption of the directly leads to health hazards.

### **Water Pollution :**



Water pollution is also a concern of this dumping ground. A short canal is passed beside the dumping yard; so the dirty water from the dumping ground directly contaminates to the canal. The canal goes to the nearby river Ganges; so river water also gets contaminated with the dirty water and causes ill effects when people consumes the water. Also, harmful chemical from the industrial and medical garbage goes to the canal with the dirty water. So, water pollution also takes place here in a large scale and leads to various water borne diseases and other types of infectious, harmful diseases. Pollution has also given rise to ***Eutrophication*** in this canal hugely.

### **Air Pollution :**



And finally, this dumping area brings another environmental risk, that is air pollution. In the urban area, people are mostly affected with air pollution by cars and mostly industrial gaseous outlays. This dumping area causes air pollution in two ways –

1. Harmful gases like Methane, Sulphur di-oxide, Nitrous Oxide, Ammonia is produced from the biodegradable pollutants and pollutes the air.
2. Sometimes, fire breaks out in the dumping yard because of inflammable gases like methane etc. So the garbage burn and gases like Carbon di-oxide (CO<sub>2</sub>), Carbon Monoxide (CO) produced and directly contaminate to air.

## **Remedies and Necessary Garbage Management processes :**

- **Solid Waste Compaction Process :**



Solid waste compaction is the process of compacting waste, reducing it in size. Garbage compactors and waste collection vehicles compress waste so that more of it can be stored in the same space. Waste is compacted again, more thoroughly, at the landfill to conserve valuable airspace and to extend the landfill's life span. In this process, the water content of the garbage gets separated from the solid content. This prevents the soil pollution as well as air pollution from the waste. Also, the reduced and compacted solid content of the garbage are now being used as fertilisers in fields.

- **Water Treatment Process :**

The dirty water, which is separated by the Solid Waste Compactor, now should be passed through a water treatment process, so as the water gets filtered and free from germs. Then only, the water can be freed to the canal or other water bodies. By this process, water pollution can be prevented mostly.

Also, there are many processes like ***Solid Waste incineration, Waste Valorization, Pyrolysis*** are now being used to process solid waste in many developed cities in world, which are very effective.

## **Conclusion :**

In today's world, population is increasing at an exponential rate. As the population increases, garbage consumed by people will also increase; that is obvious. But what we can do is to follow a proper garbage management process so that our environment doesn't get affected by the harmful effects of the pollutants. But this needs a build up of proper infrastructure, maintenance and proper knowledge of the civilians about conservation of environment. I would like to request to the higher municipal authorities to take necessary steps to implement these modern methods in municipal solid waste management process.

## **ACKNOWLEDGEMENT**

I would like to thank all the professors of Environmental Sciences of our Scottish Church College for their guidance and teaching. Also, I am highly grateful to Dr. Jayeeta Chowdhury; HOD, Physics Department, Scottish Church College; for her constant guidance and support. My friends of Physics department also deserve a special thanks for their support and help.

## **BIBLIOGRAPHY**

- Textbook of Environmental Studies for Undergraduate Courses (3<sup>rd</sup> Edition)- Erach Bharucha
  - [Wikipedia.org/Waste\\_management](https://www.wikipedia.org/Waste_management)
  - [Wikipedia.org/Waste\\_compaction](https://www.wikipedia.org/Waste_compaction)

**Date : 06.07.2021**

# **PROJECT REPORT**

**SEMESTER II**

**COURSE : AECC2 (Environmental Studies)**

**Project Title : VISIT TO A LOCAL POLLUTED SITE**



**College Roll No. : PHSA20M578**

**CU Registration No. : 223-1111-0257-20**

**CU Roll No. : 203223-21-0029**

**Type of the Study : Study of Pollutions at a Solid Waste Polluted Site .**

**Place of the Study : Garbage Dumping Site**

**Locality : Urban**

**Location : Bhairab Dutta Lane, Salkia, Howrah – 711106**

### **INTRODUCTION:**

Garbage dumping sites are the common sources of environmental pollutions in urban as well as rural areas. The main reason of this problem is basically due to excessive increase of population in our country, so the over utilisation of everyday non-biodegradable consumer goods, and lack of awareness about the daily household solid waste management system among the common people as well as. Our main concern is the management process of the huge amount of garbage produced everyday, as the process has so many drawbacks and that is the cause of environmental pollution in various ways.

Apart from environmental concern, improper handling of the garbage leads to various types of health hazards, as garbage is a source of various types of micro-organisms causing various types of diseases.



In this survey, I have studied an urban garbage dumping site and tried to find the causes for different types of environmental pollution from that site.

### **Sources of the Garbage :**

The garbage that comes in this ground are mainly collected from local households in Howrah Municipal Corporation area, and the industrial areas nearby.

### **Serving people :**

Around 3 Lakh people per day in Howrah Municipal Corporation area.

### **Garbage Collection Process :**

The garbage collection process is -



### **Different Types of the Garbage :**

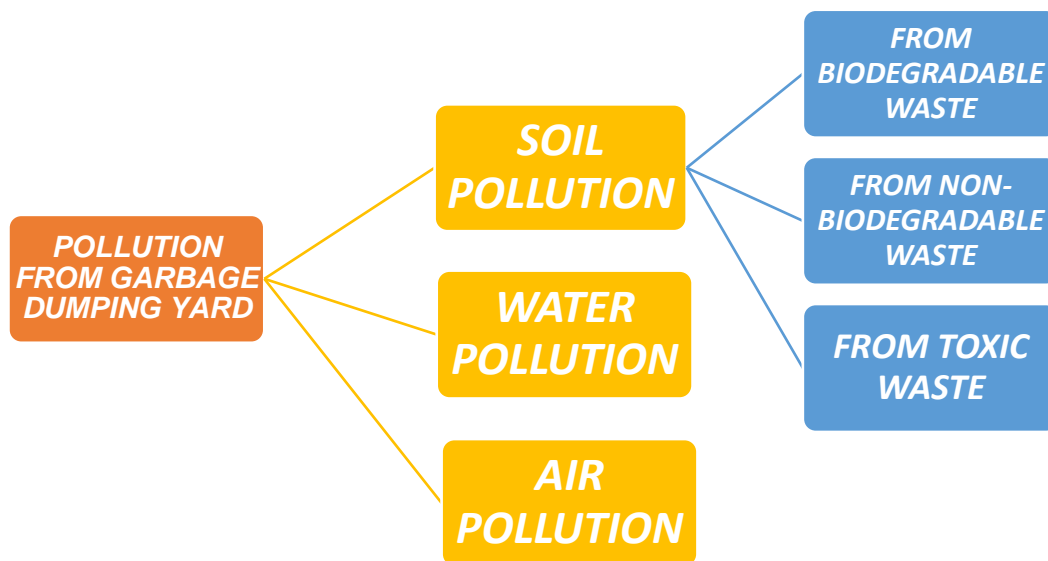
The various types of garbages dumped can be categorised generally into three types. These are –

- Biodegradable
- Non-Biodegradable
- Toxic





## Types of Pollutions from Dumping Yard :



### Soil Pollution :

Soil pollution is one of the major concerns from dumping yard. Contamination of pollutants such as – Biodegradable, Non-Biodegradable and Toxic, decreases the quality of soil. Good microbes that keeps the soil rich and fertile are killed because of the contamination. Along with that, soil pollution leads directly to water pollution.

In this site, we have observed soil pollution created by Biodegradable, Non-Biodegradable and Toxic pollutants.



- **Biodegradable Pollutants :**

This type of pollutants; such as vegetables residue, animal waste, bodies and body parts of dead organisms and biodegradable plastic etc. gradually degrades in soil over time, but contaminates soil with bacteria, fungus and viruses of infectious diseases. In this place, garbage including human and animal waste, body parts are openly dumped in ground, that's why the soil of this place is getting polluted badly.

- **Non-Biodegradable Pollutants :**

Nowadays, the deepest concern of environment is caused by Non-Biodegradable Pollutants; such as polythene packets, plastic materials, parts of electronic appliances etc. These are being dumped at this dumping ground uncontrollably. As these type of pollutants don't get consumed by the microbes in the soil, they remain in the soil infinitely. These causes death of good micro organisms of soil and decreases fertility of the soil permanently.

- **Toxic Pollutants :**

These type of pollutants are considered as the most dangerous for environment. These are mostly Non-Biodegradable pollutants; and most of the sources of these pollutants are Industrial sites and hospitals. Some of these pollutants are – Mercury, Lead, medical solutions, chemical components, disposable injection syringes, vials etc. These hazardous pollutants are very much harmful to the living organisms because from soil, it directly contaminates to water and the consumption of the directly leads to health hazards.

### **Water Pollution :**



Water pollution is also a concern of this dumping ground. A short canal is passed beside the dumping yard; so the dirty water from the dumping ground directly contaminates to the canal. The canal goes to the nearby river Ganges; so river water also gets contaminated with the dirty water and causes ill effects when people consumes the water. Also, harmful chemical from the industrial and medical garbage goes to the canal with the dirty water. So, water pollution also takes place here in a large scale and leads to various water borne diseases and other types of infectious, harmful diseases. Pollution has also given rise to ***Eutrophication*** in this canal hugely.

### **Air Pollution :**



And finally, this dumping area brings another environmental risk, that is air pollution. In the urban area, people are mostly affected with air pollution by cars and mostly industrial gaseous outlays. This dumping area causes air pollution in two ways –

1. Harmful gases like Methane, Sulphur di-oxide, Nitrous Oxide, Ammonia is produced from the biodegradable pollutants and pollutes the air.
2. Sometimes, fire breaks out in the dumping yard because of inflammable gases like methane etc. So the garbage burn and gases like Carbon di-oxide (CO<sub>2</sub>), Carbon Monoxide (CO) produced and directly contaminate to air.

## **Remedies and Necessary Garbage Management processes :**

- **Solid Waste Compaction Process :**



Solid waste compaction is the process of compacting waste, reducing it in size. Garbage compactors and waste collection vehicles compress waste so that more of it can be stored in the same space. Waste is compacted again, more thoroughly, at the landfill to conserve valuable airspace and to extend the landfill's life span. In this process, the water content of the garbage gets separated from the solid content. This prevents the soil pollution as well as air pollution from the waste. Also, the reduced and compacted solid content of the garbage are now being used as fertilisers in fields.

- **Water Treatment Process :**

The dirty water, which is separated by the Solid Waste Compactor, now should be passed through a water treatment process, so as the water gets filtered and free from germs. Then only, the water can be freed to the canal or other water bodies. By this process, water pollution can be prevented mostly.

Also, there are many processes like ***Solid Waste incineration, Waste Valorization, Pyrolysis*** are now being used to process solid waste in many developed cities in world, which are very effective.

## **Conclusion :**

In today's world, population is increasing at an exponential rate. As the population increases, garbage consumed by people will also increase; that is obvious. But what we can do is to follow a proper garbage management process so that our environment doesn't get affected by the harmful effects of the pollutants. But this needs a build up of proper infrastructure, maintenance and proper knowledge of the civilians about conservation of environment. I would like to request to the higher municipal authorities to take necessary steps to implement these modern methods in municipal solid waste management process.

## **ACKNOWLEDGEMENT**

I would like to thank all the professors of Environmental Sciences of our Scottish Church College for their guidance and teaching. Also, I am highly grateful to Dr. Jayeeta Chowdhury; HOD, Physics Department, Scottish Church College; for her constant guidance and support. My friends of Physics department also deserve a special thanks for their support and help.

## **BIBLIOGRAPHY**

- Textbook of Environmental Studies for Undergraduate Courses (3<sup>rd</sup> Edition)- Erach Bharucha
  - [Wikipedia.org/Waste\\_management](https://www.wikipedia.org/Waste_management)
  - [Wikipedia.org/Waste\\_compaction](https://www.wikipedia.org/Waste_compaction)

**Date : 06.07.2021**

# PROJECT REPORT

SEMESTER II

COURSE: AECC2 (Environmental Studies)

POND ECOSYSTEM

Checked  
24 out of  
30

College Roll No.: PHSA20M579

CU Registration No.: 223-1111-0268-20

CU Roll no.: 203223-21-0035

# **Ecosystem – A General Introduction**

The ecosystem is the structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interaction between organisms and their environment. The term “Ecosystem” was first coined by A.G. Tansley, an English botanist, in 1935.

## **Types of Ecosystems**

An ecosystem can be as small as an oasis in a desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystems:

- Terrestrial Ecosystem
- Aquatic Ecosystem

### **Terrestrial Ecosystems**

Terrestrial ecosystems are exclusively land-based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones. They are as follows:

1. Forest Ecosystems
2. Grassland Ecosystems
3. Tundra Ecosystems
4. Desert Ecosystem

### **Aquatic Ecosystem**

Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely:

1. Freshwater Ecosystem
2. Marine Ecosystem.

### **Structure of the Ecosystem**

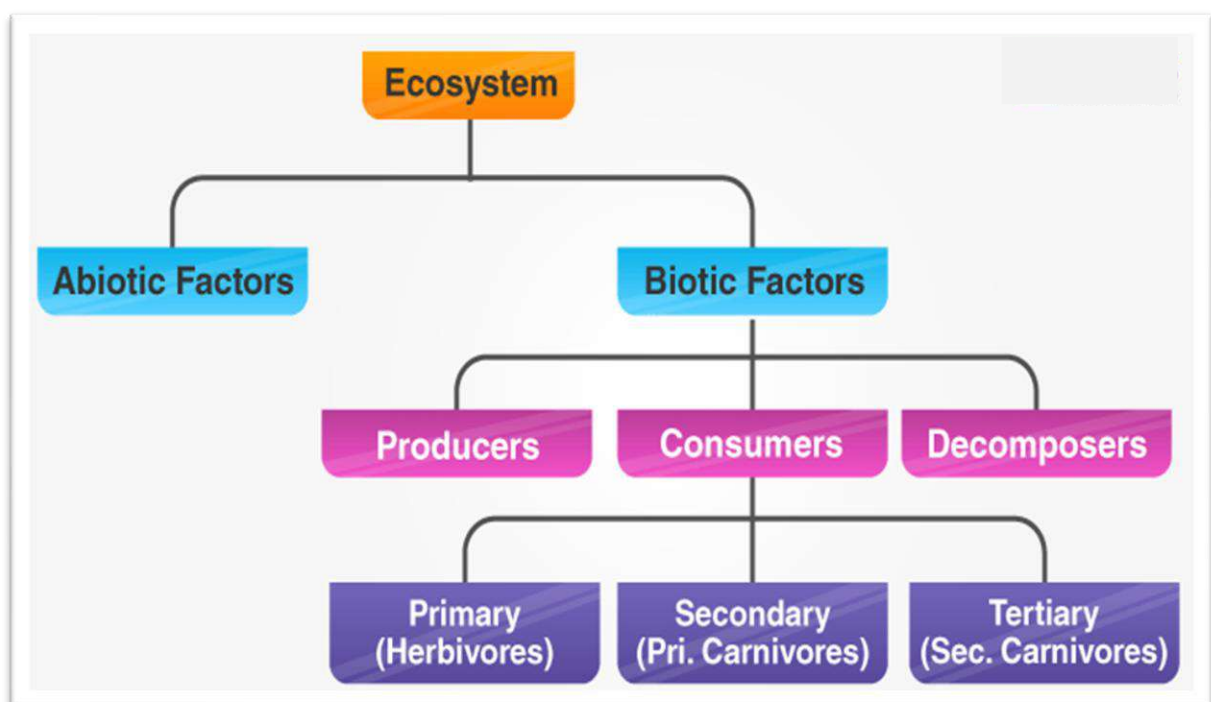
The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in **our**

**environment.** It also includes the climatic conditions prevailing in that particular environment.

The structure of an ecosystem can be split into two main components, namely:

- Biotic Components
- Abiotic Components

The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries.



▲  
Structure of Ecosystem highlighting the biotic and abiotic factors

## Functions of Ecosystem

The functions of the ecosystem are as follows:

1. It regulates the essential ecological processes, supports life systems and renders stability.
2. It is also responsible for the cycling of nutrients between biotic and abiotic components.



3. It maintains a balance among the various trophic levels in the ecosystem.
4. It cycles the minerals through the biosphere.
5. The abiotic components help in the synthesis of organic components that involves the exchange of energy.

## **Pond Ecosystem**

A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges and throughout. However, it is often difficult to classify the differences between a pond and a lake, since the two terms are artificial and the ecosystems really exist on a continuum. Generally, in a pond, the temperature changes with the air temperature and is relatively uniform. Lakes are similar to ponds, but because they are larger, temperature layering or stratification takes place in summer and winter, and these layers turnover in spring and fall. Ponds get their energy from the sun. As with other ecosystems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide and water to organic compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

## **Ecological Zonation of Lakes and Ponds**

Aquatic habitats of lakes and ponds can be vertically divided into different levels based on light penetration, wavelength absorption, surface pressure, temperature, etc., viz.

### **(1) Littoral Zone**

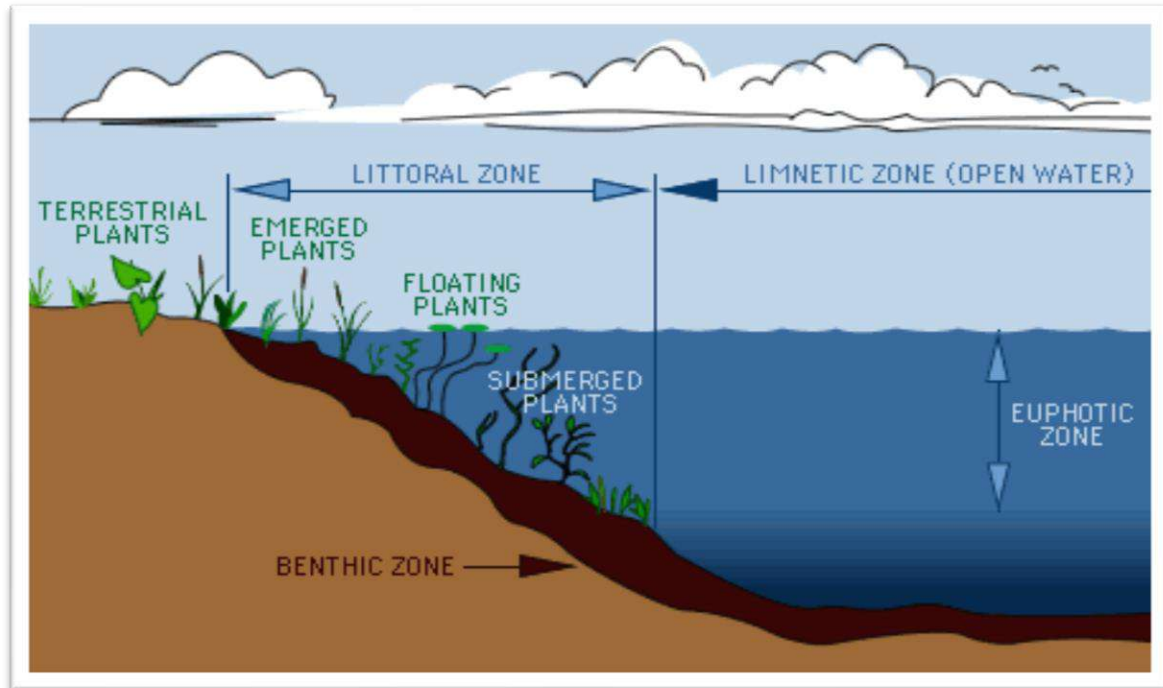
The shallow area where light enters the bottom is included in this region. Natural ponds and lakes have rooted plants. However, in the case of cultivation ponds, such plants may not exist. It has a layer of hot and oxygen rich water on top which is called epilimnion.

### **(2) Limnetic Zone**

The limnetic zone is the open area away from the shore. The region extends as far as light effectively penetrates and to a depth where the rate of photosynthesis and respiration are equal.

### (3) Profoundal Zone

This area is located below the limnetic region, the area of deep water and below the area of effective light penetration.



▲  
Pond Zones

### Role of temperature in Stratification, Biological Oxygen Demand and Dissolved Oxygen

The thermal stratification of ponds refers to a change in the temperature at different depth in the pond and due to change in water's density with temperature. Thermal variation influences the aquatic life and leads to the stratification of the pond. There are three different regions in the pond which are epilimnion, thermocline, and hypolimnion. Epilimnion is the zone of gradually decreasing temperature from the surface, thermocline is a zone of rapidly falling temperature and hypolimnion is a bottom zone where no temperature gradient is evident.

- **Biological Oxygen Demand (BOD)**

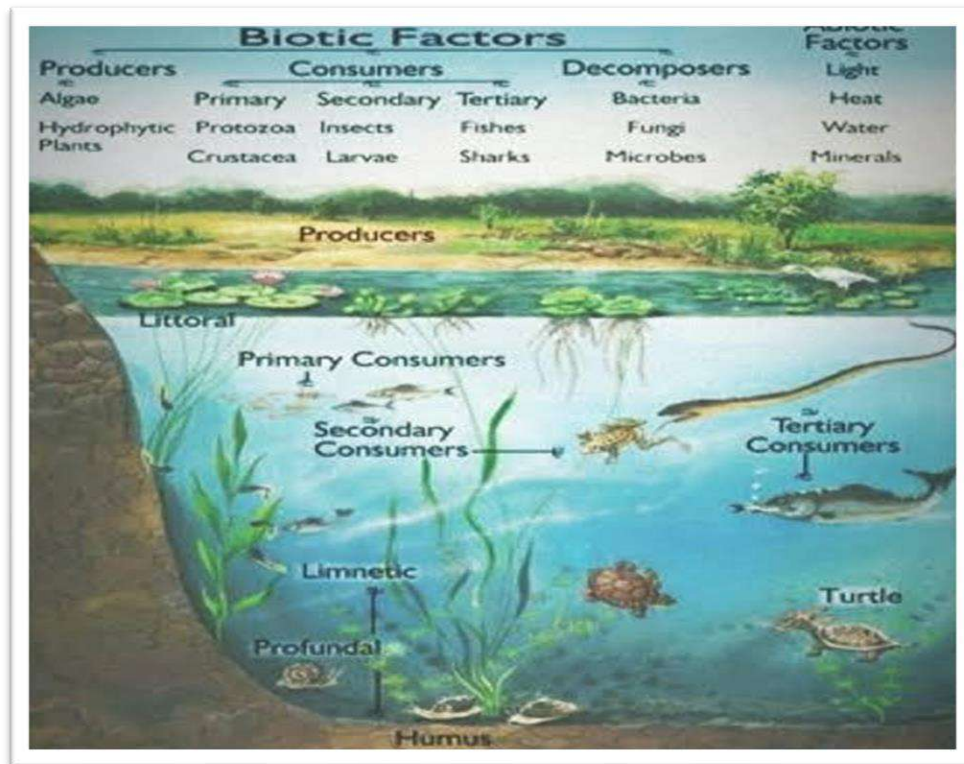
It is the amount of oxygen required by bacteria in the pond in a unit volume of water at a specified time.

- **Dissolved Oxygen (DO)**

Dissolved oxygen refers to the level of free, non-compound oxygen dissolved or present in water or any other liquid. BOD and DO govern the kind of organisms present in the water.

## Structure of Pond ecosystem

It is a classic example for natural, aquatic, freshwater, lentic type of ecosystem. It helps us to understand the structure and function of an ecosystem. When rain water gathers in a shallow area, gradually over a period of time, different kinds of organisms (microbes, plants, animals) become part of this ecosystem. This pond ecosystem is a self-sustaining and self-regulatory fresh water ecosystem, which shows a complex interaction between the abiotic and biotic components in it.



▲  
Structure of Pond Ecosystem

- **Abiotic components**

A pond ecosystem consists of dissolved inorganic ( $\text{CO}_2$ ,  $\text{O}_2$ , Ca, N, Phosphate) and organic substances (amino acids and humic acid) formed from the dead organic matter. The function of pond ecosystem is regulated

by few factors like the amount of light, temperature, pH value of water and other climatic conditions.

- **Biotic components**

They constitute the producers, variety of consumers and decomposers (microorganisms).

- **Producers**

- **Phytoplankton**, literally “wandering plants,” are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants—they are protists!

- **Periphytic algae** are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.

- **Submerged plants** grow completely under water • **Floating plants** include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.

- **Emergent plants** are rooted in shallow water but their stems and leaves are above water most of the time. • **Shore plants** grow in wet soil at the edge of the pond.

- **Consumers**

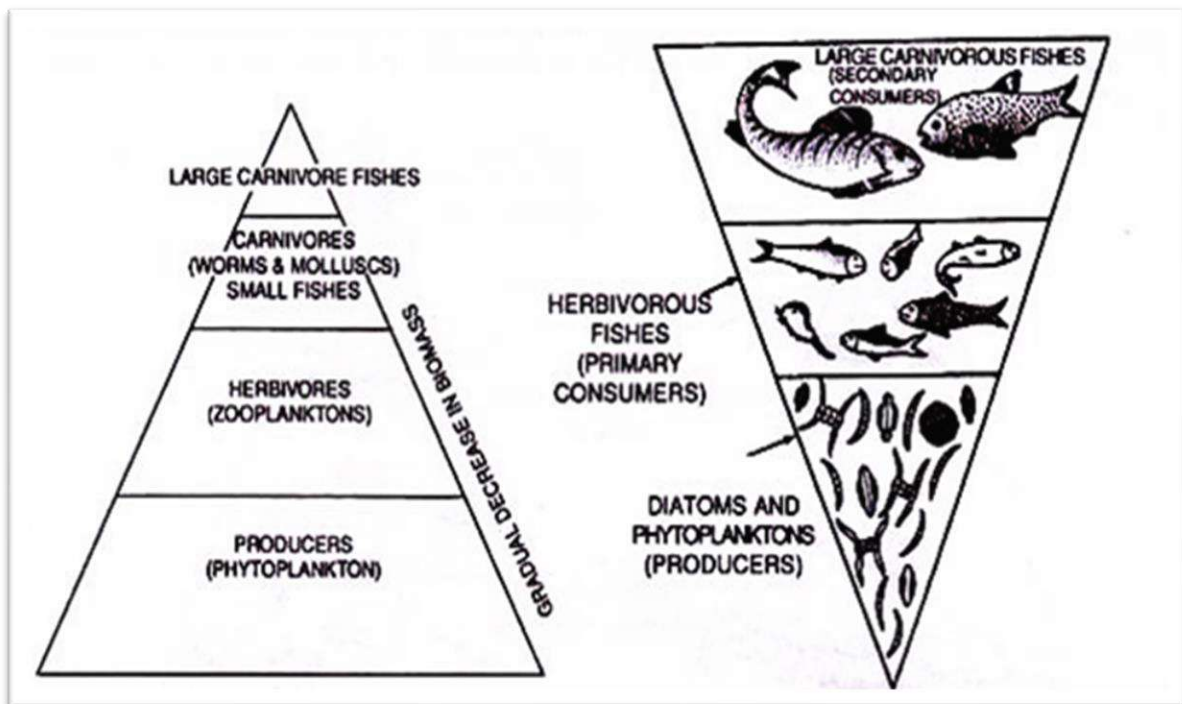
- **Zooplankton** are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.

- **Invertebrates** include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

• **Vertebrates** are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles.

### ➤ **Decomposers**

Animal waste and dead and decaying plants and animals form detritus on the bottom of the pond. Decomposers, also known as detritivores, are bacteria and other organisms like *Aspergillus* *Cladosporium* *Rhizopus*, *Saprolegnia* etc. that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide.



▲  
Pyramid of Biomass

## **Importance of pond ecosystems**

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

## **1. Biodiversity**

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

## **2. Ubiquity**

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

## **3. Abundance**

Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

## **4. Source of hydration**

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

## **5. Beauty**

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond, we can feel inspired, calm and in touch with nature.

## **Conclusion**

Ponds are found everywhere but yet they are endangered so we need to conserve them and protect them from getting extinct. We need to remember that we have to save something for the future generations as well. Ponds are inhabitation to many and are very important to maintain the nature.

# PROJECT REPORT

SEMESTER II

COURSE: AECC2 (Environmental Studies)

POND ECOSYSTEM

College Roll No.: PHSA20M579

CU Registration No.: 223-1111-0268-20

CU Roll no.: 203223-21-0035

# **Ecosystem – A General Introduction**

The ecosystem is the structural and functional unit of ecology where the living organisms interact with each other and the surrounding environment. In other words, an ecosystem is a chain of interaction between organisms and their environment. The term “Ecosystem” was first coined by A.G. Tansley, an English botanist, in 1935.

## **Types of Ecosystems**

An ecosystem can be as small as an oasis in a desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystems:

- Terrestrial Ecosystem
- Aquatic Ecosystem

### **Terrestrial Ecosystems**

Terrestrial ecosystems are exclusively land-based ecosystems. There are different types of terrestrial ecosystems distributed around various geological zones. They are as follows:

1. Forest Ecosystems
2. Grassland Ecosystems
3. Tundra Ecosystems
4. Desert Ecosystem

### **Aquatic Ecosystem**

Aquatic ecosystems are ecosystems present in a body of water. These can be further divided into two types, namely:

1. Freshwater Ecosystem
2. Marine Ecosystem.

### **Structure of the Ecosystem**

The structure of an ecosystem is characterised by the organisation of both biotic and abiotic components. This includes the distribution of energy in **our**

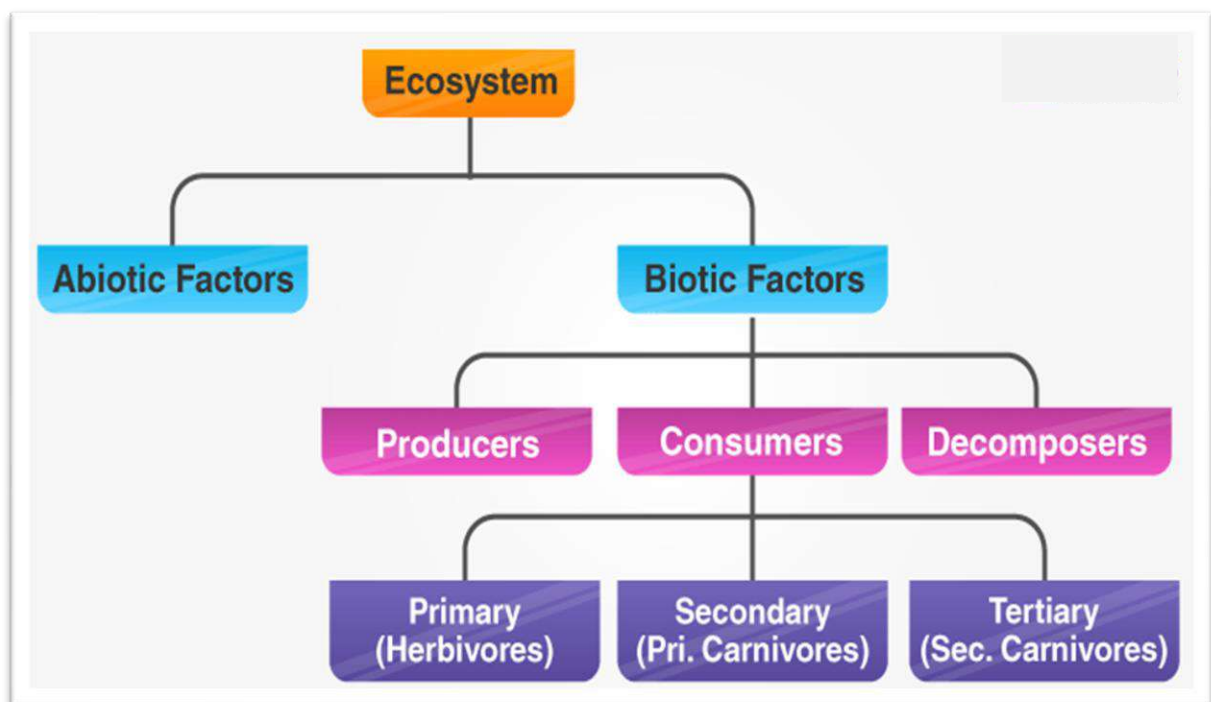


**environment.** It also includes the climatic conditions prevailing in that particular environment.

The structure of an ecosystem can be split into two main components, namely:

- Biotic Components
- Abiotic Components

The biotic and abiotic components are interrelated in an ecosystem. It is an open system where the energy and components can flow throughout the boundaries.



▲  
Structure of Ecosystem highlighting the biotic and abiotic factors

## Functions of Ecosystem

The functions of the ecosystem are as follows:

1. It regulates the essential ecological processes, supports life systems and renders stability.
2. It is also responsible for the cycling of nutrients between biotic and abiotic components.

3. It maintains a balance among the various trophic levels in the ecosystem.
4. It cycles the minerals through the biosphere.
5. The abiotic components help in the synthesis of organic components that involves the exchange of energy.

## **Pond Ecosystem**

A pond is a quiet body of water that is too small for wave action and too shallow for major temperature differences from top to bottom. It usually has a muddy or silty bottom with aquatic plants around the edges and throughout. However, it is often difficult to classify the differences between a pond and a lake, since the two terms are artificial and the ecosystems really exist on a continuum. Generally, in a pond, the temperature changes with the air temperature and is relatively uniform. Lakes are similar to ponds, but because they are larger, temperature layering or stratification takes place in summer and winter, and these layers turnover in spring and fall. Ponds get their energy from the sun. As with other ecosystems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide and water to organic compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

## **Ecological Zonation of Lakes and Ponds**

Aquatic habitats of lakes and ponds can be vertically divided into different levels based on light penetration, wavelength absorption, surface pressure, temperature, etc., viz.

### **(1) Littoral Zone**

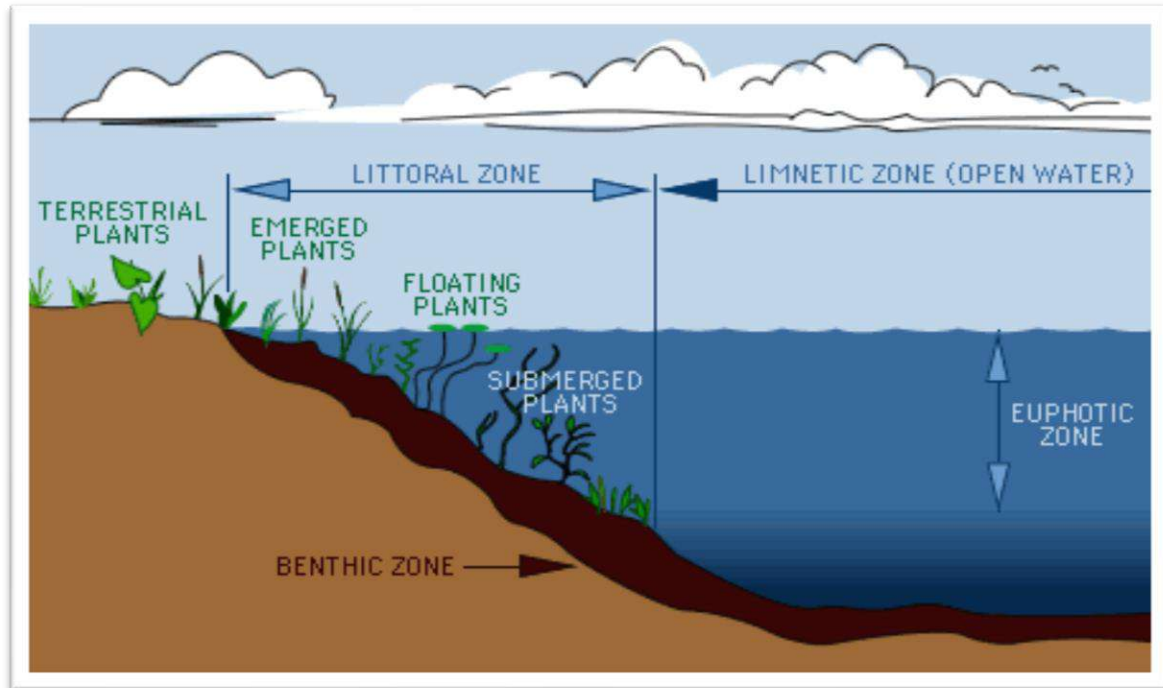
The shallow area where light enters the bottom is included in this region. Natural ponds and lakes have rooted plants. However, in the case of cultivation ponds, such plants may not exist. It has a layer of hot and oxygen rich water on top which is called epilimnion.

### **(2) Limnetic Zone**

The limnetic zone is the open area away from the shore. The region extends as far as light effectively penetrates and to a depth where the rate of photosynthesis and respiration are equal.

### (3) Profoundal Zone

This area is located below the limnetic region, the area of deep water and below the area of effective light penetration.



▲  
Pond Zones

### Role of temperature in Stratification, Biological Oxygen Demand and Dissolved Oxygen

The thermal stratification of ponds refers to a change in the temperature at different depth in the pond and due to change in water's density with temperature. Thermal variation influences the aquatic life and leads to the stratification of the pond. There are three different regions in the pond which are epilimnion, thermocline, and hypolimnion. Epilimnion is the zone of gradually decreasing temperature from the surface, thermocline is a zone of rapidly falling temperature and hypolimnion is a bottom zone where no temperature gradient is evident.

- **Biological Oxygen Demand (BOD)**

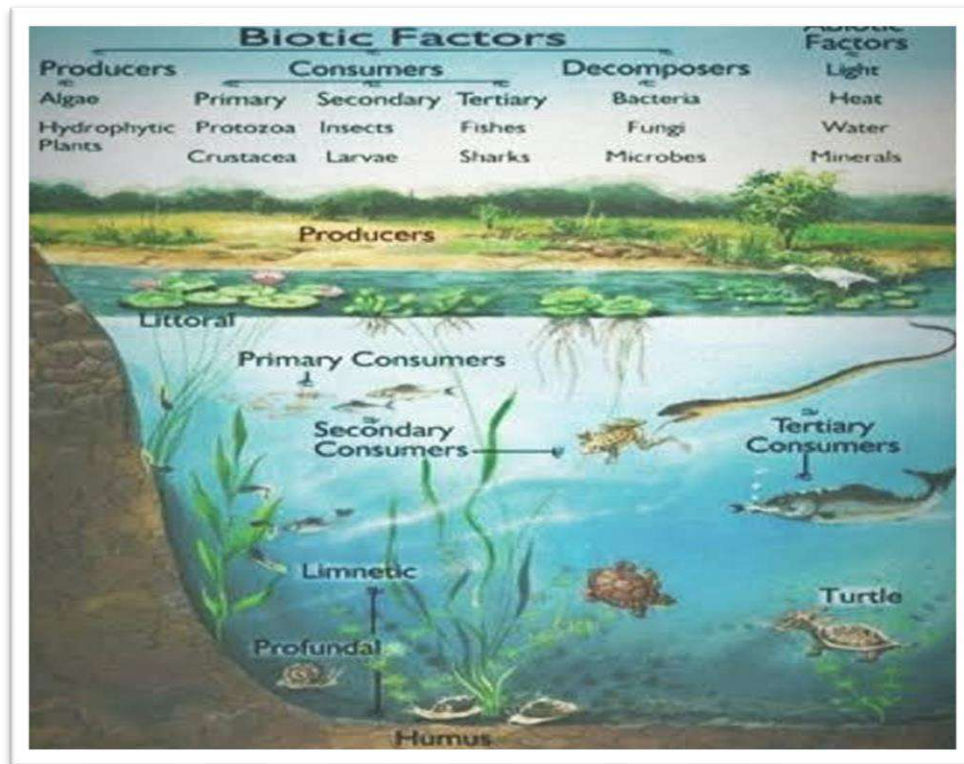
It is the amount of oxygen required by bacteria in the pond in a unit volume of water at a specified time.

- **Dissolved Oxygen (DO)**

Dissolved oxygen refers to the level of free, non-compound oxygen dissolved or present in water or any other liquid. BOD and DO govern the kind of organisms present in the water.

## Structure of Pond ecosystem

It is a classic example for natural, aquatic, freshwater, lentic type of ecosystem. It helps us to understand the structure and function of an ecosystem. When rain water gathers in a shallow area, gradually over a period of time, different kinds of organisms (microbes, plants, animals) become part of this ecosystem. This pond ecosystem is a self-sustaining and self-regulatory fresh water ecosystem, which shows a complex interaction between the abiotic and biotic components in it.



▲  
Structure of Pond Ecosystem

- **Abiotic components**

A pond ecosystem consists of dissolved inorganic ( $\text{CO}_2$ ,  $\text{O}_2$ , Ca, N, Phosphate) and organic substances (amino acids and humic acid) formed from the dead organic matter. The function of pond ecosystem is regulated

by few factors like the amount of light, temperature, pH value of water and other climatic conditions.

- **Biotic components**

They constitute the producers, variety of consumers and decomposers (microorganisms).

- **Producers**

- **Phytoplankton**, literally “wandering plants,” are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants—they are protists!

- **Periphytic algae** are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.

- **Submerged plants** grow completely under water • **Floating plants** include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.

- **Emergent plants** are rooted in shallow water but their stems and leaves are above water most of the time. • **Shore plants** grow in wet soil at the edge of the pond.

- **Consumers**

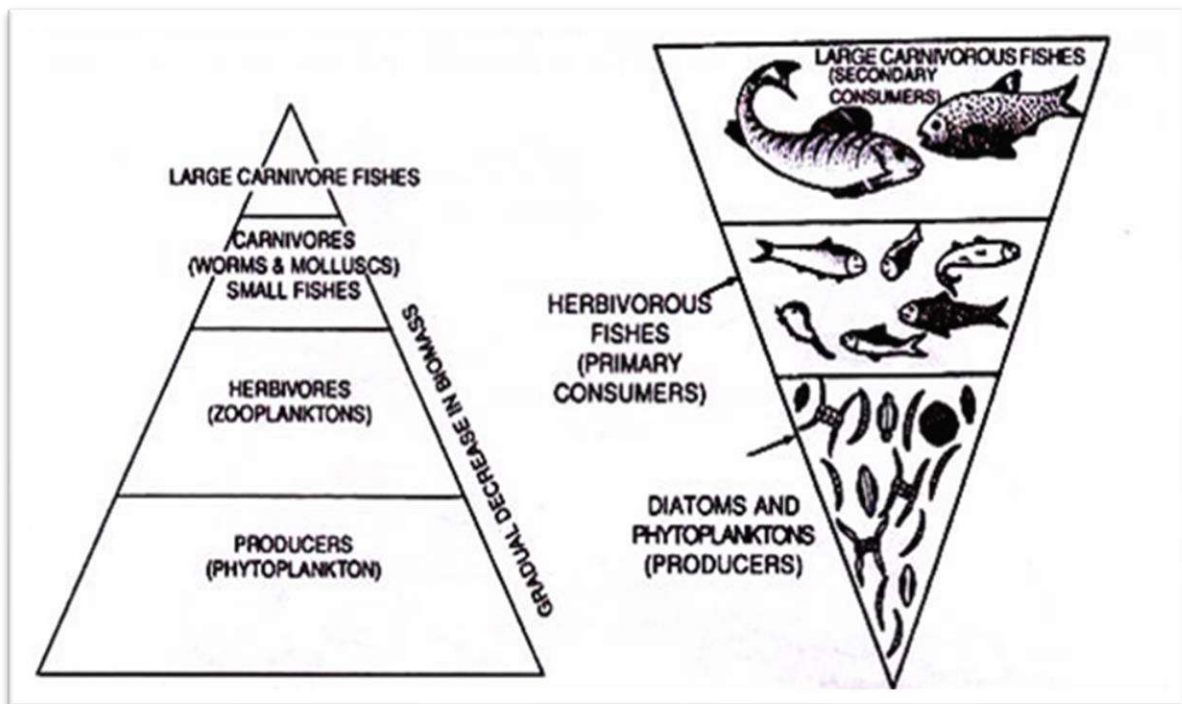
- **Zooplankton** are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.

- **Invertebrates** include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

• **Vertebrates** are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles.

### ➤ **Decomposers**

Animal waste and dead and decaying plants and animals form detritus on the bottom of the pond. Decomposers, also known as detritivores, are bacteria and other organisms like *Aspergillus*, *Cladosporium*, *Rhizopus*, *Saprolegnia* etc. that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide.



▲  
Pyramid of Biomass

## **Importance of pond ecosystems**

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

## **1. Biodiversity**

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

## **2. Ubiquity**

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

## **3. Abundance**

Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

## **4. Source of hydration**

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

## **5. Beauty**

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond, we can feel inspired, calm and in touch with nature.

## **Conclusion**

Ponds are found everywhere but yet they are endangered so we need to conserve them and protect them from getting extinct. We need to remember that we have to save something for the future generations as well. Ponds are inhabitation to many and are very important to maintain the nature.

Checked  
25 out of

PROJECT REPORT 30

## SEMESTER II

COURSE: AECC 2 (Environmental Studies)

Project Title: Visit to a local polluted site (Industrial Polluted Site)

College Roll No: PHSA20M582

CU Registration No: 223-1111-0295-20

CU Roll No: 203223-21-0046



## **ACKNOWLEDGMENT**

I would like to thank my subject teachers of AECC ENVIS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my other teachers also because without their timely help and guidance, it was impossible for me to opt and work on this project.

**INTRODUCTION:-** **Pollution** is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat, or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9 million people worldwide.

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

**INDUSTRIAL POLLUTION:-** **Industrial pollution** is the **pollution** which can be directly linked with **industry**. This form of **pollution** is one of the leading causes of **pollution** worldwide. **Industrial pollution** can also impact air quality, and it can enter the soil, causing widespread environmental problems.

**Objectives to do project on industrial pollution:-**

- (1) To make a list of the names of the industries situated in the specific industrial belt.
  
- (2) To specify how many types of pollution occurs in the industrial belt.
  
- (3) We have to list the name of the diseases which spread due to the emissions of pollutants from the industrial belt.
  
- (4) To make a plan how to reduce the pollution in the industrial belt.
  
- (5) How to keep local people free from the diseases which spreads due to the industrial pollutants.

## Survey area: Haldia Industrial Belt

**Location of survey area:** Haldia Industrial belt is one of the best industrial belt in west Bengal. **Haldia Industrial Belt** or **Haldia Industrial Zone** [1] is an industrial area established in Eastern Midnapore district, West Bengal, India. This industrial area is housed in the center of Haldia port. The main industrial center of this industrial city is Petrochemicals. Industrial area is developed with more than 350 sq km area of Haldia sub-division.

Haldia Industrial Zone is formed by river on three sides. The Rupnarayan river and Hooghly river in the north, the Hooghly river on the east and the Haldi river on the south. The industrial area is 40 km away from the Bay of Bengal by Hooghly river. The industrial area is 10 meters high from the sea level.



### RESULTS OF THE SURVEY:

**Name of the industries situated in the belt:** Indian Oil Corporation, Haldia Dock Complex, Exide Industry, Tata Chemicals, Indian Oil Petronas, Shamon Ispat, Greenways Shipping Agency, South Asian Petrochemicals, Swal corporation, Soya-Industries.

### Pollution in Haldia Industrial Belt

#### Water Pollution –

##### (a) Pollution of under-ground water in the industrial belt:

NAME	UNIT	HINDUSTAN LIVER	IOC	EXIDE
PH	-	7.93	8.04	7.41
BOD	mg/l	1.5	0.35	1
Chloride	mg/l	530.53	456.56	484.62

Mercury	mg/l	4.27	4.15	3.23
Arsenic	mg/l	nil	nil	nil

(b) Pollution in river water- The industrial pollutants causes river-water pollution. Water with metals, petroleum, halogenated hydrocarbon comes in the river water from the industries and pollute the river water. so the river-water biodiversity becomes highly affected for such pollution.



Air Pollution :-

All coal and oil-fired units situated in this area lead to air pollution. Thermal power stations based on coal causes serious levels of air pollution. Besides, in this industrial belt traffics also produces exhaust emissions what also causes air pollution. Industries emits polluted air which consists of huge amount of venomous gases (such as carbon -di oxide, sulphur-di-oxide, carbon-mono-oxide) which dangerously pollutes local atmosphere as well as effect on the health of local people.

Pollutants	Organs which become affected
Smoke	eyes
Nitrogen di oxide	lungs
Sulphur di oxide	Eyes and lungs
Carbon mono oxide	lungs



Soil pollution :- Soil in this area also get polluted by the industrial works. chemicals which have high toxicity levels can cause soil pollution . Plastics is another nonbio -degradable properties which causes soil erosion. Besides coal-dusts and petroleum also causes soil erosion in this industrial belt.



Sound Pollution:- Industrial machinery and processes are composed of various noise sources such as rotors, stators, gears, fans, vibrating panels, turbulent fluid flow, impact processes, electrical machines, internal combustion engines etc. Most of these workers are in the production and manufacturing industries.

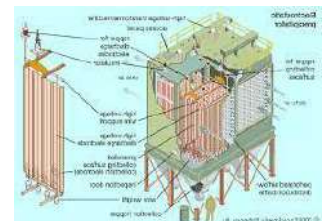


### Bad effects of such pollution in the local area:

- (1) Effects on local atmosphere :- Acid rain and the effect of smog is now the main problem in this area which are results of such pollution in this area.
- (2) Effects on trees:- The leaves ,flowers, new buds and many other parts of trees get harmed. The air pollution prevents photosynthesis procedure of the plants.
- (3)Effects on local people:- local people get highly affected by asthma, pneumonia, coughs, cancer etc.

### Steps should be taken to prevent such pollution:-

- (1)Huge number of tree plantation will prevent the air pollution.
- (2)Scrubber should be used to refine the air emitted from the industries.
- (3) An electrostatic **precipitator** (ESP) is a device that removes fine particles, like dust and smoke, from a flowing gas. It can be used to prevent air pollution.
- (4) Uses of plastics should be reduced.
- (5) Dirty water should not be directly poured in the river water. After pure refining then only the water of industries can be immersed in river water.
- (6) Sound absorbing materials should be used to reduce the noise pollution in the industrial belt. Tree plantation should be done as 'Noise Barrier' across the boundary of the industrial belt.



CONCLUSION- Haldia Industrial belt is now in a devastating problems by pollution. To make our daily life easier we need industries. But for this reason we are creating huge pollution. So, we have to think about it we will try how we can reduce pollution in this area through so many scientific steps as Haldia Industrial Belt also get a pollution free atmosphere.

## **Bibliography:**

- Asthana, D. K. (2006). *Text Book of Environmental Studies*. S. Chand Publishing.
- Basu, M., Xavier, S. (2016). *Fundamentals of Environmental Studies*, Cambridge University Press, India
- Basu, R. N., (Ed.) (2000). *Environment*. University of Calcutta, Kolkata
- Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
- De, A.K., (2006). *Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
- Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). *Environment Reader for Universities*, Centre for Science and Environment, New Delhi.
- Masters, G. M., & Ela, W. P. (1991). *Introduction to environmental engineering and science*. Englewood Cliffs, NJ: Prentice Hall.
- Odum, E. P., Odum, H. T., & Andrews, J. (1971). *Fundamentals of ecology*. Philadelphia: Saunders.
- Sharma, P. D., & Sharma, P. D. (2005). *Ecology and environment*. Rastogi Publications

## **References:**

- 1) [www.google.com](http://www.google.com)
- 2) [www.wikipedia.com](http://www.wikipedia.com)

# PROJECT REPORT

## SEMESTER II

COURSE: AECC 2 (Environmental Studies)

Project Title: Visit to a local polluted site (Industrial Polluted Site)

College Roll No: PHSA20M582

CU Registration No: 223-1111-0295-20

CU Roll No: 203223-21-0046



## **ACKNOWLEDGMENT**

I would like to thank my subject teachers of AECC ENVIS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my other teachers also because without their timely help and guidance, it was impossible for me to opt and work on this project.

**INTRODUCTION:-** **Pollution** is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat, or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9 million people worldwide.

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

**INDUSTRIAL POLLUTION:-** **Industrial pollution** is the **pollution** which can be directly linked with **industry**. This form of **pollution** is one of the leading causes of **pollution** worldwide. **Industrial pollution** can also impact air quality, and it can enter the soil, causing widespread environmental problems.

**Objectives to do project on industrial pollution:-**

- (1) To make a list of the names of the industries situated in the specific industrial belt.
  
- (2) To specify how many types of pollution occurs in the industrial belt.
  
- (3) We have to list the name of the diseases which spread due to the emissions of pollutants from the industrial belt.
  
- (4) To make a plan how to reduce the pollution in the industrial belt.
  
- (5) How to keep local people free from the diseases which spreads due to the industrial pollutants.

## Survey area: Haldia Industrial Belt

**Location of survey area:** Haldia Industrial belt is one of the best industrial belt in west Bengal. **Haldia Industrial Belt** or **Haldia Industrial Zone** [1] is an industrial area established in Eastern Midnapore district, West Bengal, India. This industrial area is housed in the center of Haldia port. The main industrial center of this industrial city is Petrochemicals. Industrial area is developed with more than 350 sq km area of Haldia sub-division.

Haldia Industrial Zone is formed by river on three sides. The Rupnarayan river and Hooghly river in the north, the Hooghly river on the east and the Haldi river on the south. The industrial area is 40 km away from the Bay of Bengal by Hooghly river. The industrial area is 10 meters high from the sea level.



### RESULTS OF THE SURVEY:

**Name of the industries situated in the belt:** Indian Oil Corporation, Haldia Dock Complex, Exide Industry, Tata Chemicals, Indian Oil Petronas, Shamon Ispat, Greenways Shipping Agency, South Asian Petrochemicals, Swal corporation, Soya-Industries.

### Pollution in Haldia Industrial Belt

#### Water Pollution –

##### (a) Pollution of under-ground water in the industrial belt:

NAME	UNIT	HINDUSTAN LIVER	IOC	EXIDE
PH	-	7.93	8.04	7.41
BOD	mg/l	1.5	0.35	1
Chloride	mg/l	530.53	456.56	484.62

Mercury	mg/l	4.27	4.15	3.23
Arsenic	mg/l	nil	nil	nil

(b) Pollution in river water- The industrial pollutants causes river-water pollution. Water with metals, petroleum, halogenated hydrocarbon comes in the river water from the industries and pollute the river water. so the river-water biodiversity becomes highly affected for such pollution.



Air Pollution :-

All coal and oil-fired units situated in this area lead to air pollution. Thermal power stations based on coal causes serious levels of air pollution. Besides, in this industrial belt traffics also produces exhaust emissions what also causes air pollution. Industries emits polluted air which consists of huge amount of venomous gases (such as carbon -di oxide, sulphur-di-oxide, carbon-mono-oxide) which dangerously pollutes local atmosphere as well as effect on the health of local people.

Pollutants	Organs which become affected
Smoke	eyes
Nitrogen di oxide	lungs
Sulphur di oxide	Eyes and lungs
Carbon mono oxide	lungs



Soil pollution :- Soil in this area also get polluted by the industrial works. chemicals which have high toxicity levels can cause soil pollution . Plastics is another nonbio -degradable properties which causes soil erosion. Besides coal-dusts and petroleum also causes soil erosion in this industrial belt.



Sound Pollution:- Industrial machinery and processes are composed of various noise sources such as rotors, stators, gears, fans, vibrating panels, turbulent fluid flow, impact processes, electrical machines, internal combustion engines etc. Most of these workers are in the production and manufacturing industries.

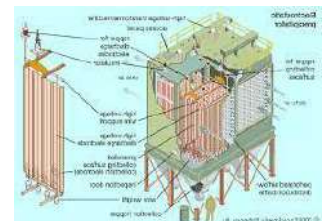


### Bad effects of such pollution in the local area:

- (1) Effects on local atmosphere :- Acid rain and the effect of smog is now the main problem in this area which are results of such pollution in this area.
- (2) Effects on trees:- The leaves ,flowers, new buds and many other parts of trees get harmed. The air pollution prevents photosynthesis procedure of the plants.
- (3)Effects on local people:- local people get highly affected by asthma, pneumonia, coughs, cancer etc.

### Steps should be taken to prevent such pollution:-

- (1)Huge number of tree plantation will prevent the air pollution.
- (2)Scrubber should be used to refine the air emitted from the industries.
- (3) An electrostatic **precipitator** (ESP) is a device that removes fine particles, like dust and smoke, from a flowing gas. It can be used to prevent air pollution.
- (4) Uses of plastics should be reduced.
- (5) Dirty water should not be directly poured in the river water. After pure refining then only the water of industries can be immersed in river water.
- (6) Sound absorbing materials should be used to reduce the noise pollution in the industrial belt. Tree plantation should be done as 'Noise Barrier' across the boundary of the industrial belt.



CONCLUSION- Haldia Industrial belt is now in a devastating problems by pollution. To make our daily life easier we need industries. But for this reason we are creating huge pollution. So, we have to think about it we will try how we can reduce pollution in this area through so many scientific steps as Haldia Industrial Belt also get a pollution free atmosphere.

## **Bibliography:**

- Asthana, D. K. (2006). *Text Book of Environmental Studies*. S. Chand Publishing.
- Basu, M., Xavier, S. (2016). *Fundamentals of Environmental Studies*, Cambridge University Press, India
- Basu, R. N., (Ed.) (2000). *Environment*. University of Calcutta, Kolkata
- Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
- De, A.K., (2006). *Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
- Mahapatra, R., Jeevan, S.S., Das, S. (Eds) (2017). *Environment Reader for Universities*, Centre for Science and Environment, New Delhi.
- Masters, G. M., & Ela, W. P. (1991). *Introduction to environmental engineering and science*. Englewood Cliffs, NJ: Prentice Hall.
- Odum, E. P., Odum, H. T., & Andrews, J. (1971). *Fundamentals of ecology*. Philadelphia: Saunders.
- Sharma, P. D., & Sharma, P. D. (2005). *Ecology and environment*. Rastogi Publications

## **References:**

- 1) [www.google.com](http://www.google.com)
- 2) [www.wikipedia.com](http://www.wikipedia.com)

# PROJECT REPORT

## SEMESTER II

COURSE: AECC2(Environmental Studies)

### *Ecosystem*

Checked  
24 out of  
30

College Roll No:- PHSA20M584

CU Registration No:- 223-1111-0309-20

CU Roll No:- 203223-21-0051



# *Acknowledgement*

I am extremely grateful to our professors of Environmental Science who gave me the opportunity to do this wonderful project on Ecosystem and various aspects of it. The completion of the project work and doing it would not have been possible without the constant motivation of the HOD of our Physics Department Dr. Jayeeta Chowdhury .

Undertaking this project has been beneficial to me in ways more than one. Besides learning time management, perseverance and other basic human skills it helped a lot to know about our environment which protects and feeds us both directly and indirectly. Being a student of Physics honours I do not really get chance very often to study on environmental matters or keep myself updated with the recent happenings in the world related to safeguarding the environment. During the research of it, I felt we all should be a little more conscious about the surroundings around us and give a little more time to admiring nature and learning about it.

- Koushik Das



# CONTENTS

	<u>Page number</u>
1. Introduction	4
2. Aim of the project	4
3. Main Project Work	5 - 8
4. Conclusion	9
5. Reference	9

- **Introduction**

An ecosystem is defined as a dynamic entity composed of a biological community and its associated abiotic environment. Often the dynamic interactions that occur within an ecosystem are numerous and complex. Ecosystems are also always undergoing alterations to their biotic and abiotic components. Some of these alterations begin first with a change in the state of one component of the ecosystem which then cascades and sometimes amplifies into other components because of relationships.

In recent years, the impact of humans has caused a number of dramatic changes to a variety of ecosystems found on the Earth. Humans use and modify natural ecosystems through agriculture, forestry, recreation, urbanization, and industry. The most obvious impact of humans on ecosystems is the loss of biodiversity. The number of extinctions caused by human domination of ecosystems has been steadily increasing since the start of the Industrial Revolution. The frequency of species extinctions is correlated to the size of human population on the Earth which is directly related to resource consumption, land-use change, and environmental degradation. Other human impacts to ecosystems include species invasions to new habitats, changes to the abundance and dominance of species in communities, modification of biogeochemical cycles, modification of hydrologic cycling, pollution, and climatic change.

- **Aims of this Project**

The aim of ecosystem education is clearly to show the economic, social, political and ecological interdependence of the modern world, in which decisions and actions by different countries can have international repercussions. Ecosystem education should, in this regard, help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the ecosystem.

Therefore, necessary steps for environmental education are:

(a) Awareness

(b) Knowledge

(c) Attitude building for motivating to protect our ecosystem

- **What is an Ecosystem?**

- An ecosystem is a natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.

- **Types of Ecosystem:**

- An ecosystem can be as small as an oasis in desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem:

- Terrestrial Ecosystem
- Aquatic Ecosystem

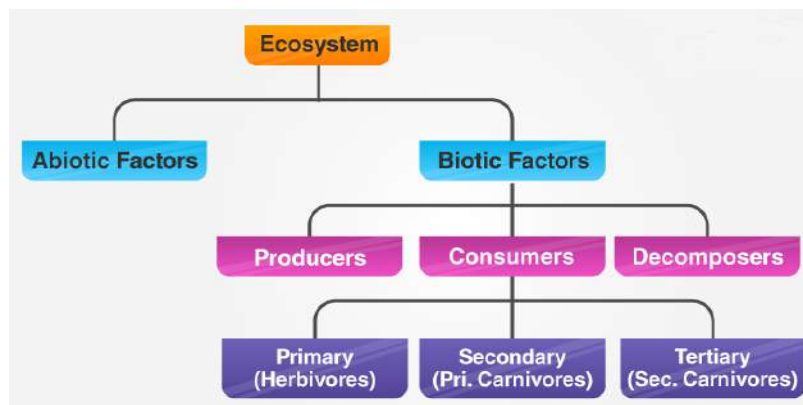
- **Components of Ecosystem:**

- **Abiotic or Non-living components:**

1. Inorganic substances
2. Organic compounds
3. Climatic factors

- **Biotic or Living components:**

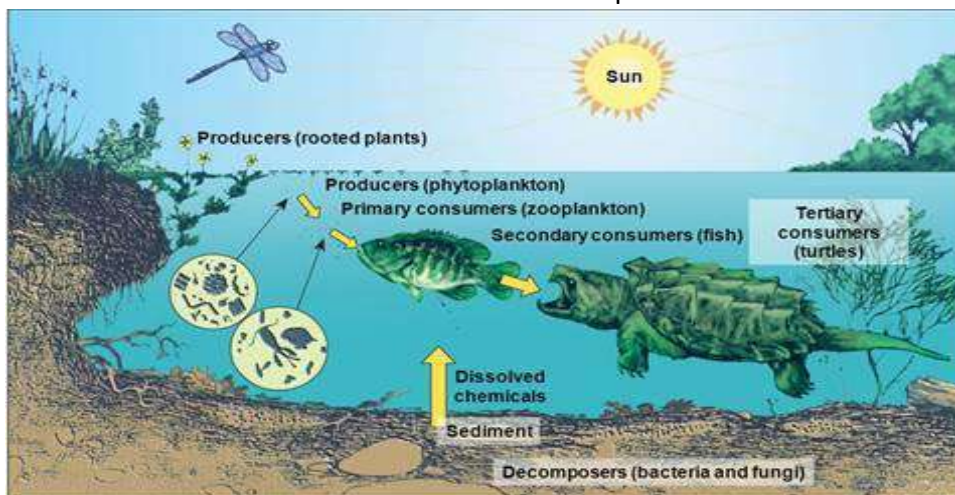
1. Autotrophs or Producers
2. Heterotrophs or Consumers
3. Decomposers or Saprotrophs



- **Examples of Ecosystem:**

1. **Ecosystem of Pond:**

The pond is a small body of standing water and the pond ecosystem is complex interactions between its biotic and abiotic components.



- **Abiotic components:** Light, temperature, water, Soil, O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, nitrates, carbonates, carbohydrates, proteins, amino acids

- **Biotic components :**

Producers:

Phytoplanktons: Spirogyra, Zygnema, Volvox, Oedogonium.

Submerged plants: those, which are submerged in water, are submerged plants eg Hydrilla and Utricularia

Floating plants: those, which float freely in water surface, are called floating plants eg. Pistia, Nymphaea etc.

Consumers:

Primary consumers: Zooplankton, Neckton

Secondary consumers: Insects, fishes, frogs, crab etc.

Tertiary consumers: Large fishes and frogs.

Top consumers: Water snake, water birds etc.

Decomposers: These include micro organisms such as bacteria fungi, which break down the organic complex food from dead producers and consumers into simple inorganic compounds made available to the producers.

## 2. Ecosystem of Forest :

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem.

- Abiotic Components: Light, temperature, water, Soil, air, carbohydrates, proteins
- Biotic Components:

**Producer:** 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.

**Consumers:**

**Primary consumers:** Herbivorous animals, like- rat, guinea pig, buffalo, giraffe, deer

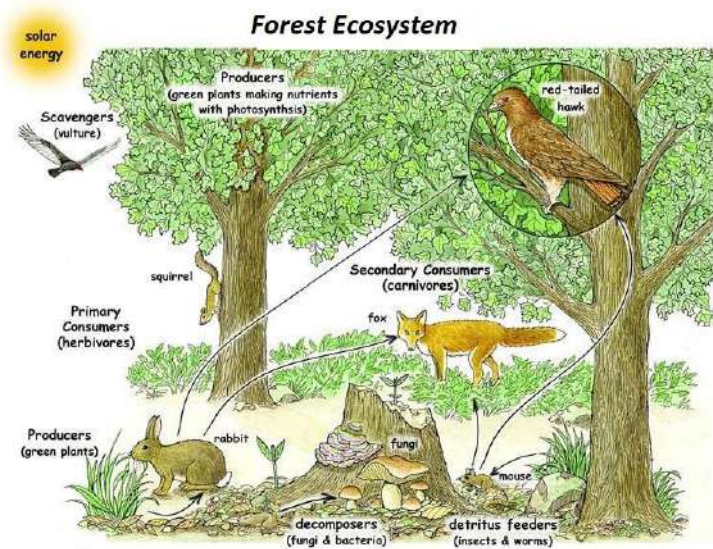
**Secondary consumers:** Insectivorous birds, frog, hyena, wolf etc.

**Tertiary consumers:** Tiger, Lion, Eagle, Hawk, Falcon etc.

**Decomposers:** These include micro organisms such as bacteria, fungi .

## 3. Ecosystem of Wetland:

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil.



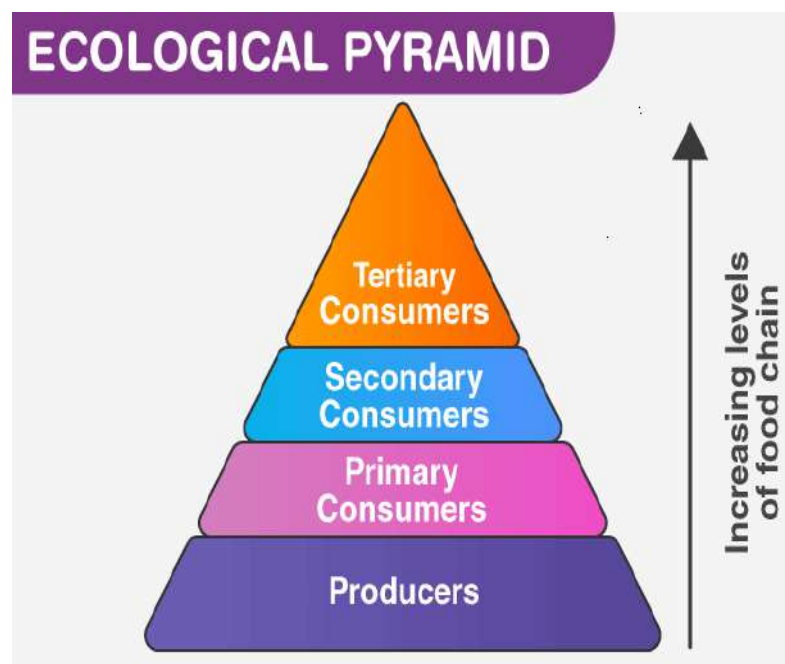
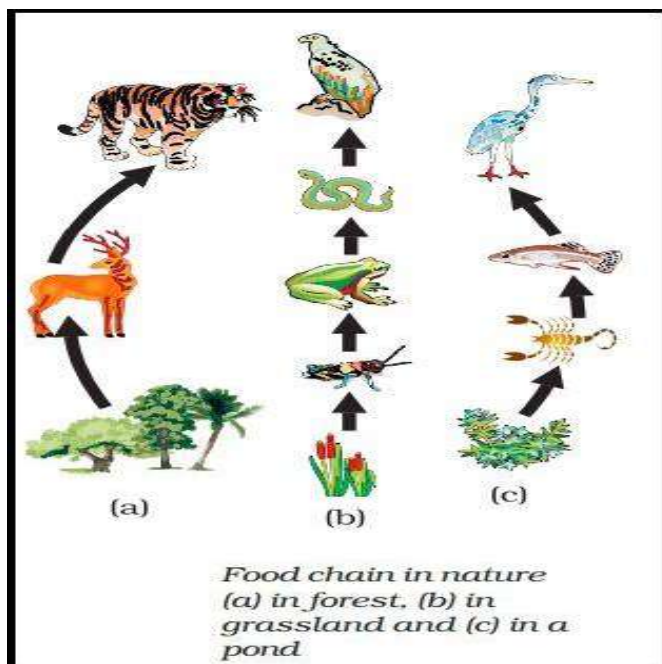
#### 4. Ecosystem of Estuary:

These are areas where both ocean and land contribute to a unique ecosystem. A basic feature is the instability of an estuary due to the ebb and flood of the tide. Plant and animal wastes are washed away, sediment is shifted and fresh and salt water are mixed.

- **Important Ecological Concepts:**

1. Food Chain:

A food chain is a linear network of links in a food web starting from producer organisms and ending at an apex predator species, detritivores, or decomposer species. A food chain also shows how organisms are related to each other by the food they eat. Each level of a food chain represents a different trophic level.

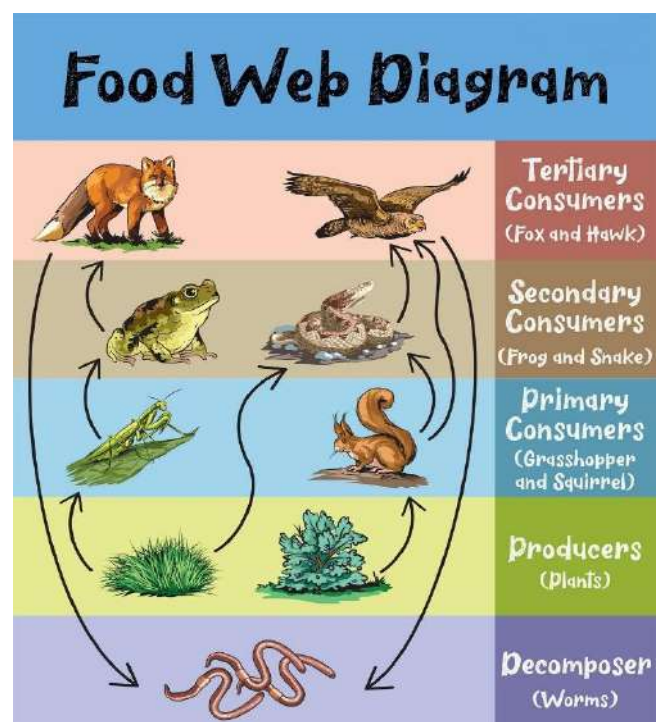


2. Ecological Pyramids:

An ecological pyramid (also trophic pyramid, Eltonian pyramid, energy pyramid, or sometimes food pyramid) is a graphical representation designed to show the biomass or bioproductivity at each trophic level in a given ecosystem.

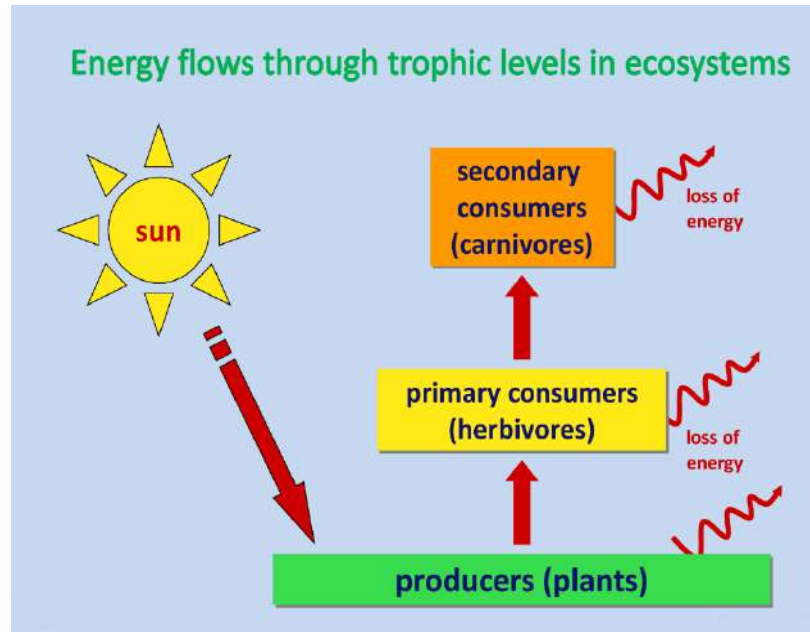
3. Food Web:

Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer.



- **ENERGY FLOW THROUGH THE ECOSYSTEM:**

The transfer of energy and matter takes place in the process of predator and prey relationship in a food chain. The original source of energy is the energy from the sun. Out of the enormous amount of energy continuously radiated by the sun, most of it is reflected or refracted back (by atmosphere, earth surface and object like plants). Only a very small fraction, about one per cent, of the solar energy received by the plant is used through the process of photosynthesis.



- **Importance of Ecosystem:**

1. It provides habitat to wild plants and animals.
2. It promotes various food chains and food webs.
3. It controls essential ecological processes and promotes lives.
4. Involved in the recycling of nutrients between biotic and abiotic components.
5. It helps in maintaining the usual flow of energy in an ecosystem including- Carbon Cycle, Energy Cycle, Nitrogen Cycle, Oxygen Cycle, and Water Cycle.

Apart from these importances, the ecosystem also plays an important role in controlling weeds, rotation of crop, management of grasslands, forests, biological surveys, conservation of soil, wildlife, etc.

- **The Five Global Threats to Ecosystem Viability:**

1. Depletion of world's tropical forests
2. Extinction of species
3. Rapid population growth
4. Shortage of fresh water resources
5. Threats to human health
6. Climate change

## • Conclusion

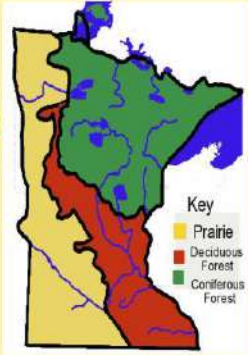
People, animals and plants depend on healthy ecosystems. Our everyday lives and luxuries would not be possible without their services and resources . In A Sand County Almanac, author and ecologist Aldo Leopold states, "We abuse the land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." Restoration gives us an opportunity to improve our relationship to the ecosystems we depend on, and allows us to become a constructive part of the communities that create our region's natural environment.

### Healthy Ecosystems

Components of a healthy ecosystem include:

- sunlight (energy source)
- living organisms (producers, consumers, decomposers; predator/prey)
- nonliving things (land forms, water sources, soil, rocks)
- dead organisms
- natural boundaries (set by the living and nonliving things within the area)

**Biodiversity:**  
the greater the biodiversity of the living organisms, the healthier the ecosystem



**Carrying Capacity & limiting factors:**  
Balance is the key to healthy ecosystems

## • Reference

[www.google.com](http://www.google.com)

[www.ecosia.org](http://www.ecosia.org)

[www.wikipedia.com](http://www.wikipedia.com)

<https://byjus.com>

[www.yourarticlelibrary.com](http://www.yourarticlelibrary.com)



# PROJECT REPORT

## SEMESTER II

COURSE: AECC2(Environmental Studies)

### *Ecosystem*

College Roll No:- PHSA20M584

CU Registration No:- 223-1111-0309-20

CU Roll No:- 203223-21-0051

# *Acknowledgement*

I am extremely grateful to our professors of Environmental Science who gave me the opportunity to do this wonderful project on Ecosystem and various aspects of it. The completion of the project work and doing it would not have been possible without the constant motivation of the HOD of our Physics Department Dr. Jayeeta Chowdhury .

Undertaking this project has been beneficial to me in ways more than one. Besides learning time management, perseverance and other basic human skills it helped a lot to know about our environment which protects and feeds us both directly and indirectly. Being a student of Physics honours I do not really get chance very often to study on environmental matters or keep myself updated with the recent happenings in the world related to safeguarding the environment. During the research of it, I felt we all should be a little more conscious about the surroundings around us and give a little more time to admiring nature and learning about it.

- Koushik Das



# CONTENTS

	<u>Page number</u>
1. Introduction	4
2. Aim of the project	4
3. Main Project Work	5 - 8
4. Conclusion	9
5. Reference	9

- **Introduction**

An ecosystem is defined as a dynamic entity composed of a biological community and its associated abiotic environment. Often the dynamic interactions that occur within an ecosystem are numerous and complex. Ecosystems are also always undergoing alterations to their biotic and abiotic components. Some of these alterations begin first with a change in the state of one component of the ecosystem which then cascades and sometimes amplifies into other components because of relationships.

In recent years, the impact of humans has caused a number of dramatic changes to a variety of ecosystems found on the Earth. Humans use and modify natural ecosystems through agriculture, forestry, recreation, urbanization, and industry. The most obvious impact of humans on ecosystems is the loss of biodiversity. The number of extinctions caused by human domination of ecosystems has been steadily increasing since the start of the Industrial Revolution. The frequency of species extinctions is correlated to the size of human population on the Earth which is directly related to resource consumption, land-use change, and environmental degradation. Other human impacts to ecosystems include species invasions to new habitats, changes to the abundance and dominance of species in communities, modification of biogeochemical cycles, modification of hydrologic cycling, pollution, and climatic change.

- **Aims of this Project**

The aim of ecosystem education is clearly to show the economic, social, political and ecological interdependence of the modern world, in which decisions and actions by different countries can have international repercussions. Ecosystem education should, in this regard, help to develop a sense of responsibility and solidarity among countries and regions as the foundation for a new international order which will guarantee the conservation and improvement of the ecosystem.

Therefore, necessary steps for environmental education are:

(a) Awareness

(b) Knowledge

(c) Attitude building for motivating to protect our ecosystem

- **What is an Ecosystem?**

- An ecosystem is a natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.

- **Types of Ecosystem:**

- An ecosystem can be as small as an oasis in desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem:

- Terrestrial Ecosystem
- Aquatic Ecosystem

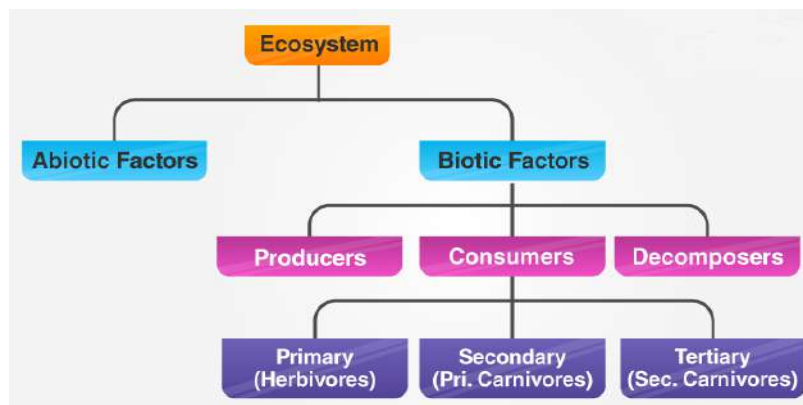
- **Components of Ecosystem:**

- **Abiotic or Non-living components:**

1. Inorganic substances
2. Organic compounds
3. Climatic factors

- **Biotic or Living components:**

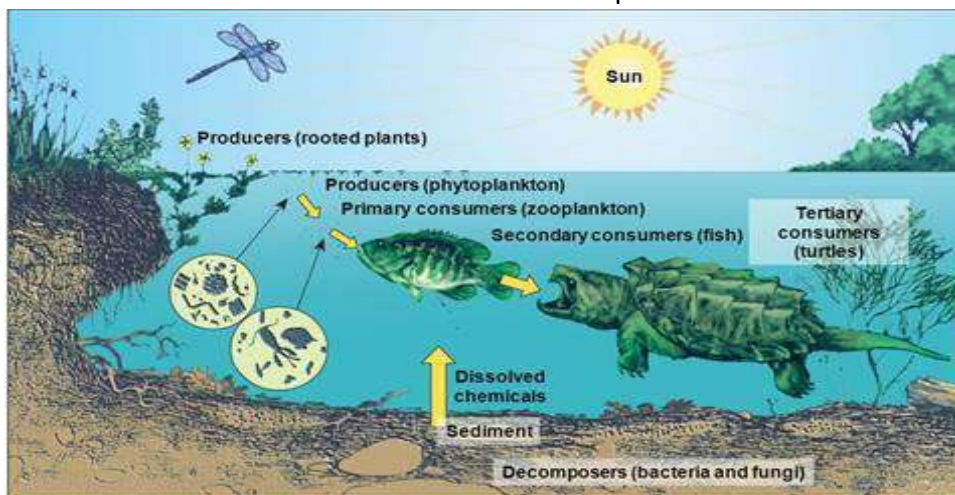
1. Autotrophs or Producers
2. Heterotrophs or Consumers
3. Decomposers or Saprotrophs



- **Examples of Ecosystem:**

1. **Ecosystem of Pond:**

The pond is a small body of standing water and the pond ecosystem is complex interactions between its biotic and abiotic components.



- **Abiotic components:** Light, temperature, water, Soil, O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, nitrates, carbonates, carbohydrates, proteins, amino acids

- **Biotic components :**

Producers:

Phytoplanktons: Spirogyra, Zygnema, Volvox, Oedogonium.

Submerged plants: those, which are submerged in water, are submerged plants eg Hydrilla and Utricularia

Floating plants: those, which float freely in water surface, are called floating plants eg. Pistia, Nymphaea etc.

Consumers:

Primary consumers: Zooplankton, Neckton

Secondary consumers: Insects, fishes, frogs, crab etc.

Tertiary consumers: Large fishes and frogs.

Top consumers: Water snake, water birds etc.

Decomposers: These include micro organisms such as bacteria fungi, which break down the organic complex food from dead producers and consumers into simple inorganic compounds made available to the producers.

## 2. Ecosystem of Forest :

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem.

- Abiotic Components: Light, temperature, water, Soil, air, carbohydrates, proteins
- Biotic Components:

**Producer:** 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.

**Consumers:**

**Primary consumers:** Herbivorous animals, like- rat, guinea pig, buffalo, giraffe, deer

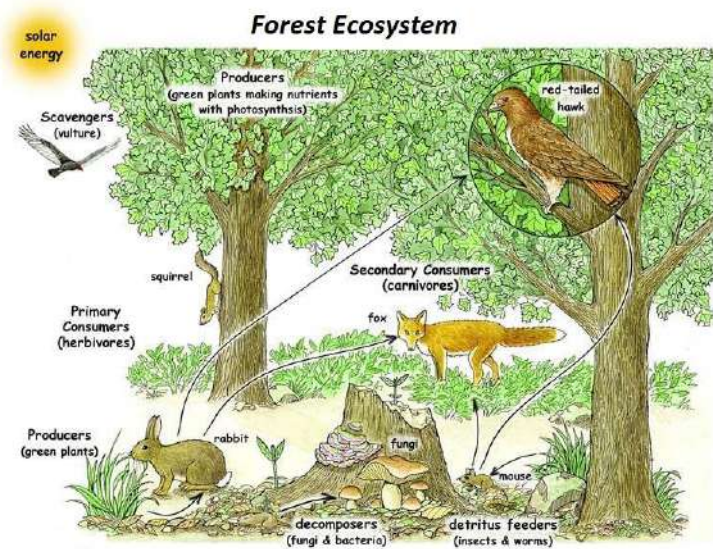
**Secondary consumers:** Insectivorous birds, frog, hyena, wolf etc.

**Tertiary consumers:** Tiger, Lion, Eagle, Hawk, Falcon etc.

**Decomposers:** These include micro organisms such as bacteria, fungi .

## 3. Ecosystem of Wetland:

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil.



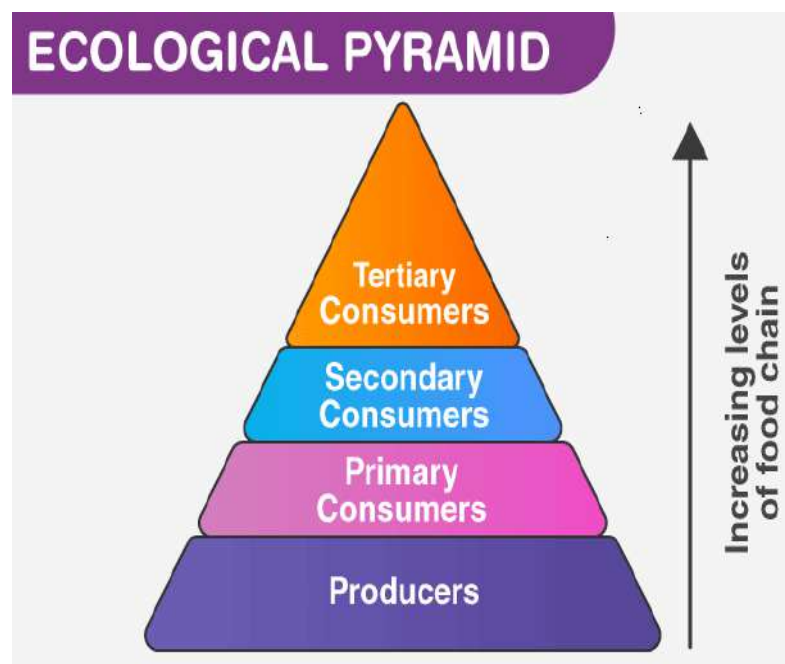
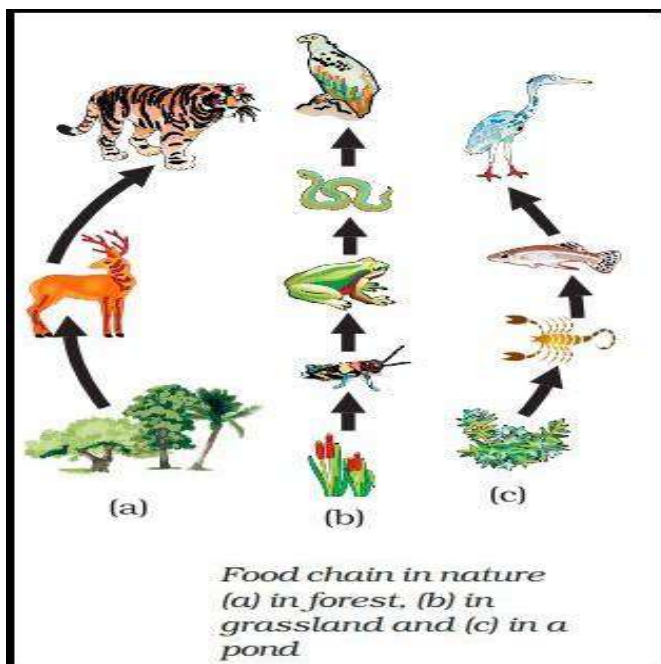
#### 4. Ecosystem of Estuary:

These are areas where both ocean and land contribute to a unique ecosystem. A basic feature is the instability of an estuary due to the ebb and flood of the tide. Plant and animal wastes are washed away, sediment is shifted and fresh and salt water are mixed.

- **Important Ecological Concepts:**

1. Food Chain:

A food chain is a linear network of links in a food web starting from producer organisms and ending at an apex predator species, detritivores, or decomposer species. A food chain also shows how organisms are related to each other by the food they eat. Each level of a food chain represents a different trophic level.

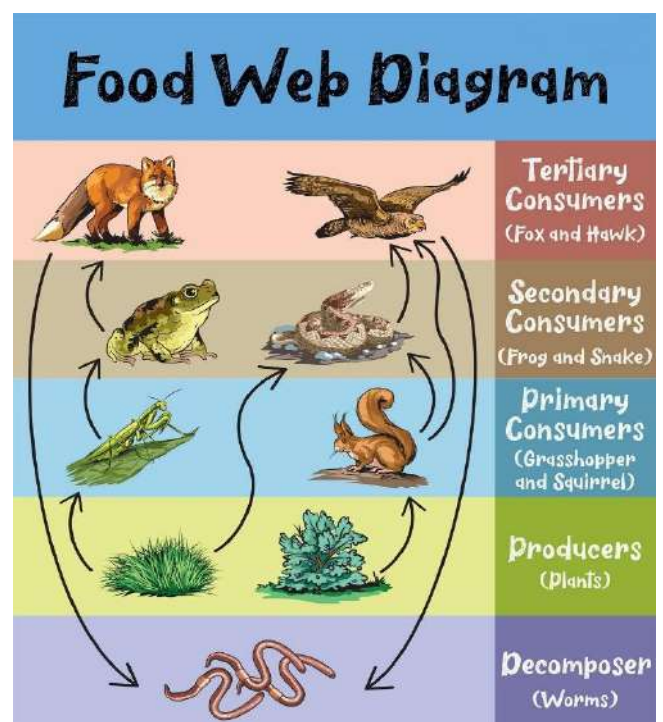


2. Ecological Pyramids:

An ecological pyramid (also trophic pyramid, Eltonian pyramid, energy pyramid, or sometimes food pyramid) is a graphical representation designed to show the biomass or bioproductivity at each trophic level in a given ecosystem.

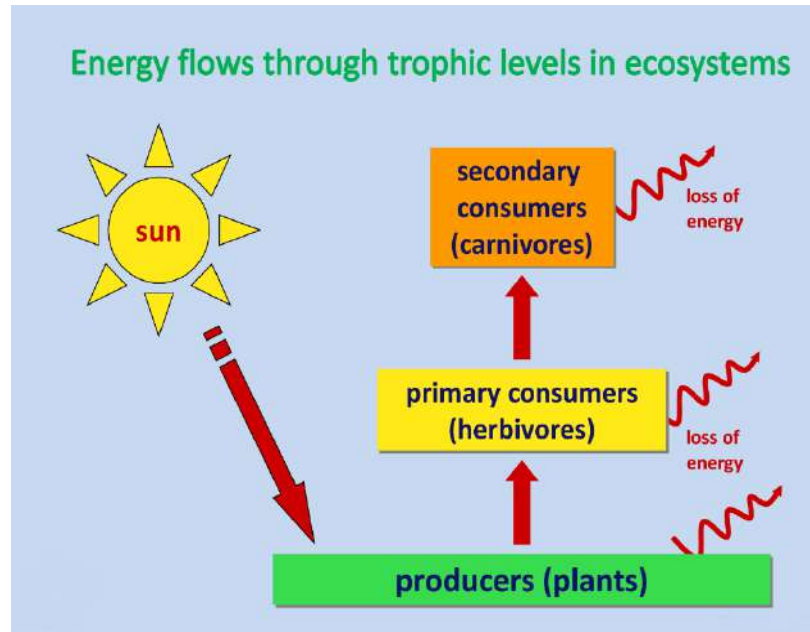
3. Food Web:

Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer.



- **ENERGY FLOW THROUGH THE ECOSYSTEM:**

The transfer of energy and matter takes place in the process of predator and prey relationship in a food chain. The original source of energy is the energy from the sun. Out of the enormous amount of energy continuously radiated by the sun, most of it is reflected or refracted back (by atmosphere, earth surface and object like plants). Only a very small fraction, about one per cent, of the solar energy received by the plant is used through the process of photosynthesis.



- **Importance of Ecosystem:**

1. It provides habitat to wild plants and animals.
2. It promotes various food chains and food webs.
3. It controls essential ecological processes and promotes lives.
4. Involved in the recycling of nutrients between biotic and abiotic components.
5. It helps in maintaining the usual flow of energy in an ecosystem including- Carbon Cycle, Energy Cycle, Nitrogen Cycle, Oxygen Cycle, and Water Cycle.

Apart from these importances, the ecosystem also plays an important role in controlling weeds, rotation of crop, management of grasslands, forests, biological surveys, conservation of soil, wildlife, etc.

- **The Five Global Threats to Ecosystem Viability:**

1. Depletion of world's tropical forests
2. Extinction of species
3. Rapid population growth
4. Shortage of fresh water resources
5. Threats to human health
6. Climate change



## • Conclusion

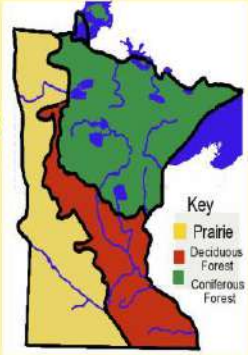
People, animals and plants depend on healthy ecosystems. Our everyday lives and luxuries would not be possible without their services and resources . In A Sand County Almanac, author and ecologist Aldo Leopold states, "We abuse the land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to use it with love and respect." Restoration gives us an opportunity to improve our relationship to the ecosystems we depend on, and allows us to become a constructive part of the communities that create our region's natural environment.

### Healthy Ecosystems

Components of a healthy ecosystem include:

- sunlight (energy source)
- living organisms (producers, consumers, decomposers; predator/prey)
- nonliving things (land forms, water sources, soil, rocks)
- dead organisms
- natural boundaries (set by the living and nonliving things within the area)

**Biodiversity:**  
the greater the biodiversity of the living organisms, the healthier the ecosystem



**Carrying Capacity & limiting factors:**  
Balance is the key to healthy ecosystems

## • Reference

[www.google.com](http://www.google.com)

[www.ecosia.org](http://www.ecosia.org)

[www.wikipedia.com](http://www.wikipedia.com)

<https://byjus.com>

[www.yourarticlelibrary.com](http://www.yourarticlelibrary.com)

PROJECT

REPORT

SEMESTER II

COURSE : AECC2 [Environmental Science]

PROJECT TITLE :

BIODIVERSITY OF JUNDARBANS

Checked  
24 out of  
30

COLLEGE ROLL No. : PHSA20M587

CU REGISTRATION No. : 223-1111-0318-20

CU ROLL No. : 203223-21-0054

No. OF PAGES WRITTEN INCLUDING FRONT PAGE : 06

## Introduction

Biodiversity can be defined as biological diversity, the great variety of all living organisms on Earth, manifest at three different interlinked levels; the Genes, the Species, the Eco-system, the basic unit being the species.

## Biodiversity of Sunderbans

The most prominent feature of this region is the presence of mangrove ecosystem that dominates the entire landscape.

Tree Mangrove Species = 26

Mangrove associates = 29

Back Mangrove Species = 29

Family = 40

Genera = 60

## Method of Study Sunderbans

Making these project I use on spot experience and internet.

- DATE → MAY, 2021
- TIME → 7 DAYS

## Location of The Area (Sundarbans)

Indian Sundarbans delta is spread over about 9630 square kilometers between  $21^{\circ}40'04''$  N and  $22^{\circ}09'21''$  N latitude, and  $89^{\circ}06'0''$  E and  $88^{\circ}01'56''$  E longitude. about 4260 square kilometers reserved forest is under the State Forest Department.

Sundarbans can be divided into three different zones :

- (1) The Core Zone : 1700 sq. km. Matla river in the west end butts into Bay of Bengal.
- (2) Buffer Zone : Between Matla and Thakuran under 24 Parganas (South) Forest Division.
- (3) Transition Zone : Covers the balance of Biosphere Reserve area.

## Plant Species (Flora)

Sundari, Gewu, Nypa palm and several other of 27 species of mangrove, Baen (*Avicennia marina*, *A. alba*), foreshore grassland of *Oryza coarctata* (Dhoni grass), Baen is gradually

was replaced by *Grewia* (*Excoecaria agallocha*) and then *Gorom* (*Ceriops* Sp.). The ~~Sot~~Southern and eastern associates include *Garjan* (*Rhizophora* sp.) and few patches of *Sundari* (*Heritiera fomes*), *Hatal* (*Phoenix* sp.), *Dhundul* (*Xylocarpus granatum*), *passur* (*Xylocarpus mekongensis*) and *Nipa fruticans* (*Golpata*) palm swamps are extremely limited.

### Animal Species (Fauna)

58 species of mammals, 55 species of reptiles and around 248 bird species, threatened animals including *Estuarine crocodile* (*Crocodylus porosus*), *Fishing cat* (*Felis viverrina*), *Common otter* (*Lutra lutra*), *water monitor lizard* (*Varanus salvator*), *Gangetic dolphin* (*Platinista gangetica*), *Snub fin dolphin* (*Orcaella brevirostris*), *River terrapin* (*Batagur baska*), *marine turtles* like *Olive Ridley*, *Green sea turtle*, *Hawksbill turtle*, *Wild bears*, *spotted deer*, *Porcupine* and *Rhesus macaque*. Among reptiles → *King cobra*, *common cobra*, *Banded krait*, *Python*, *Chequered kit back*, *Dhama*, *Green whip snake*. The most popular species is *Royal Bengal tiger*.

Green & pigeons, Sand pipers, Seagulls, Teals, great variety of wild geese and ducks. Gutter fish, Hilsa ilisha, Fiddler crabs, Horse shoe crab, mind skipper fish.

## Loss of Biodiversity

### (I) Quasi-natural phenomenon:

Human encroachment into wild areas over-population. Resettled poor people depends intensively on Sundarbans. Occupations like fishing, poaching, deforestation, collection of honey, snakes, other animals etc.

Pollution through industrial waste, pesticides, insecticide and domestic ~~water~~ waste into water.

Agriculture lands converted to aquaculture land scarcity of fresh water in dry season.

Organizational and infrastructural deficiency. All continuous trampling cause reduction of wildlife habitat.

### (II) Natural Phenomenon:

Global warming, climate change, Effect of natural calamities, Increased salinity of water and soil.

## Biodiversity Management

The Sundarbans Biosphere Reserve has three main objectives taken by the government. Restoration of unique mangrove ecosystem of Sundarbans and conservation of its ~~di~~ biodiversity. Development of sustainable economic, social activities of the population living in the Biosphere Reserve.

Facilitating research, monitoring, education and training to perpetuate the achievements made.

Besides these, Sundarbans Tiger Reserve Programme has been successfully running by the Govt. involving the local people which has to be continued in its true spirit. Sundarbans National Park (1330 sq. km.), Sajnekhali Wildlife Sanctuary (362 sq. km.), Lothian Wildlife Sanctuary (38 sq. km.) & Holiday Wildlife Sanctuary (~~3~~ 6 sq. km.) are also built to preserve its biodiversity.

## Conclusion

Sundarbans is a natural treasure house of biodiversity and it is our duty to preserve it not only for the benefit of the people, but for entire flora and fauna through sustainable development.

PROJECT

REPORT

SEMESTER II

COURSE : AECC2 [Environmental Science]

PROJECT TITLE :

BIODIVERSITY OF SUNDARBANS

COLLEGE ROLL No. : PHSA20M587

CU REGISTRATION No. : 223-1111-0318-20

CU ROLL No. : 203223-21-0054

No. OF PAGES WRITTEN INCLUDING FRONT PAGE : 06



## Introduction

Biodiversity can be defined as biological diversity, the great variety of all living organisms on Earth, manifest at three different interlinked levels; the Genes, the Species, the Eco-system, the basic unit being the species.

## Biodiversity of Sunderbans

The most prominent feature of this region is the presence of mangrove ecosystem that dominates the entire landscape.

Tree Mangrove Species = 26

Mangrove associates = 29

Back Mangrove Species = 29

Family = 40

Genera = 60

## Method of Study Sunderbans

Making these project I use on spot experience and internet.

- DATE → MAY, 2021
- TIME → 7 DAYS

## Location of The Area (Sundarbans)

Indian Sundarbans delta is spread over about 9630 square kilometers between  $21^{\circ}40'04''$  N and  $22^{\circ}09'21''$  N latitude, and  $89^{\circ}06'0''$  E and  $88^{\circ}01'56''$  E longitude. about 4260 square kilometers reserved forest is under the State Forest Department.

Sundarbans can be divided into three different zones :

- (1) The Core Zone : 1700 sq. km. Matla river in the west end butts into Bay of Bengal.
- (2) Buffer Zone : Between Matla and Thakuran under 24 Parganas (South) Forest Division.
- (3) Transition Zone : Covers the balance of Biosphere Reserve area.

## Plant Species (Flora)

Sundari, Gewu, Nypa palm and several other of 27 species of mangrove, Baen (*Avicennia marina*, *A. alba*), foreshore grassland of *Oryza coarctata* (Dhoni grass), Baen is gradually

was replaced by *Grewia* (*Excoecaria agallocha*) and then *Gorom* (*Ceriops* Sp.). The ~~Sot~~Southern and eastern associates include *Garjan* (*Rhizophora* sp.) and few patches of *Sundari* (*Heritiera fomes*), *Hatal* (*Phoenix* sp.), *Dhundul* (*Xylocarpus granatum*), *passur* (*Xylocarpus mekongensis*) and *Nipa fruticans* (*Golpata*) palm swamps are extremely limited.

### Animal Species (Fauna)

58 species of mammals, 55 species of reptiles and around 248 bird species, threatened animals including *Estuarine crocodile* (*Crocodylus porosus*), *Fishing cat* (*Felis viverrina*), *Common otter* (*Lutra lutra*), *water monitor lizard* (*Varanus salvator*), *Gangetic dolphin* (*Platanista gangetica*), *Snub fin dolphin* (*Orcella brevirostris*), *River terrapin* (*Batagur baska*), *marine turtles* like *Olive Ridley*, *Green sea turtle*, *Hawksbill turtle*, *Wild bears*, *spotted deer*, *Porcupine* and *Rhesus macaque*. Among reptiles → *King cobra*, *common cobra*, *Banded krait*, *Python*, *Chequered kit back*, *Dhama*, *Green whip snake*. The most popular species is *Royal Bengal tiger*.

Green & pigeons, Sand pipers, Seagulls, Teals, great variety of wild geese and ducks. Gutter fish, Hilsa ilisha, Fiddler crabs, Horse shoe crab, mind skipper fish.

## Loss of Biodiversity

### (I) Quasi-natural phenomenon:

Human encroachment into wild areas over-population. Resettled poor people depends intensively on Sundarbans. Occupations like fishing, poaching, deforestation, collection of honey, snakes, other animals etc.

Pollution through industrial waste, pesticides, insecticide and domestic ~~water~~ waste into water.

Agriculture lands converted to aquaculture land scarcity of fresh water in dry season.

Organizational and infrastructural deficiency. All continuous trampling cause reduction of wildlife habitat.

### (II) Natural Phenomenon:

Global warming, climate change, Effect of natural calamities, Increased salinity of water and soil.

## Biodiversity Management

The Sundarbans Biosphere Reserve has three main objectives taken by the government. Restoration of unique mangrove ecosystem of Sundarbans and conservation of its ~~di~~ biodiversity. Development of sustainable economic, social activities of the population living in the Biosphere Reserve.

Facilitating research, monitoring, education and training to perpetuate the achievements made.

Besides these, Sundarbans Tiger Reserve Programme has been successfully running by the Govt. involving the local people which has to be continued in its true spirit. Sundarbans National Park (1330 sq. km.), Sajnekhali Wildlife Sanctuary (362 sq. km.), Lothian Wildlife Sanctuary (38 sq. km.) & Holiday Wildlife Sanctuary (~~3~~ 6 sq. km.) are also built to preserve its biodiversity.

## Conclusion

Sundarbans is a natural treasure house of biodiversity and it is our duty to preserve it not only for the benefit of the people, but for entire flora and fauna through sustainable development.

Checked  
25 out of  
30

**CU Roll No. – 203223-21-0057**

**CU Regd. No. – 223-1111-0323-20**

**Semester- 2**

**Honours Subject – PHYSICS**

**Subject for Tutorial- AECC ENVS**

**Tutorial Topic – ECOSYSTEM**

**Batch- 2020-23**

## **ACKNOWLEDGMENT**

I would like to thank my subject teachers of AECC ENVS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my mother and teacher, because without their timely help and guidance, it was impossible for me to opt and work on this project.

## **INDEX**

1. INTRODUCTION	P-4
2. ORIGIN AND USE OF THE TERM	P- 5
3. DEFINITION OF ECOSYSTEM	P- 5
4. CHARACTERISTICS OF ECOSYSTEM	P-6
5. CLASSIFICATION OF ECOSYSTEM	P- 7
6. COMPONENTS OF ECOSYSTEM	P- 8
7. TYPE OF ECOSYSTEM	P- 9-11
8. TROPHIC LEVELS, FOOD CHAIN, FOOD WEB	P- 11-12
9. ENERGY FLOW IN ECOSYSTEM	P- 12-13
10. PROCESS OF ECOSYSTEM	P- 13-14
11. IMPORTANCE OF ECOSYSTEM	P- 14
12. CONCLUSION	P- 14
13. BIBILIOGRAPHY	P - 15



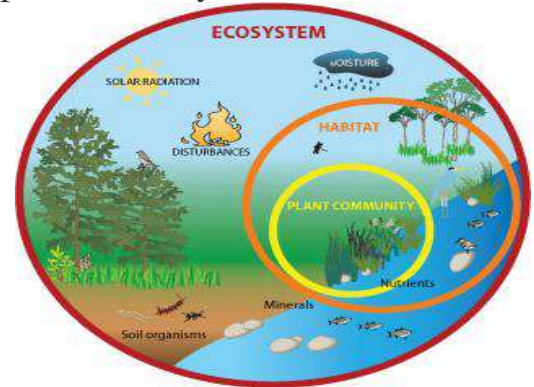
## **INTRODUCTION**

An **ecosystem** was defined as a dynamic entity composed of a biological community and its associated abiotic environment. Often the dynamic interactions that occur within an ecosystem are numerous and complex. Ecosystems are also always undergoing alterations to their biotic and abiotic components. Some of these alterations begin first with a change in the state of one component of the ecosystem which then cascades and sometimes amplifies into other components because of relationships.

In recent years, the impact of humans has caused a number of dramatic changes to a variety of ecosystems found on the Earth. Humans use and modify natural ecosystems through agriculture, forestry, recreation, urbanization, and industry. The most obvious impact of humans on ecosystems is the loss of biodiversity . The number of extinctions caused by human domination of ecosystems has been steadily increasing since the start of the **Industrial Revolution**. The frequency of species extinctions is correlated to the size of human population on the Earth which is directly related to resource consumption, land-use change, and environmental degradation. Other human impacts to ecosystems include species invasions to new habitats, changes to the abundance and dominance of species in communities, modification of **biogeochemical cycles**, modification of hydrologic cycling, pollution, and climatic change.

## • ORIGIN AND USE OF THE TERM

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



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

## • DEFINITION OF ECOSYSTEM

An ecosystem or biome describes a single environment and every living (biotic) organism and non-living (abiotic) factor that is contained within it or characterizes it. An ecosystem embodies every aspect of a single habitat, including all interactions between its different elements. Actually, A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

## • Most Important Characteristics of Our Ecosystem

- (1) The ecosystem is a major structural and functional unit of ecology.
- (2) The structure of an ecosystem is related to its species diversity; the more complex ecosystems have high species diversity.
- (3) The function of the ecosystem is related to energy flow and material cycling through and within the system.
- (4) The relative amount of energy needed to maintain an ecosystem depends on its structure. The more complex the structure, the lesser the energy it needs to maintain itself.
- (5) Ecosystems mature by passing from less complex to more complex states. Early stages of such succession have an excess of potential energy and a relatively high energy flow per unit biomass. Later (mature) stages have less energy accumulation and its flow through more diverse components.
- (6) Both the environment and the energy fixation in any given ecosystem are limited and cannot be exceeded without causing serious undesirable effects.
- (7) Alterations in the environments represent selective pressures upon the population to which it must adjust. Organisms which are unable to adjust to the changed environment must needs vanish.

The ecosystem is an integrated unit or zone of variable size, comprising vegetation, fauna, microbes and the environment. Most ecosystems characteristically possess a well-defined soil, climate, flora and fauna (or communities) and have their own potential for adaptation, change and tolerance. The functioning of any ecosystem involves a series of cycles, e.g., the water cycle and the cycles of various nutrients. These cycles are driven by energy flow, the energy being the solar energy. Continuation of life demands a constant exchange and return of nutrients to and from (amongst) the different components of the ecosystem.

## ● Classification of Ecosystems

1. Natural Ecosystems (Self-operating): These systems operate by themselves under natural conditions without any major interference by man.
2. These are further divided into following ecosystems: (i) Terrestrial ecosystem includes forests, grasslands and deserts etc. (ii) Aquatic ecosystem may be further distinguished as:

(a) Fresh water which may be lotic (running water as springs, streams or rivers) or lentic (standing water as lakes, ponds, pools, ditches, puddles, swamps etc.).



*Figure 1 :- Natural Ecosystem*

(b) Marine water such as oceans (deep bodies) or seas or estuaries (shallow ones).

3. Artificial (Man-engineered) Ecosystems: These are maintained artificially by man where, by addition of energy and planned manipulations, natural balance is disturbed regularly. Crop, urban, industrial, space and control of biotic community as well as the physico-chemical environment are man-engineered ecosystems.



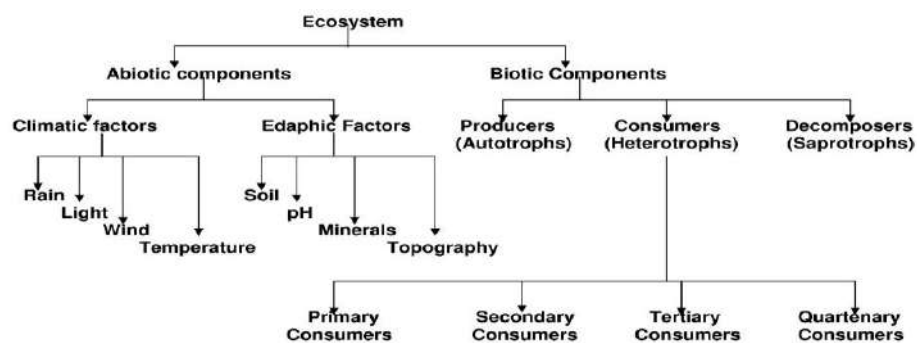
*Fig 2:- Artificial Ecosystem*

4. Space Ecosystem :- Space ecosystem is also recognised as one of ecosystems and play a very important role in human life. The common features of all ecosystems terrestrial, aquatic and agricultural are the interactions of the autotrophic and heterotrophic components.

## • Components of the Ecosystem

The components of an ecosystem are divided into abiotic components, that include all nonliving components such as minerals, climate, soil, water, sunlight and biotic components, that include all the living components. These components together make up for the flow of energy in the ecosystem and the nutrient cycle in the ecosystem. The gleaming energy from the sun is the basic source of energy in all the ecosystems. The autotrophs (self-sustaining organisms) absorb this energy and produce photosynthesis where they can use this energy to convert CO<sub>2</sub> and H<sub>2</sub>O into simple carbohydrates. The autotrophs store energy in these carbohydrates, which they then use to produce more complex and organic products like lipids, proteins, and starches that help the organism to survive. These autotrophs are the producers of the ecosystem.

Organic compounds produced by autotrophs help in the survival of the heterotrophic organisms. And heterotrophs are the consumers of the ecosystem since they're incapable of making their own food. All organisms like bacteria, fungi or animals are heterotrophs.



*Fig 3 :- Block diagram of components of the eco system*

## • Types of Ecosystems

An ecosystem consists of three types of ecosystems. The three major types are:  
**a. Aquatic biomes , b. Terrestrial biomes , c. Lentic biomes.**

**a. Aquatic Biomes:**

Aquatic biomes are the ones, one finds in water bodies, such as oceans, rivers, seas, lakes, springs, etc. This biome is further divided into smaller ecosystems:

**Pond Ecosystems:** Pond ecosystems are comparatively small and mostly include many kinds of amphibians and insects. At times one can also find fishes here but they aren't capable of moving as easily as the amphibians.



*Fig 4 :- Pond Ecosystem*

**River Ecosystems:** This ecosystem consists of fishes along with plants, amphibians, and insects. One may also find birds that hunt in and around the water for its food (small fishes).



*Fig 5 :- River Ecosystem*

**Shallow water Ecosystem:** Here one can only find tiny fishes and corals that live in shallow waters close to land.



*Fig 6 :- Shallow water Ecosystem*

**Deepwater Ecosystem:** These are kind of ecosystem where one can find gigantic sea creatures that live at the deep bottom of the sea. Creatures that wouldn't be visible to the normal human eye.



*Fig 7 :- Deepwater Ecosystem*

## **b. Terrestrial Biomes:**

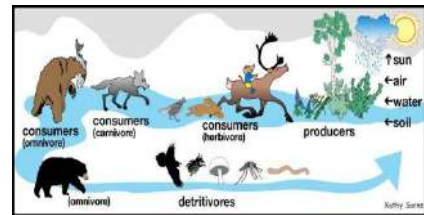
Terrestrial ecosystems are ecosystems that are found on land that include forests, deserts, grasslands, tundras, and coastal regions. There can be more than one terrestrial biome depending on its climate. This ecosystem further divides into:

**Rainforests:** Rainforests are the kind of ecosystems that are extremely dense because of a variety of organisms living in a tiny area.



*Fig 8 :- Rain Forest*

**Tundra:** Tundra is the kind of ecosystem that is a relatively simple ecosystem since only a few life forms can survive this ecosystem; especially because of its harsh conditions.



*Fig 9 :- Tundra Ecosystem*

**Deserts:** They are opposite of tundras, yet they have extreme conditions. Animals prefer to live in extreme heat than extreme cold.



*Fig 10 :- Desert Ecosystem*

**Forests:** One can find more forests than any other ecosystem in the world such as deciduous and coniferous forests. Forests can support many life forms and complex ecosystems.



*Fig 11:- Forest Ecosystem*

**c. Lentic Biomes:** These are the kinds of ecosystems that support both aquatic and terrestrial life forms such as swamps. The only requirement is that this kind of ecosystem is

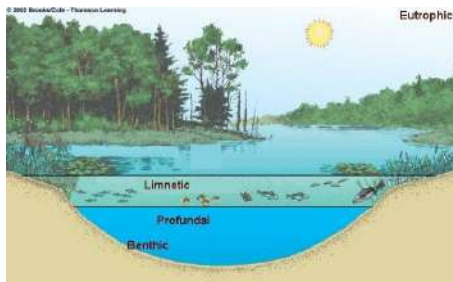


Fig 12 :- Lentic Ecosystem

the exposure for the photosynthesis process to happen; since organisms here survive on the carbohydrates made by photosynthesis.

## • Trophic Levels, Food Chain and Food Web

- The nutritive levels in a food chain are known as Trophic Levels. The organisms in the trophic levels of the food chain are categorized based on their feeding patterns.
- Producers (green plants) make for the lowest level of the chain.
- Consumption of the by-products of these producers by the herbivores or the primary consumers makes for the second-level.
- Next, the consumption of these herbivores by carnivore or the tertiary consumers makes for the third-level. Additionally, omnivores (organisms that consume plants and animals both) as well come at the third level.
- Quaternary consumers consist of organisms that eat these carnivores.
- Lastly, decomposers make up for a completely different level of the food chain alongside the given levels. These decomposers help in breaking waste materials and convert them into nutrients which is useful for the producers.
- Organisms that lie at the very top of the food chain are known as ‘Apex Consumers’.
- All of the above points together make up for what is known as ‘Food Chain’.

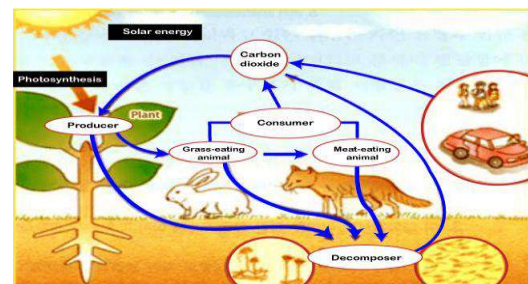
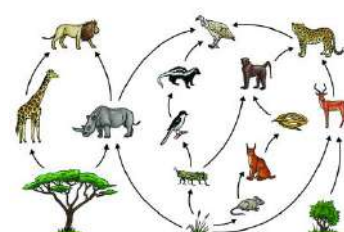


Fig 13 :- Trophic Levels

- **Food Web**: The interlinking of feeding relationships of various



of 15

Fig 14 :- Food Web



communities of organisms is known as the 'Food web'.

## • Energy and Matter Flow in Ecosystems

Many of the most important relationships between living organisms and the environment are controlled ultimately by the amount of available incoming energy received at the Earth's surface from the Sun. It is this energy which helps to drive biotic systems. The Sun's energy allows plants to convert inorganic chemicals into organic compounds. Only a very small proportion of the sunlight received at the Earth's surface is transformed into biochemical form. Several studies have been carried out to determine this amount. A study of an Illinois cornfield reported that 1.6% of the available solar radiation was photosynthetically utilized by the corn. Other data suggests that even the most efficient ecosystems seldom incorporate more than 3% of the available solar insolation. Most ecosystems fix less than 1% of the sunlight available for photosynthesis.

Living organisms can use energy in basically two forms: radiant or fixed. Radiant energy exists in the form of electromagnetic energy, such as light.

Fixed energy is the potential chemical energy found in organic substances. This energy can be released through respiration.

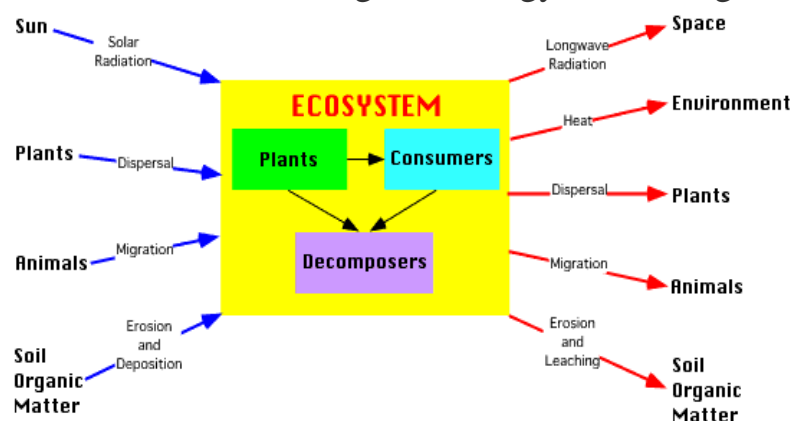
Organisms that can take energy from

inorganic sources

and fix it into energy

rich organic molecules are called autotrophs. If this energy comes from light then these organisms are called photosynthetic autotrophs. In most ecosystems plants are the dominant photosynthetic autotroph.

Organisms that require fixed energy found in organic molecules for their survival are called heterotrophs. Heterotrophs who obtain their energy from living organisms are called consumers. Consumers can be of two basic types: Consumer and decomposers. Consumers that consume plants are known as



*Fig15 :- Inputs and outputs of energy and matter in a typical ecosystem.*

herbivores. Carnivores are consumers who eat herbivores or other carnivores. Decomposers or detritivores are heterotrophs that obtain their energy either from dead organisms or from organic compounds dispersed in the environment.

Once fixed by plants, organic energy can move within the ecosystem through the consumption of living or dead organic matter. Upon decomposition the chemicals that were once organized into organic compounds are returned to their inorganic form and can be taken up by plants once again. Organic energy can also move from one ecosystem to another by a variety of processes. These processes include: animal migration, animal harvesting, plant harvesting, plant dispersal of seeds, leaching, and erosion.

## • Processes

Ecosystems are controlled both by external and internal factors. External factors, also called state factors, control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem. The most important of these is climate. Climate determines the biome in which the ecosystem is embedded. Rainfall patterns and seasonal temperatures influence photosynthesis and thereby determine the amount of water and energy available to the ecosystem. Parent material determines the nature of the soil in an ecosystem, and influences the supply of mineral nutrients. Topography also controls ecosystem processes by affecting things like microclimate, soil development and the movement of water through a system. For example, ecosystems can be quite different if situated in a small depression on the landscape, versus one present on an adjacent steep hillside.

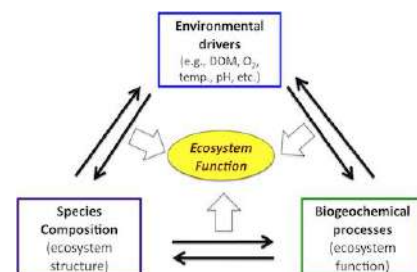


Fig 16 :- Processes

Other external factors that play an important role in ecosystem functioning include time and potential biota. Similarly, the set of organisms that can potentially be present in an area can also significantly affect ecosystems. Ecosystems in similar environments that are located in different parts of the world can end up doing things very differently simply because they have

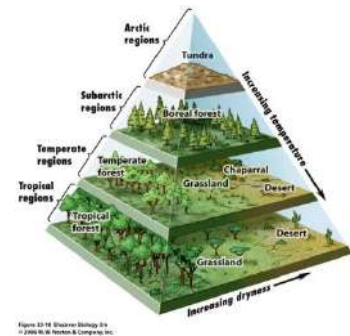
different pools of species present. The introduction of non-native species can cause substantial shifts in ecosystem function.

Unlike external factors, internal factors in ecosystems not only control ecosystem processes but are also controlled by them. Consequently, they are often subject to feedback loops. While the resource inputs are generally

controlled by external processes like climate and parent material, the availability of these resources within the ecosystem is controlled by internal factors like decomposition, root competition or shading. Other factors like disturbance, succession or the types of species present are also internal factors.

## ● Importance of Ecosystem:

- a) It provides habitat to wild plants and animals.
- b) It promotes various food chains and food webs.
- c) It controls essential ecological processes and promotes lives.
- d) Involved in the recycling of nutrients between biotic and abiotic components.
- e) It helps in maintaining the usual flow of energy in an ecosystem including- Carbon Cycle, Energy Cycle, Nitrogen Cycle, Oxygen Cycle, and Water Cycle.



## ● CONCLUSION :

Everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process in fact, many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent. So it is better that care for ecosystems should be taken as one of the major responsibilities of every individual for sustainable living of future generations as well.

## ● BIBLIOGRAPHY

- <https://biologydictionary.net/ecosystem/>
- <http://www.physicalgeography.net/fundamentals/9j.html>

- <https://www.biodiversitya-z.org/content/ecosystem>

wikipedia and Other Books

**THE END**

**CU Roll No. – 203223-21-0057**  
**CU Regd. No. – 223-1111-0323-20**  
**Semester- 2**  
**Honours Subject – PHYSICS**  
**Subject for Tutorial- AECC ENVS**  
**Tutorial Topic – ECOSYSTEM**  
**Batch- 2020-23**

## **ACKNOWLEDGMENT**

I would like to thank my subject teachers of AECC ENVS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my mother and teacher, because without their timely help and guidance, it was impossible for me to opt and work on this project.

## **INDEX**

1. INTRODUCTION	P-4
2. ORIGIN AND USE OF THE TERM	P- 5
3. DEFINITION OF ECOSYSTEM	P- 5
4. CHARACTERISTICS OF ECOSYSTEM	P-6
5. CLASSIFICATION OF ECOSYSTEM	P- 7
6. COMPONENTS OF ECOSYSTEM	P- 8
7. TYPE OF ECOSYSTEM	P- 9-11
8. TROPHIC LEVELS, FOOD CHAIN, FOOD WEB	P- 11-12
9. ENERGY FLOW IN ECOSYSTEM	P- 12-13
10. PROCESS OF ECOSYSTEM	P- 13-14
11. IMPORTANCE OF ECOSYSTEM	P- 14
12. CONCLUSION	P- 14
13. BIBILIOGRAPHY	P - 15

## **INTRODUCTION**

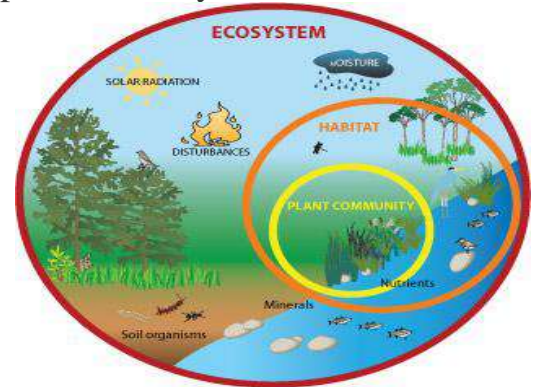
An **ecosystem** was defined as a dynamic entity composed of a biological community and its associated abiotic environment. Often the dynamic interactions that occur within an ecosystem are numerous and complex. Ecosystems are also always undergoing alterations to their biotic and abiotic components. Some of these alterations begin first with a change in the state of one component of the ecosystem which then cascades and sometimes amplifies into other components because of relationships.

In recent years, the impact of humans has caused a number of dramatic changes to a variety of ecosystems found on the Earth. Humans use and modify natural ecosystems through agriculture, forestry, recreation, urbanization, and industry. The most obvious impact of humans on ecosystems is the loss of biodiversity . The number of extinctions caused by human domination of ecosystems has been steadily increasing since the start of the **Industrial Revolution**. The frequency of species extinctions is correlated to the size of human population on the Earth which is directly related to resource consumption, land-use change, and environmental degradation. Other human impacts to ecosystems include species invasions to new habitats, changes to the abundance and dominance of species in communities, modification of **biogeochemical cycles**, modification of hydrologic cycling, pollution, and climatic change.



## • ORIGIN AND USE OF THE TERM

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



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

## • DEFINITION OF ECOSYSTEM

An ecosystem or biome describes a single environment and every living (biotic) organism and non-living (abiotic) factor that is contained within it or characterizes it. An ecosystem embodies every aspect of a single habitat, including all interactions between its different elements. Actually, A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

## • Most Important Characteristics of Our Ecosystem

- (1) The ecosystem is a major structural and functional unit of ecology.
- (2) The structure of an ecosystem is related to its species diversity; the more complex ecosystems have high species diversity.
- (3) The function of the ecosystem is related to energy flow and material cycling through and within the system.
- (4) The relative amount of energy needed to maintain an ecosystem depends on its structure. The more complex the structure, the lesser the energy it needs to maintain itself.
- (5) Ecosystems mature by passing from less complex to more complex states. Early stages of such succession have an excess of potential energy and a relatively high energy flow per unit biomass. Later (mature) stages have less energy accumulation and its flow through more diverse components.
- (6) Both the environment and the energy fixation in any given ecosystem are limited and cannot be exceeded without causing serious undesirable effects.
- (7) Alterations in the environments represent selective pressures upon the population to which it must adjust. Organisms which are unable to adjust to the changed environment must needs vanish.

The ecosystem is an integrated unit or zone of variable size, comprising vegetation, fauna, microbes and the environment. Most ecosystems characteristically possess a well-defined soil, climate, flora and fauna (or communities) and have their own potential for adaptation, change and tolerance. The functioning of any ecosystem involves a series of cycles, e.g., the water cycle and the cycles of various nutrients. These cycles are driven by energy flow, the energy being the solar energy. Continuation of life demands a constant exchange and return of nutrients to and from (amongst) the different components of the ecosystem.

## ● Classification of Ecosystems

1. Natural Ecosystems (Self-operating): These systems operate by themselves under natural conditions without any major interference by man.
2. These are further divided into following ecosystems: (i) Terrestrial ecosystem includes forests, grasslands and deserts etc. (ii) Aquatic ecosystem may be further distinguished as:

(a) Fresh water which may be lotic (running water as springs, streams or rivers) or lentic (standing water as lakes, ponds, pools, ditches, puddles, swamps etc.).



*Figure 1 :- Natural Ecosystem*

(b) Marine water such as oceans (deep bodies) or seas or estuaries (shallow ones).

3. Artificial (Man-engineered) Ecosystems: These are maintained artificially by man where, by addition of energy and planned manipulations, natural balance is disturbed regularly. Crop, urban, industrial, space and control of biotic community as well as the physico-chemical environment are man-engineered ecosystems.



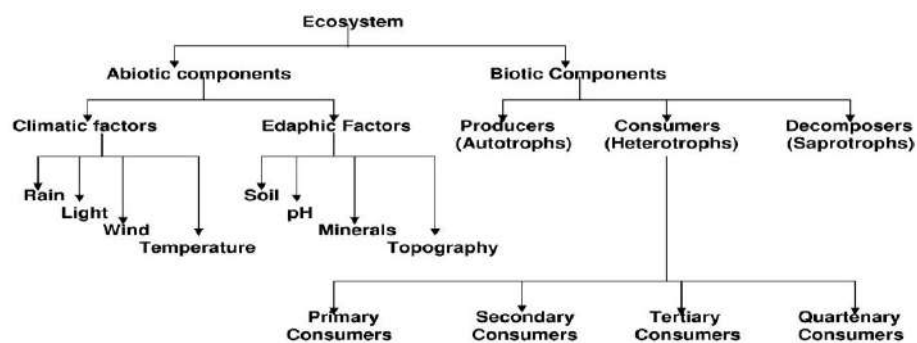
*Fig 2:- Artificial Ecosystem*

4. Space Ecosystem :- Space ecosystem is also recognised as one of ecosystems and play a very important role in human life. The common features of all ecosystems terrestrial, aquatic and agricultural are the interactions of the autotrophic and heterotrophic components.

## • Components of the Ecosystem

The components of an ecosystem are divided into abiotic components, that include all nonliving components such as minerals, climate, soil, water, sunlight and biotic components, that include all the living components. These components together make up for the flow of energy in the ecosystem and the nutrient cycle in the ecosystem. The gleaming energy from the sun is the basic source of energy in all the ecosystems. The autotrophs (self-sustaining organisms) absorb this energy and produce photosynthesis where they can use this energy to convert CO<sub>2</sub> and H<sub>2</sub>O into simple carbohydrates. The autotrophs store energy in these carbohydrates, which they then use to produce more complex and organic products like lipids, proteins, and starches that help the organism to survive. These autotrophs are the producers of the ecosystem.

Organic compounds produced by autotrophs help in the survival of the heterotrophic organisms. And heterotrophs are the consumers of the ecosystem since they're incapable of making their own food. All organisms like bacteria, fungi or animals are heterotrophs.



*Fig 3 :- Block diagram of components of the eco system*

## • Types of Ecosystems

An ecosystem consists of three types of ecosystems. The three major types are:  
**a. Aquatic biomes , b. Terrestrial biomes , c. Lentic biomes.**

**a. Aquatic Biomes:**

Aquatic biomes are the ones, one finds in water bodies, such as oceans, rivers, seas, lakes, springs, etc. This biome is further divided into smaller ecosystems:

**Pond Ecosystems:** Pond ecosystems are comparatively small and mostly include many kinds of amphibians and insects. At times one can also find fishes here but they aren't capable of moving as easily as the amphibians.



*Fig 4 :- Pond Ecosystem*

**River Ecosystems:** This ecosystem consists of fishes along with plants, amphibians, and insects. One may also find birds that hunt in and around the water for its food (small fishes).



*Fig 5 :- River Ecosystem*

**Shallow water Ecosystem:** Here one can only find tiny fishes and corals that live in shallow waters close to land.



*Fig 6 :- Shallow water Ecosystem*

**Deepwater Ecosystem:** These are kind of ecosystem where one can find gigantic sea creatures that live at the deep bottom of the sea. Creatures that wouldn't be visible to the normal human eye.



*Fig 7 :- Deepwater Ecosystem*

## **b. Terrestrial Biomes:**

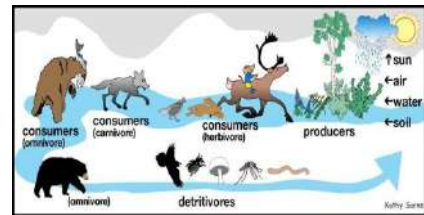
Terrestrial ecosystems are ecosystems that are found on land that include forests, deserts, grasslands, tundras, and coastal regions. There can be more than one terrestrial biome depending on its climate. This ecosystem further divides into:

**Rainforests:** Rainforests are the kind of ecosystems that are extremely dense because of a variety of organisms living in a tiny area.



*Fig 8 :- Rain Forest*

**Tundra:** Tundra is the kind of ecosystem that is a relatively simple ecosystem since only a few life forms can survive this ecosystem; especially because of its harsh conditions.



*Fig 9 :- Tundra Ecosystem*

**Deserts:** They are opposite of tundras, yet they have extreme conditions. Animals prefer to live in extreme heat than extreme cold.



*Fig 10 :- Desert Ecosystem*

**Forests:** One can find more forests than any other ecosystem in the world such as deciduous and coniferous forests. Forests can support many life forms and complex ecosystems.



*Fig 11:- Forest Ecosystem*

**c. Lentic Biomes:** These are the kinds of ecosystems that support both aquatic and terrestrial life forms such as swamps. The only requirement is that this kind of ecosystem is

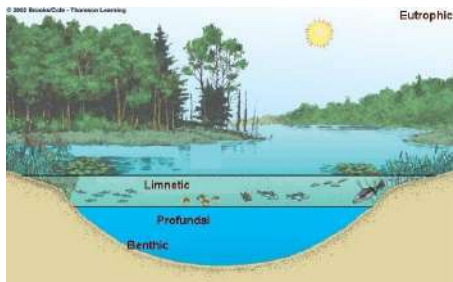


Fig 12 :- Lentic Ecosystem

the exposure for the photosynthesis process to happen; since organisms here survive on the carbohydrates made by photosynthesis.

## • Trophic Levels, Food Chain and Food Web

- The nutritive levels in a food chain are known as Trophic Levels. The organisms in the trophic levels of the food chain are categorized based on their feeding patterns.
- Producers (green plants) make for the lowest level of the chain.
- Consumption of the by-products of these producers by the herbivores or the primary consumers makes for the second-level.
- Next, the consumption of these herbivores by carnivore or the tertiary consumers makes for the third-level. Additionally, omnivores (organisms that consume plants and animals both) as well come at the third level.
- Quaternary consumers consist of organisms that eat these carnivores.
- Lastly, decomposers make up for a completely different level of the food chain alongside the given levels. These decomposers help in breaking waste materials and convert them into nutrients which is useful for the producers.
- Organisms that lie at the very top of the food chain are known as ‘Apex Consumers’.
- All of the above points together make up for what is known as ‘Food Chain’.

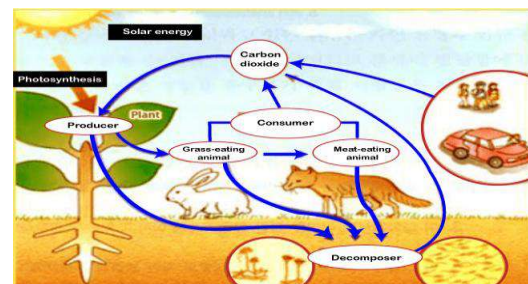
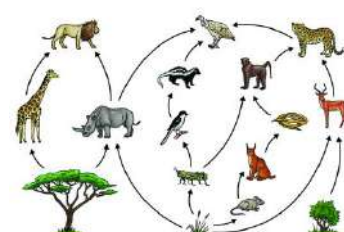


Fig 13 :- Trophic Levels

- **Food Web**: The interlinking of feeding relationships of various



of 15

Fig 14 :- Food Web

communities of organisms is known as the 'Food web'.

## • Energy and Matter Flow in Ecosystems

Many of the most important relationships between living organisms and the environment are controlled ultimately by the amount of available incoming energy received at the Earth's surface from the Sun. It is this energy which helps to drive biotic systems. The Sun's energy allows plants to convert inorganic chemicals into organic compounds. Only a very small proportion of the sunlight received at the Earth's surface is transformed into biochemical form. Several studies have been carried out to determine this amount. A study of an Illinois cornfield reported that 1.6% of the available solar radiation was photosynthetically utilized by the corn. Other data suggests that even the most efficient ecosystems seldom incorporate more than 3% of the available solar insolation. Most ecosystems fix less than 1% of the sunlight available for photosynthesis.

Living organisms can use energy in basically two forms: radiant or fixed. Radiant energy exists in the form of electromagnetic energy, such as light.

Fixed energy is the potential chemical energy found in organic substances. This energy can be released through respiration.

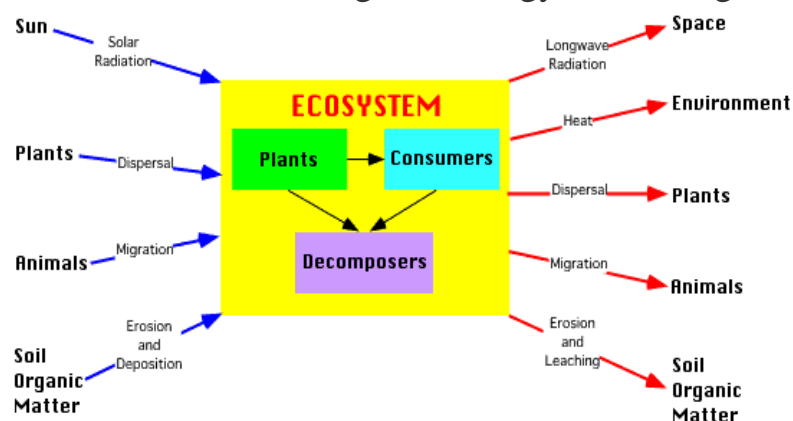
Organisms that can take energy from

inorganic sources

and fix it into energy

rich organic molecules are called autotrophs. If this energy comes from light then these organisms are called photosynthetic autotrophs. In most ecosystems plants are the dominant photosynthetic autotroph.

Organisms that require fixed energy found in organic molecules for their survival are called heterotrophs. Heterotrophs who obtain their energy from living organisms are called consumers. Consumers can be of two basic types: Consumer and decomposers. Consumers that consume plants are known as



*Fig15 :- Inputs and outputs of energy and matter in a typical ecosystem.*



herbivores. Carnivores are consumers who eat herbivores or other carnivores. Decomposers or detritivores are heterotrophs that obtain their energy either from dead organisms or from organic compounds dispersed in the environment.

Once fixed by plants, organic energy can move within the ecosystem through the consumption of living or dead organic matter. Upon decomposition the chemicals that were once organized into organic compounds are returned to their inorganic form and can be taken up by plants once again. Organic energy can also move from one ecosystem to another by a variety of processes. These processes include: animal migration, animal harvesting, plant harvesting, plant dispersal of seeds, leaching, and erosion.

## • Processes

Ecosystems are controlled both by external and internal factors. External factors, also called state factors, control the overall structure of an ecosystem and the way things work within it, but are not themselves influenced by the ecosystem. The most important of these is climate. Climate determines the biome in which the ecosystem is embedded. Rainfall patterns and seasonal temperatures influence photosynthesis and thereby determine the amount of water and energy available to the ecosystem. Parent material determines the nature of the soil in an ecosystem, and influences the supply of mineral nutrients. Topography also controls ecosystem processes by affecting things like microclimate, soil development and the movement of water through a system. For example, ecosystems can be quite different if situated in a small depression on the landscape, versus one present on an adjacent steep hillside.

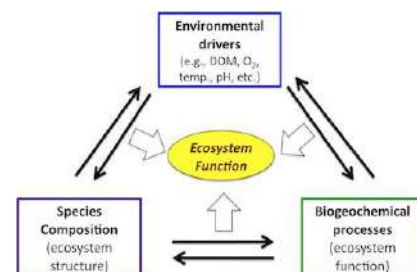


Fig 16 :- Processes

Other external factors that play an important role in ecosystem functioning include time and potential biota. Similarly, the set of organisms that can potentially be present in an area can also significantly affect ecosystems. Ecosystems in similar environments that are located in different parts of the world can end up doing things very differently simply because they have

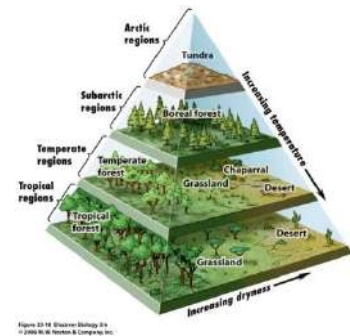
different pools of species present. The introduction of non-native species can cause substantial shifts in ecosystem function.

Unlike external factors, internal factors in ecosystems not only control ecosystem processes but are also controlled by them. Consequently, they are often subject to feedback loops. While the resource inputs are generally

controlled by external processes like climate and parent material, the availability of these resources within the ecosystem is controlled by internal factors like decomposition, root competition or shading. Other factors like disturbance, succession or the types of species present are also internal factors.

## ● Importance of Ecosystem:

- a) It provides habitat to wild plants and animals.
- b) It promotes various food chains and food webs.
- c) It controls essential ecological processes and promotes lives.
- d) Involved in the recycling of nutrients between biotic and abiotic components.
- e) It helps in maintaining the usual flow of energy in an ecosystem including- Carbon Cycle, Energy Cycle, Nitrogen Cycle, Oxygen Cycle, and Water Cycle.



## ● CONCLUSION :

Everyone in the world depends completely on Earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber, and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process in fact, many have been harmed. Moreover, the full costs associated with these gains are only now becoming apparent. So it is better that care for ecosystems should be taken as one of the major responsibilities of every individual for sustainable living of future generations as well.

## ● BIBLIOGRAPHY

- <https://biologydictionary.net/ecosystem/>
- <http://www.physicalgeography.net/fundamentals/9j.html>

- <https://www.biodiversitya-z.org/content/ecosystem>

wikipedia and Other Books

# THE END

# Project Report

---

## Semester II

Course :: AECC 2 ( Environmental studies )

Project Title : visit to a local polluted site - industrial

College roll no. – PHSA20M590

CU registration no. – 223-1111-0330-20

CU Roll no. – 203223-21-0059

Checked  
24 out of  
30

## ***ACKNOWLEDGMENT***

---

I would like to thank my subject teachers of AECC ENVS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my classmate , because without their timely help, it was impossible for me to opt and work on this project.

## ***INTRODUCTION:-***

---

**Pollution** is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat, or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9 million people worldwide.

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

**INDUSTRIAL POLLUTION:- Industrial pollution** is the **pollution** which can be directly linked with **industry**. This form of **pollution** is one of the leading causes of **pollution** worldwide. **Industrial pollution** can also impact air quality, and it can enter the soil, causing widespread environmental problems.

## ***Objectives to do project on industrial pollution:-***

---

- (1) To make a list of the names of the industries situated in the specific industrial belt.
- (2) To specify how many types of pollution occurs in the industrial belt.
- (3) We have to list the name of the diseases which spread due to the emissions of pollutants from the industrial belt.

(4) To make a plan how to reduce the pollution in the industrial belt.

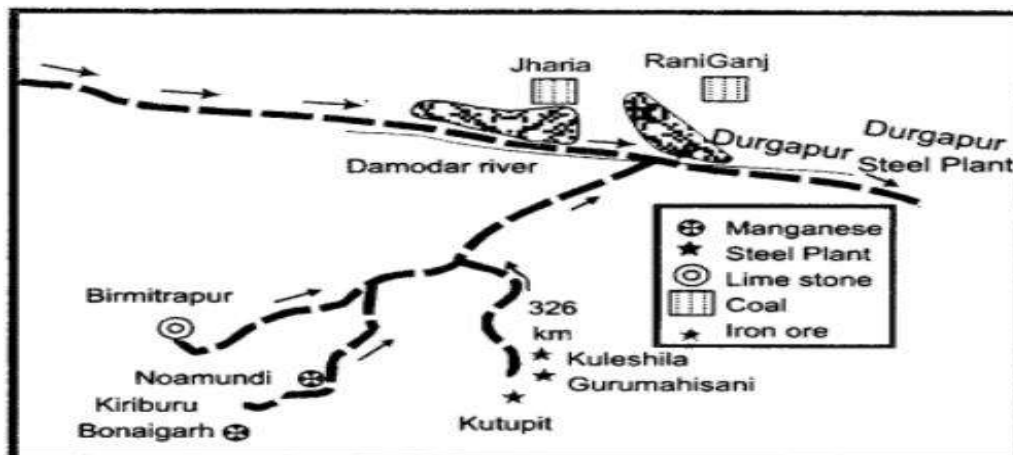
(5) How to keep local people free from the diseases which spreads due to the industrial pollutants.

## survey area: Durgapur steel plant

*“ Environmental pollution is an incurable disease. It can only be prevented.”*

*~ Barry Commoner.*

*Durgapur Steel Plant is one of the integrated steel plants of steel authority of india limited located in Durgapur, in the eastern indian state of west bengal. It was set up with the help of United Kingdom . Plant started production with an initial crude steel*



**Location of steel plant of Durgapur**

*capacity of 1 MPTA (million ton per annum) in 1959, which has been progressively increased to 1.8 MPTA during the modernization in nineties and further to 2.2 MPTA during recently completed Modernization & Expansion Plan (MEP). The present Plant capacity is given below.*

	<b>Hot Metal</b>	<b>Crude Steel</b>	<b>Saleable Steel</b>
<b>Capacity (MTPA)</b>	<b>2.45</b>	<b>2.20</b>	<b>2.12</b>

**Location:**

*Durgapur having geographical location of 27' North and 88. 29' East, located at a distance of 158 KM from Kolkata is situated on the banks river Damodar. It has excellent connectivity with various parts of the country as NH-19 (erstwhile GT road) and main Kolkata-Delhi railway line passes through it and direct air connectivity has been established through recent starting of a number of flights from local airport i.e. Kazi Nazrul Islam Airport , Andal.*



**Steel Manufacturers Durgapur:**

- *Steel Authority Of India Ltd.*
- *Shyam Steel Industries Ltd.*



- V. GI Global Chemicals Pvt. Ltd
- Shree Ji Steel Corporation
- Agrasen Iron and Steel Pvt Ltd.
- V. Goyal Steel.
- V. Supreme Colour Roofing And Decking Pvt Ltd.

### **Environmental impact of steel production:**

1) The main ingredient in the production of steel is iron ore mined from Earth. Over 2,000 million tons of iron ore is mined a year - about 95 percent is used by the steel industry.

Iron ore is the world's third most produced commodity by volume - after crude oil and coal - and the second most traded commodity - only beaten by crude oil.

2) The making of steel from the mined iron ore is also highly energy demanding. Production of steel is the most energy-consuming and CO<sub>2</sub> emitting industrial activity in the world.

3) On average, 1.83 tons of CO<sub>2</sub> is emitted for every ton of steel produced making steel production a major contributor to global warming adding over 3,3 million tons annually to global emissions.

### ***Effects of pollutions :***

*industries have been polluting our environment, especially since the beginning of the industrial revolution, notably due to the increasing use of fossil fuels. In the 19th century and for a significant part of the 20th century, coal has been used to make machines work faster, replacing human force.*

#### ***1. Effects on Humans***

*The effects of environmental pollution on humans are mainly physical, but can also turn into neuro-affectations in the long term. The best-known troubles to us are respiratory, in the form of allergies, asthma, irritation of the eyes and nasal passages, or other forms of respiratory infections. Notably, these well-spread affections can be observed when air pollution is high in cities, when the weather gets hot.*

#### ***2. Effects on Animals***

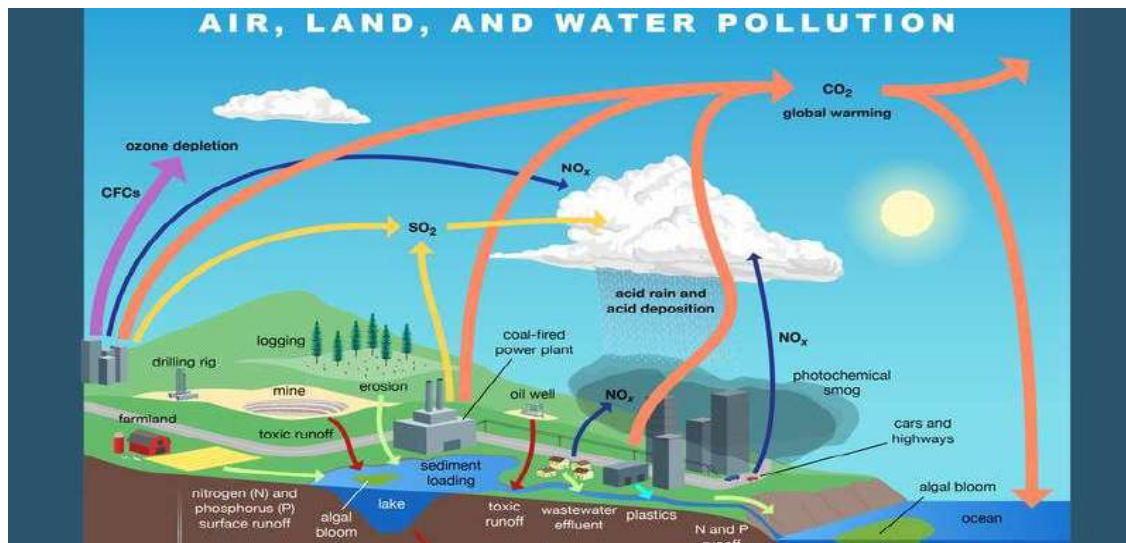
*Environmental pollution mainly affects animals by causing harm to their living environment, making it toxic for them to live in. Acid rains can change the composition of rivers and seas, making them toxic for fishes; an essential quantity of ozone in the lower parts of the atmosphere can cause lung problems to all animals.*

### 3. Effects on Plants

As for animals, plants, and especially trees, can be destroyed by acid rains (and this will also have a negative impact on animals as well, as their natural environment will be modified), ozone in the lower atmosphere block the plant respiration, and harmful pollutants can be absorbed from the water or soil.

### 4. Effects on the Ecosystem

In short, environmental pollution, almost exclusively created by human activities, has a negative effect on the ecosystem, destroying crucial layers of it and causing an even more negative effect on the upper layers.



*Steps should be taken to prevent such pollution:-*

- *Huge number of tree plantation will prevent the air pollution.*
- *Scrubber should be used to refine the air emitted from the industries.*
- *An electrostatic precipitator (ESP) is a device that removes fine particles, like dust and smoke, from a flowing gas. It can be used to prevent air pollution.*
- *Uses of plastics should be reduced.*
- *Dirty water should not be directly poured in the river water. After pure refining then only the water of industries can be immersed in river water.*
- *Sound absorbing materials should be used to reduce the noise pollution in the industrial belt. Tree plantation should be done as 'Noise Barrier' across the boundary of the industrial belt*

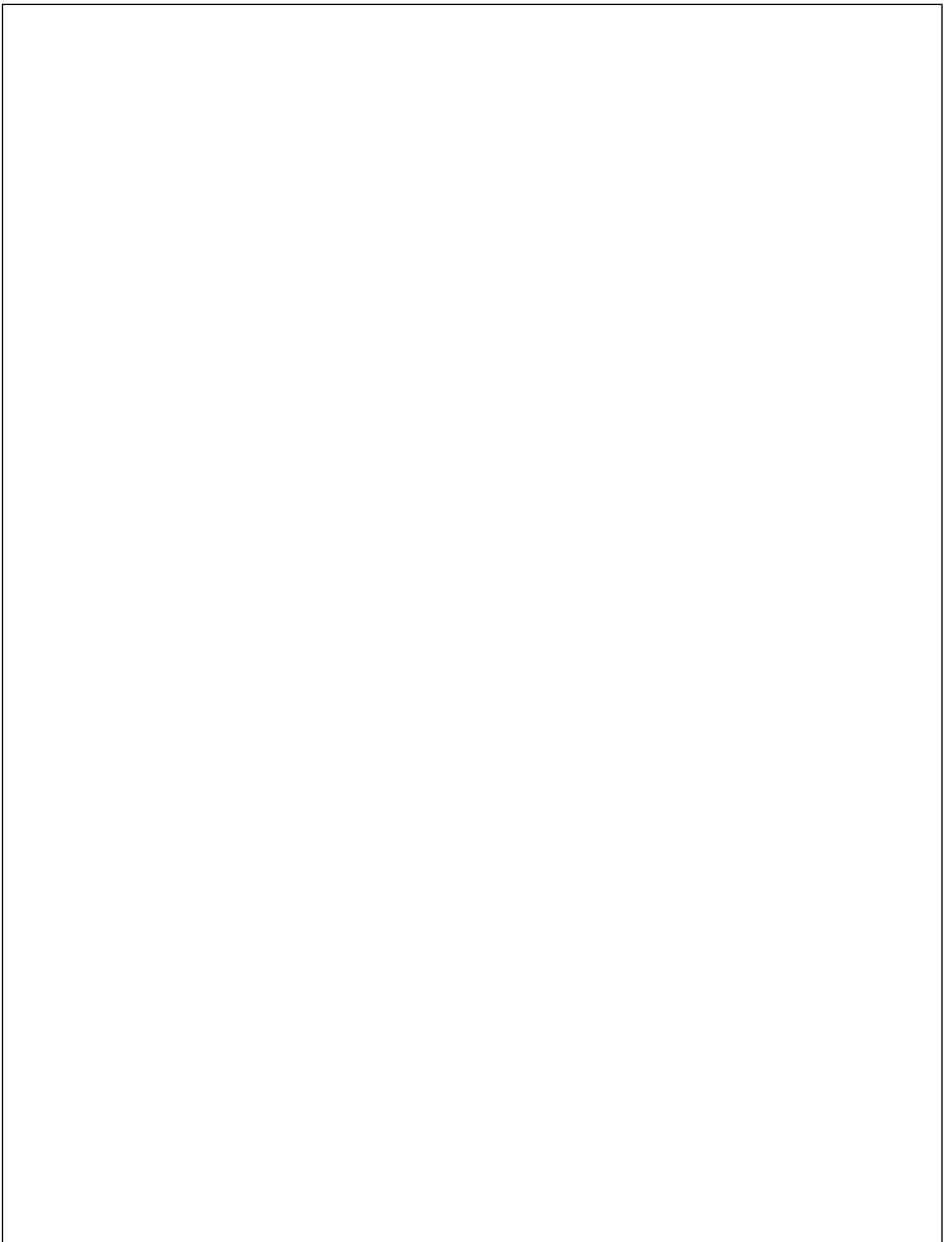
## CONCLUSION:

*: In a nutshell, every kind of pollution leaves a huge negative impact on our environment, human lives, animals etc. We, as responsible citizens, must take steps towards a better tomorrow. We must join hands to take various initiatives and fight against this problem.*

## *References*

---

- 1) [www.google.com](http://www.google.com)
- 2) [www.wikipedia.com](http://www.wikipedia.com)
- 3) *Byjus.com*



# **Project Report**

---

## **Semester II**

**Course :: AECC 2 ( Environmental studies )**

**Project Title : visit to a local polluted site - industrial**

**College roll no. – PHSA20M590**

**CU registration no. – 223-1111-0330-20**

**CU Roll no. – 203223-21-0059**

## ***ACKNOWLEDGMENT***

---

I would like to thank my subject teachers of AECC ENVS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my classmate , because without their timely help, it was impossible for me to opt and work on this project.

## ***INTRODUCTION:-***

---

**Pollution** is the introduction of contaminants into the natural environment that cause adverse change. Pollution can take the form of chemical substances or energy, such as noise, heat, or light. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollution is often classed as point source or nonpoint source pollution. In 2015, pollution killed 9 million people worldwide.

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

**INDUSTRIAL POLLUTION:- Industrial pollution** is the **pollution** which can be directly linked with **industry**. This form of **pollution** is one of the leading causes of **pollution** worldwide. **Industrial pollution** can also impact air quality, and it can enter the soil, causing widespread environmental problems.

## ***Objectives to do project on industrial pollution:-***

---

- (1) To make a list of the names of the industries situated in the specific industrial belt.
- (2) To specify how many types of pollution occurs in the industrial belt.
- (3) We have to list the name of the diseases which spread due to the emissions of pollutants from the industrial belt.

(4) To make a plan how to reduce the pollution in the industrial belt.

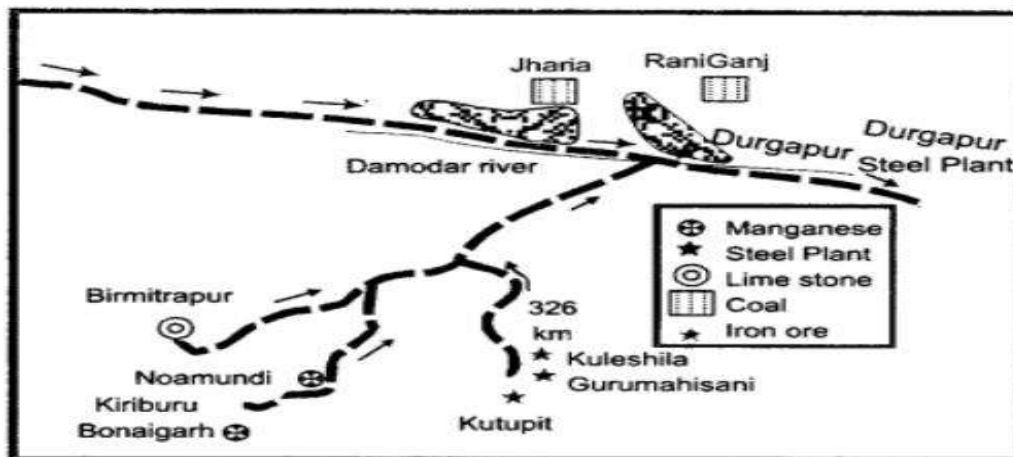
(5) How to keep local people free from the diseases which spreads due to the industrial pollutants.

## survey area: Durgapur steel plant

*“ Environmental pollution is an incurable disease. It can only be prevented.”*

*~ Barry Commoner.*

*Durgapur Steel Plant is one of the integrated steel plants of steel authority of india limited located in Durgapur, in the eastern indian state of west bengal. It was set up with the help of United Kingdom . Plant started production with an initial crude steel*



**Location of steel plant of Durgapur**



*capacity of 1 MPTA (million ton per annum) in 1959, which has been progressively increased to 1.8 MPTA during the modernization in nineties and further to 2.2 MPTA during recently completed Modernization & Expansion Plan (MEP). The present Plant capacity is given below.*

	<b>Hot Metal</b>	<b>Crude Steel</b>	<b>Saleable Steel</b>
<b>Capacity (MTPA)</b>	<b>2.45</b>	<b>2.20</b>	<b>2.12</b>

**Location:**

*Durgapur having geographical location of 27' North and 88. 29' East, located at a distance of 158 KM from Kolkata is situated on the banks river Damodar. It has excellent connectivity with various parts of the country as NH-19 (erstwhile GT road) and main Kolkata-Delhi railway line passes through it and direct air connectivity has been established through recent starting of a number of flights from local airport i.e. Kazi Nazrul Islam Airport , Andal.*



**Steel Manufacturers Durgapur:**

- *Steel Authority Of India Ltd.*
- *Shyam Steel Industries Ltd.*

- V. GI Global Chemicals Pvt. Ltd
- Shree Ji Steel Corporation
- Agrasen Iron and Steel Pvt Ltd.
- V. Goyal Steel.
- V. Supreme Colour Roofing And Decking Pvt Ltd.

### **Environmental impact of steel production:**

1) The main ingredient in the production of steel is iron ore mined from Earth. Over 2,000 million tons of iron ore is mined a year - about 95 percent is used by the steel industry.

Iron ore is the world's third most produced commodity by volume - after crude oil and coal - and the second most traded commodity - only beaten by crude oil.

2) The making of steel from the mined iron ore is also highly energy demanding. Production of steel is the most energy-consuming and CO<sub>2</sub> emitting industrial activity in the world.

3) On average, 1.83 tons of CO<sub>2</sub> is emitted for every ton of steel produced making steel production a major contributor to global warming adding over 3,3 million tons annually to global emissions.

### ***Effects of pollutions :***

*industries have been polluting our environment, especially since the beginning of the industrial revolution, notably due to the increasing use of fossil fuels. In the 19th century and for a significant part of the 20th century, coal has been used to make machines work faster, replacing human force.*

#### ***1. Effects on Humans***

*The effects of environmental pollution on humans are mainly physical, but can also turn into neuro-affectations in the long term. The best-known troubles to us are respiratory, in the form of allergies, asthma, irritation of the eyes and nasal passages, or other forms of respiratory infections. Notably, these well-spread affections can be observed when air pollution is high in cities, when the weather gets hot.*

#### ***2. Effects on Animals***

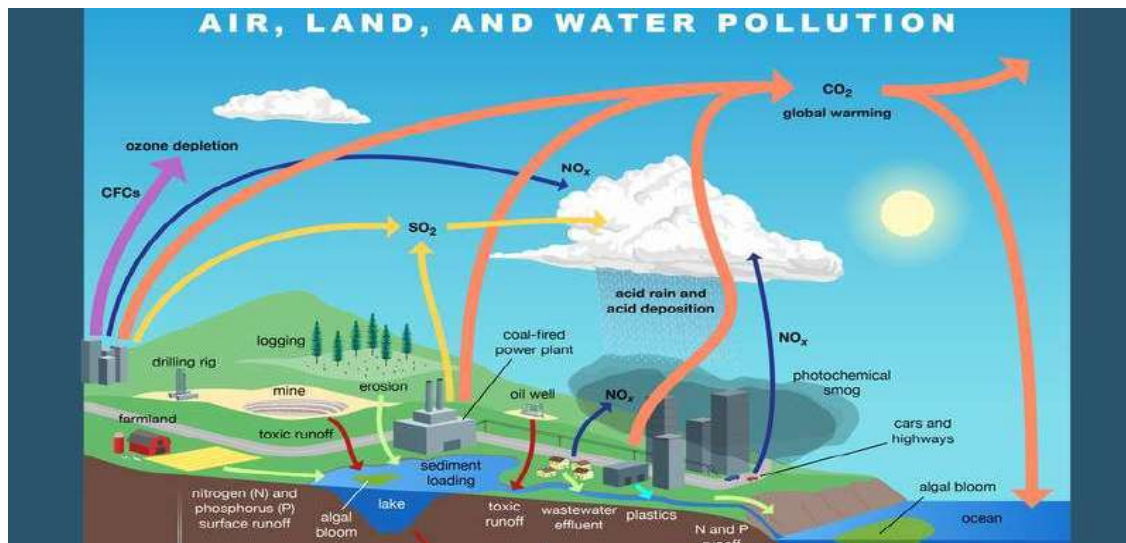
*Environmental pollution mainly affects animals by causing harm to their living environment, making it toxic for them to live in. Acid rains can change the composition of rivers and seas, making them toxic for fishes; an essential quantity of ozone in the lower parts of the atmosphere can cause lung problems to all animals.*

### 3. Effects on Plants

As for animals, plants, and especially trees, can be destroyed by acid rains (and this will also have a negative impact on animals as well, as their natural environment will be modified), ozone in the lower atmosphere block the plant respiration, and harmful pollutants can be absorbed from the water or soil.

### 4. Effects on the Ecosystem

In short, environmental pollution, almost exclusively created by human activities, has a negative effect on the ecosystem, destroying crucial layers of it and causing an even more negative effect on the upper layers.



*Steps should be taken to prevent such pollution:-*

- *Huge number of tree plantation will prevent the air pollution.*
- *Scrubber should be used to refine the air emitted from the industries.*
- *An electrostatic precipitator (ESP) is a device that removes fine particles, like dust and smoke, from a flowing gas. It can be used to prevent air pollution.*
- *Uses of plastics should be reduced.*
- *Dirty water should not be directly poured in the river water. After pure refining then only the water of industries can be immersed in river water.*
- *Sound absorbing materials should be used to reduce the noise pollution in the industrial belt. Tree plantation should be done as 'Noise Barrier' across the boundary of the industrial belt*

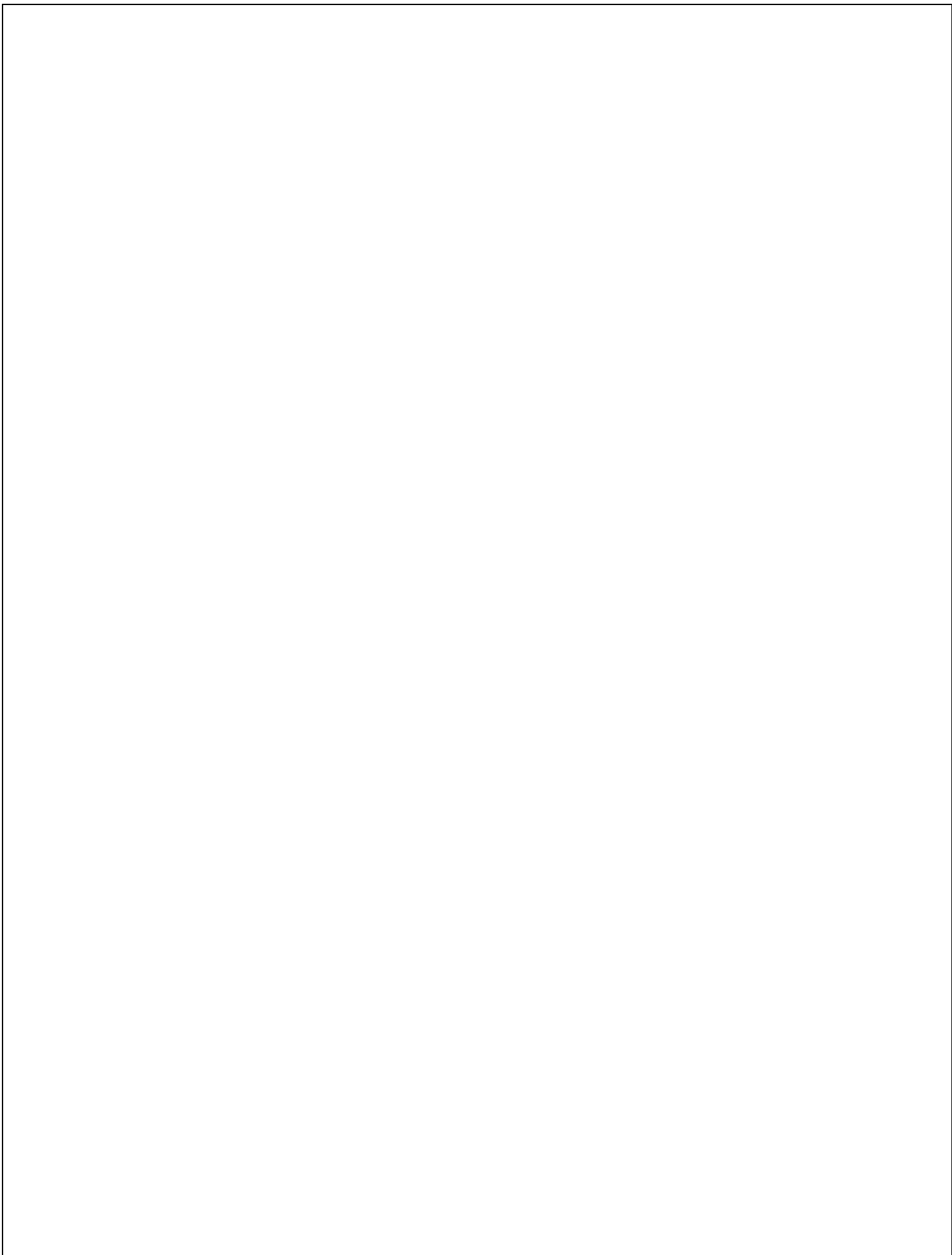
## CONCLUSION:

*: In a nutshell, every kind of pollution leaves a huge negative impact on our environment, human lives, animals etc. We, as responsible citizens, must take steps towards a better tomorrow. We must join hands to take various initiatives and fight against this problem.*

## *References*

---

- 1) [www.google.com](http://www.google.com)
- 2) [www.wikipedia.com](http://www.wikipedia.com)
- 3) *Byjus.com*



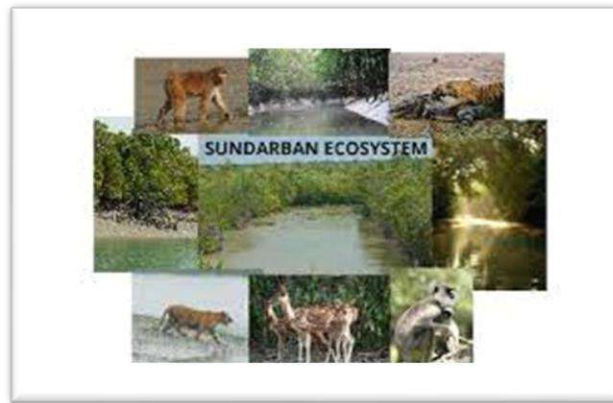
# PROJECT REPORT

SEMESTER II  
COURSE: AECC2 (Environmental Studies)

Project Topic: “Study of Ecosystems.”

Project Subtopic: “Forest Ecosystem”

Project Title: “The Sundarbans”



Checked  
24 out of  
30

College Roll No.: PHSA20M592

CU Registration No.: 223-1111-0337-20

CU Roll No.: 203223-21-0063

## **ACKNOWLEDGMENT**

I would like to thank my subject teachers of AECC-2 ENVS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my classmates, because without their timely help and guidance, it was impossible for me to opt and work on this project.

## **Contains**

- ❖ **Aims and Objective**
- ❖ **Introduction**
- ❖ **Ecoregions**
- ❖ **Flora**
- ❖ **Fauna**
- ❖ **Food chains and Food web**
- ❖ **Food Pyramid**
- ❖ **Biochemical Cycle**
- ❖ **Endangered and Extinct Species**
- ❖ **Sundarban Tiger Reserve**
- ❖ **Conclusion**



## **Aims and Objectives:**

- Interpret the connection between the abiotic and biotic aspects of ecosystem.
- Observe differences in types of vegetation during the field visit and relate these to abiotic features such as temperature, rainfall, soil, and topographic patterns wherever possible.
- Understand food chains and food pyramids.
  - Observe the abundance of different species in the ecosystem.
  - Observe which plants are found commonly in the forest. Only a few species are very abundant but there are a large number of less common species of trees, shrubs and climbers and small ground plants that add to the diversity of plant life in any forest.
  - Observe and document the names of animals seen. Classify them as mammals, birds, reptiles, amphibians or insects. Classify these into herbivores and carnivores.

## Introduction:

**Sundarbans** is a richly biodiverse area. It is situated in delta formed by the confluences of three main rivers, Ganga, Brahmaputra and Meghna in the Bay of Bengal. It has four protected parts, Sundarbans National Parks, Sundarbans West, Sundarbans South and Sundarbans East Wildlife Sanctuaries. Which are enlisted as **UNESCO World Heritage Sites** in 1987. Despite these protections it is considered endangered in a 2020 assessment under the **IUCN Red Lists of Ecosystems Frameworks**. Some prominent species like the **Royal Bengal Tiger, Sundari tree**, salt water crocodile, hornbill etc. are found here. The mangrove forest spans about 10,000 sq km.



Figure 1: A brief map of Sundarbans

## Ecoregions:

**Sundarbans** has been divided into two ecoregions. 1) "**Sundarbans freshwater swamp forests**". 2) "**Sundarbans mangroves**". The first one is a tropical moist broadleaf forest which lie behind the Sundarbans Mangroves, where salinity of water is more pronounced. It spans over the vast Ganga-Brahmaputra delta. According to Champion and Seth (1968), the freshwater swamp forests. The second one is the main part here. It spans on the coast from seaward fringe of the delta which is around 20,400 sq km in size. The dominant mangrove species *Heritiera fomes* is locally known as Sundari. The other species are *Avicennia*, *Xylocarpus mekongensis*, *Xylocarpus granatum*, *Sonneratia apetala*, *Rhizophora mucronata* etc.

## Flora:

According to David Prain (1903) a total of 245 genera and 334 plant species were recorded. Among them sundari (*Heritiera fomes*), gewa (*Excoecaria agallocha*), goran (*Ceriops decandra*), and keora (*Sonneratia apetala*) are prominent in this region.



Figure 3 Golpata Tree



Figure 2 Sundari Tree

## Fauna:

A 1991 study has revealed that it has 150 species of important fish, 270 species of birds, 42 species of mammals, 35 reptiles and 8 amphibian species, although new ones are being discovered. In which The **Royal Bengal Tiger** (*Panthera tigris*) is famous here. Although it is the habitat of jungle cat, fishing cat and leopard cat. Besides this many small creatures dwell here.



Figure 4 The Royal Bengal Tiger

## Food chains and Food web:

The following relationships between the prey and predator are found here.

Flower → butterflies → spiders

Flower → sunbirds → birds of prey

Fruit → parakeet → birds of prey

Seeds → rodents → birds of prey

Flowers → bees → bee eaters

Seeds → munias → small carnivorous mammals and birds of prey

Leaves → monkey → leopard

Grass → chital → tiger

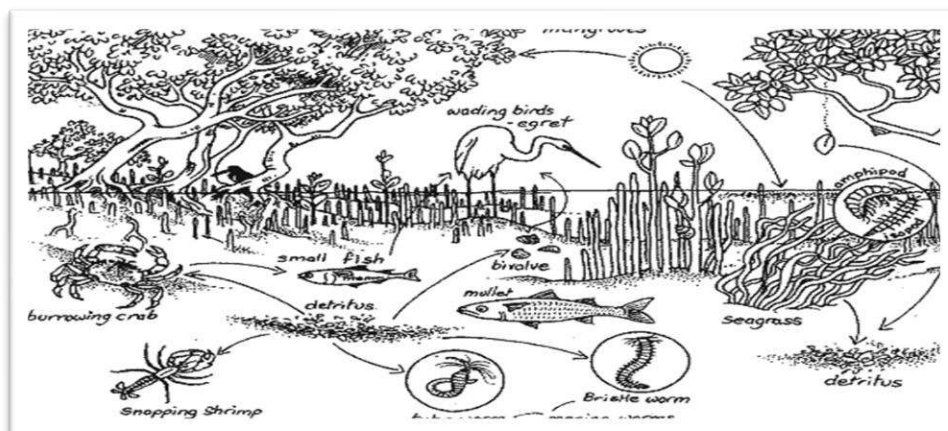


Figure 5 Food Web

## Food Pyramid:

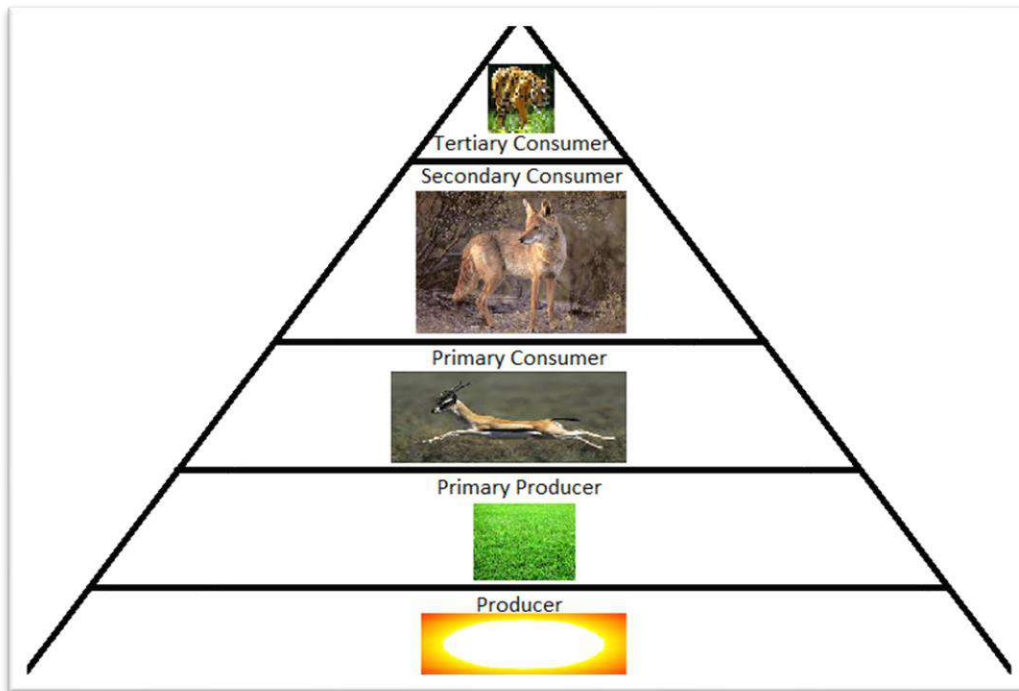


Figure 6 Food Pyramid

## Biochemical Cycle:

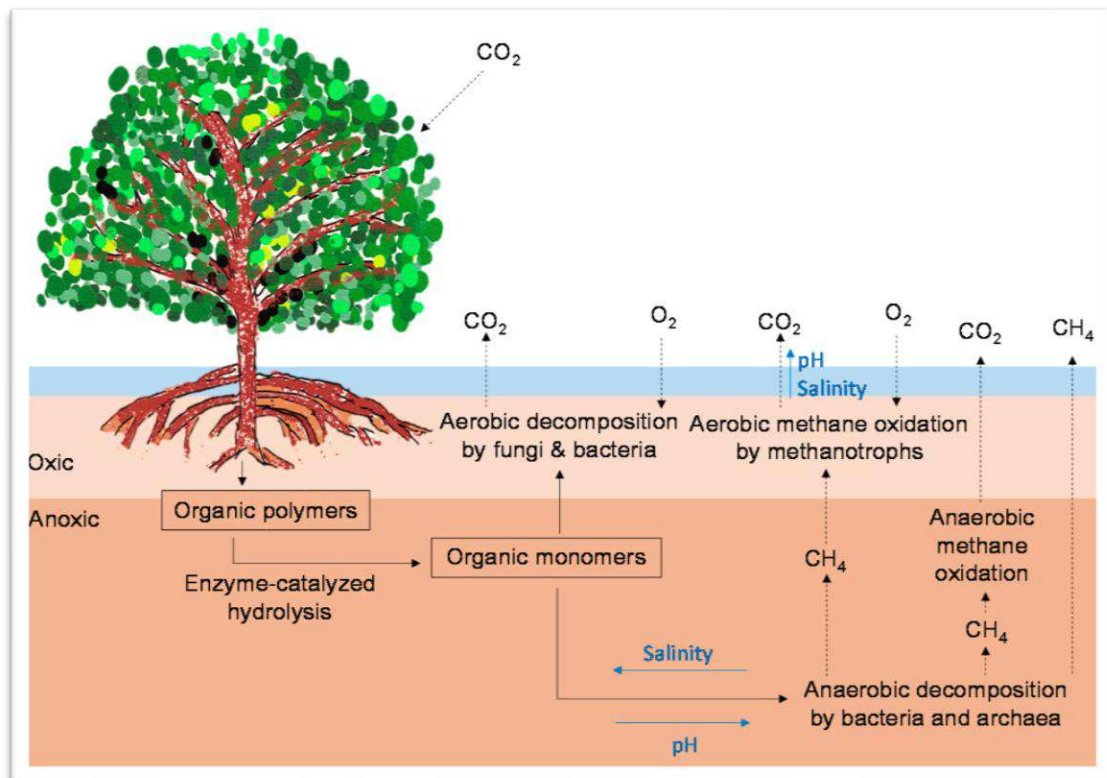


Figure 7 Biochemical Cycle

## **Endangered and Extinct Species:**

Despite the popularity of Sundari and Gewa species its number is declining which are 40% and 45% of the total tree population.

The endangered species that live within the Sundarbans and extinct species that used to be include the Bengal tiger, estuarine crocodile, northern river terrapin (*Batagur baska*), olive ridley sea turtle, Gangetic dolphin, ground turtles, hawksbill sea turtles and king crabs (horse shoe). Some species such as hog deer (*Axis porcinus*), water buffalos (*Bubalus bubalis*), barasingha or swamp deer (*Cervus duvauceli*), Javan rhinoceros (*Rhinoceros sondaicus*), Indian rhinoceros (*Rhinoceros unicornis*) and the mugger crocodile (*Crocodylus palustris*) started to become extinct in the Sundarbans towards the middle of the 20<sup>th</sup> century, because of extensive poaching and hunting by the British. There are other threatened mammal species, such as the capped langur (*Semnopithecus pileatus*), smooth-coated otter (*Lutrogale perspicillata*), Asian small-clawed otter (*Aonyx cinerea*) and large Indian civet (*Viverra zibetha*).

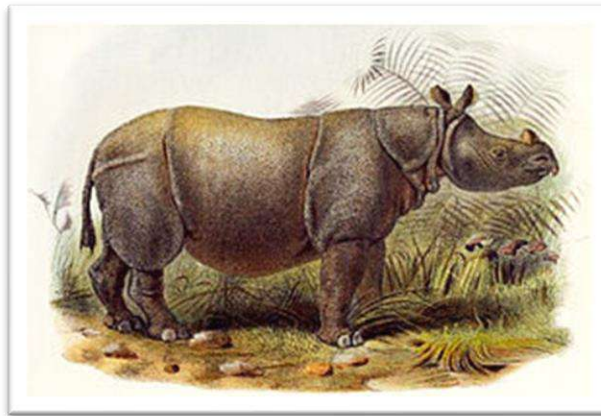


Figure 8 Extinct Java Rhino

## **Sundarban Tiger Reserve:**

Here are some key points of Sundarban Tiger Reserve.

- One of the first nine Tiger Reserves declared under the Project Tiger scheme in the year 1973.
- The National Park area of the Tiger Reserve is a natural World Heritage Site, which was declared in the year 1987.
- The Sundarban Tiger Reserve is a part of the Sundarban Biosphere Reserve, which is one of the few globally recognized Biosphere Reserves in the country. It was declared as a Biosphere Reserve in the year 1989.
- The Sundarbans has been classified as a Tiger Conservation Landscape of global priority, as it is the only mangrove habitat (along with the Bangladesh), which support a significant tiger population.
- The Tiger Reserve is home to a large number of endangered and globally threatened species like the tiger.
- The Tiger Reserve is home to a large number of endangered and globally threatened species like the tiger (*Panthera tigris tigris*), fishing cat (*Prionailurus viverrina*) and estuarine crocodile (*Crocodylus porosus*), Gangetic (*Platanista gangetica*) and Irrawady Dolphin (*Oracella brevirostris*), king cobra (*Ophiophagus hannah*), water monitor lizard (*Varanus salvator*) etc.

## Conclusion

Here, I have come to the end of the project on the topic Forest Ecosystem. I tried my best to include all the necessary points that are required related to the given topic. Some of the information I wrote in the project were taken from the internet and I have also referred to some books. This project contains information of sundarban ecosystem, its conservation, and many other topics. I do hope that my project will be interesting and may be even knowledgeable.

---

### Bibliography:

- <https://leeones.files.wordpress.com/2013/03/food-pyramid.png>
- <https://en.wikipedia.org/wiki/Sundarbans>
- [https://www.google.com/imgres?imgurl=https%3A%2F%2Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2Fthumb%2F%2F23%2FSundarban\\_Tiger.jpg%2F1200px-Sundarban\\_Tiger.jpg&imgrefurl=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FSundarbans\\_National\\_Park&tbnid=dGMHkbfJPMr58M&vet=12ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ..i&docid=RSMUbxg8wuSKIM&w=1200&h=800&itg=1&q=sundarbans&safe=active&ved=2ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ](https://www.google.com/imgres?imgurl=https%3A%2F%2Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2Fthumb%2F%2F23%2FSundarban_Tiger.jpg%2F1200px-Sundarban_Tiger.jpg&imgrefurl=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FSundarbans_National_Park&tbnid=dGMHkbfJPMr58M&vet=12ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ..i&docid=RSMUbxg8wuSKIM&w=1200&h=800&itg=1&q=sundarbans&safe=active&ved=2ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ)
- [https://www.google.com/search?q=sundarbans&safe=active&sxsr=AleKk02Ki\\_K0Ekk7F3zxRZZ1s8khmbFKGA:1625371832537&source=lnms&tbn=isch&sa=X&ved=2ahUKEwie5tL1xcjxAhXL8HMBHaFsB6AQ\\_AUoAnoECAEQBA&cshid=1625371875491144&biw=1536&bih=750](https://www.google.com/search?q=sundarbans&safe=active&sxsr=AleKk02Ki_K0Ekk7F3zxRZZ1s8khmbFKGA:1625371832537&source=lnms&tbn=isch&sa=X&ved=2ahUKEwie5tL1xcjxAhXL8HMBHaFsB6AQ_AUoAnoECAEQBA&cshid=1625371875491144&biw=1536&bih=750)
- <https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
- [https://www.google.com/search?q=biochemical+cycle+mangrove&tbn=isch&ved=2ahUKEwjSr63tgsfxAhUSLHIKHl8BdkQ2-cCegQIABAA&oq=biochemical+cycle+mangrove&gs\\_lcp=CgNpbWcQAzoECCMQJzoCCAA6BAgAEB46BggAEAUQHjoECAAQGDogCAAQChAYUIJAWJ9jYLNlaABwAHgAgAGIAYgB-ggSAQMwLjmYAQCgAQGqAQtd3Mtd2l6LWltZ8ABAQ&scient=img&ei=LmjgYNLgDZLYyAPp-ZXIDQ&bih=704&biw=1522&safe=active&hl=en#imgrc=f8L0adBxw76ZZM](https://www.google.com/search?q=biochemical+cycle+mangrove&tbn=isch&ved=2ahUKEwjSr63tgsfxAhUSLHIKHl8BdkQ2-cCegQIABAA&oq=biochemical+cycle+mangrove&gs_lcp=CgNpbWcQAzoECCMQJzoCCAA6BAgAEB46BggAEAUQHjoECAAQGDogCAAQChAYUIJAWJ9jYLNlaABwAHgAgAGIAYgB-ggSAQMwLjmYAQCgAQGqAQtd3Mtd2l6LWltZ8ABAQ&scient=img&ei=LmjgYNLgDZLYyAPp-ZXIDQ&bih=704&biw=1522&safe=active&hl=en#imgrc=f8L0adBxw76ZZM)
- <http://sundarbantigerreserve.org/str/>

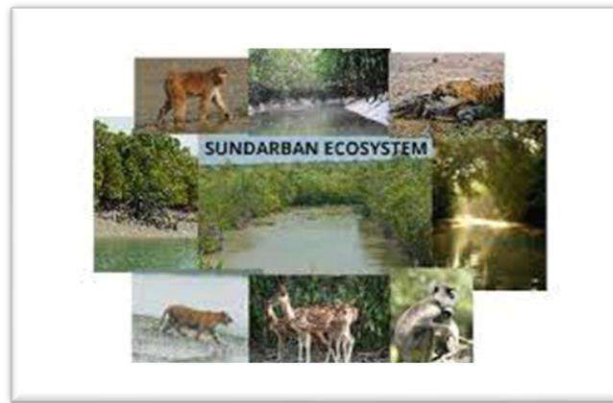
# PROJECT REPORT

SEMESTER II  
COURSE: AECC2 (Environmental Studies)

Project Topic: “Study of Ecosystems.”

Project Subtopic: “Forest Ecosystem”

Project Title: “The Sundarbans”



College Roll No.: PHSA20M592

CU Registration No.: 223-1111-0337-20

CU Roll No.: 203223-21-0063

## **ACKNOWLEDGMENT**

I would like to thank my subject teachers of AECC-2 ENVS for providing me with adequate study materials for this topic and encouraging me to do this project systematically. I would also like to thank my classmates, because without their timely help and guidance, it was impossible for me to opt and work on this project.



## **Contains**

- ❖ **Aims and Objective**
- ❖ **Introduction**
- ❖ **Ecoregions**
- ❖ **Flora**
- ❖ **Fauna**
- ❖ **Food chains and Food web**
- ❖ **Food Pyramid**
- ❖ **Biochemical Cycle**
- ❖ **Endangered and Extinct Species**
- ❖ **Sundarban Tiger Reserve**
- ❖ **Conclusion**

## **Aims and Objectives:**

- Interpret the connection between the abiotic and biotic aspects of ecosystem.
- Observe differences in types of vegetation during the field visit and relate these to abiotic features such as temperature, rainfall, soil, and topographic patterns wherever possible.
- Understand food chains and food pyramids.
  - Observe the abundance of different species in the ecosystem.
  - Observe which plants are found commonly in the forest. Only a few species are very abundant but there are a large number of less common species of trees, shrubs and climbers and small ground plants that add to the diversity of plant life in any forest.
  - Observe and document the names of animals seen. Classify them as mammals, birds, reptiles, amphibians or insects. Classify these into herbivores and carnivores.

## Introduction:

**Sundarbans** is a richly biodiverse area. It is situated in delta formed by the confluences of three main rivers, Ganga, Brahmaputra and Meghna in the Bay of Bengal. It has four protected parts, Sundarbans National Parks, Sundarbans West, Sundarbans South and Sundarbans East Wildlife Sanctuaries. Which are enlisted as **UNESCO World Heritage Sites** in 1987. Despite these protections it is considered endangered in a 2020 assessment under the **IUCN Red Lists of Ecosystems Frameworks**. Some prominent species like the **Royal Bengal Tiger, Sundari tree**, salt water crocodile, hornbill etc. are found here. The mangrove forest spans about 10,000 sq km.



Figure 1: A brief map of Sundarbans

## Ecoregions:

**Sundarbans** has been divided into two ecoregions. 1) "**Sundarbans freshwater swamp forests**". 2) "**Sundarbans mangroves**". The first one is a tropical moist broadleaf forest which lie behind the Sundarbans Mangroves, where salinity of water is more pronounced. It spans over the vast Ganga-Brahmaputra delta. According to Champion and Seth (1968), the freshwater swamp forests. The second one is the main part here. It spans on the coast from seaward fringe of the delta which is around 20,400 sq km in size. The dominant mangrove species *Heritiera fomes* is locally known as Sundari. The other species are *Avicennia*, *Xylocarpus mekongensis*, *Xylocarpus granatum*, *Sonneratia apetala*, *Rhizophora mucronata* etc.

## Flora:

According to David Prain (1903) a total of 245 genera and 334 plant species were recorded. Among them sundari (*Heritiera fomes*), gewa (*Excoecaria agallocha*), goran (*Ceriops decandra*), and keora (*Sonneratia apetala*) are prominent in this region.



Figure 3 Golpata Tree



Figure 2 Sundari Tree

## Fauna:

A 1991 study has revealed that it has 150 species of important fish, 270 species of birds, 42 species of mammals, 35 reptiles and 8 amphibian species, although new ones are being discovered. In which The **Royal Bengal Tiger** (*Panthera tigris*) is famous here. Although it is the habitat of jungle cat, fishing cat and leopard cat. Besides this many small creatures dwell here.



Figure 4 The Royal Bengal Tiger

## Food chains and Food web:

The following relationships between the prey and predator are found here.

Flower → butterflies → spiders

Flower → sunbirds → birds of prey

Fruit → parakeet → birds of prey

Seeds → rodents → birds of prey

Flowers → bees → bee eaters

Seeds → munias → small carnivorous mammals and birds of prey

Leaves → monkey → leopard

Grass → chital → tiger

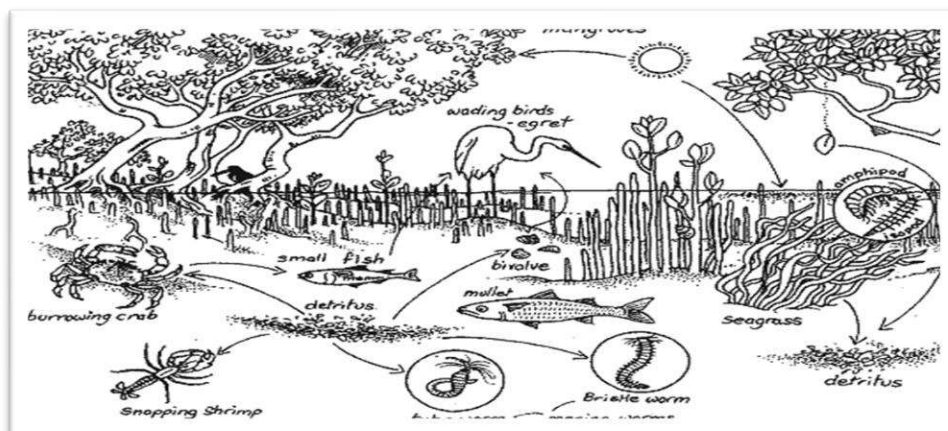


Figure 5 Food Web

## Food Pyramid:

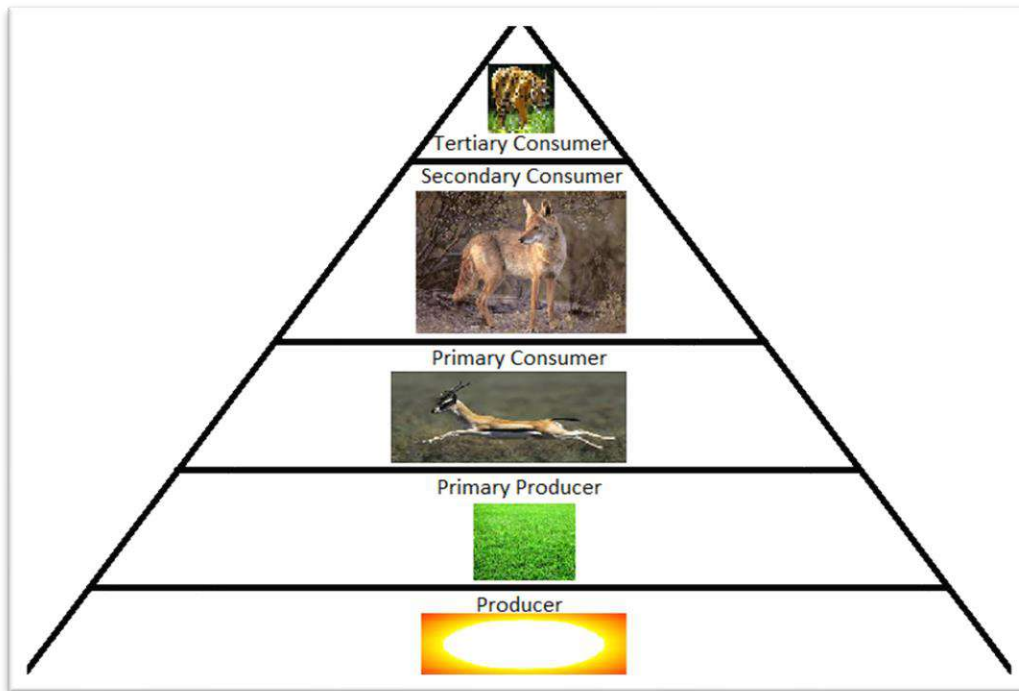


Figure 6 Food Pyramid

## Biochemical Cycle:

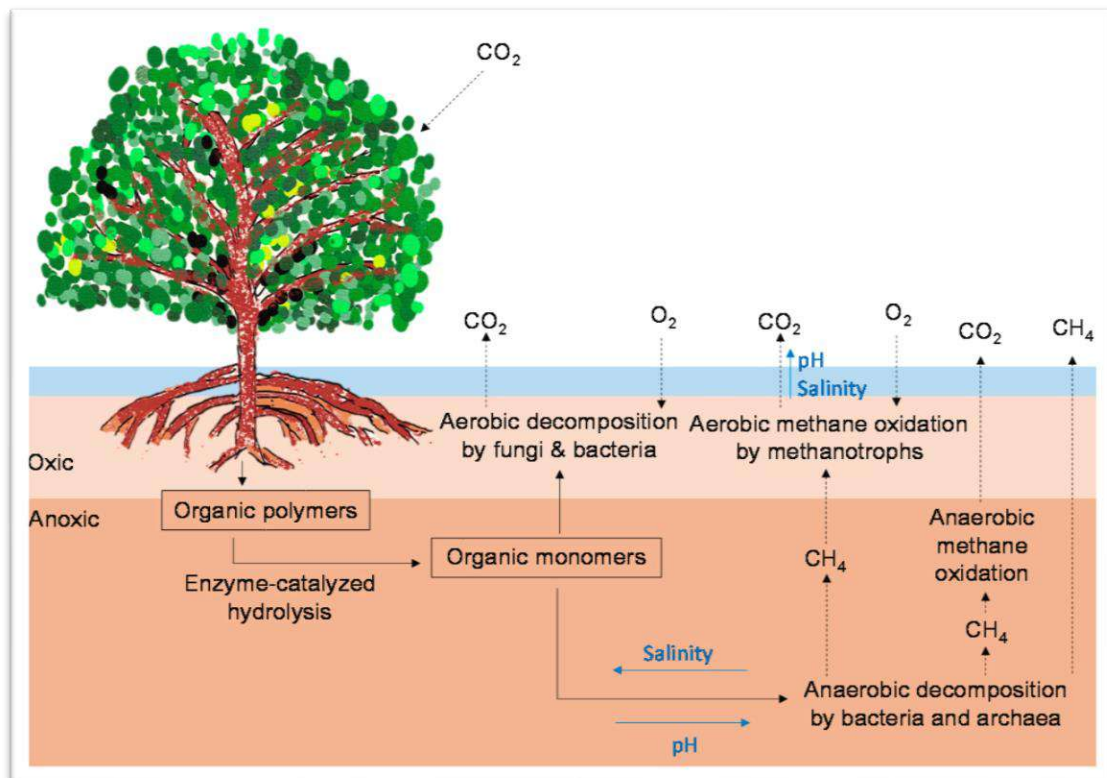


Figure 7 Biochemical Cycle

## **Endangered and Extinct Species:**

Despite the popularity of Sundari and Gewa species its number is declining which are 40% and 45% of the total tree population.

The endangered species that live within the Sundarbans and extinct species that used to be include the Bengal tiger, estuarine crocodile, northern river terrapin (*Batagur baska*), olive ridley sea turtle, Gangetic dolphin, ground turtles, hawksbill sea turtles and king crabs (horse shoe). Some species such as hog deer (*Axis porcinus*), water buffalos (*Bubalus bubalis*), barasingha or swamp deer (*Cervus duvauceli*), Javan rhinoceros (*Rhinoceros sondaicus*), Indian rhinoceros (*Rhinoceros unicornis*) and the mugger crocodile (*Crocodylus palustris*) started to become extinct in the Sundarbans towards the middle of the 20<sup>th</sup> century, because of extensive poaching and hunting by the British. There are other threatened mammal species, such as the capped langur (*Semnopithecus pileatus*), smooth-coated otter (*Lutrogale perspicillata*), Asian small-clawed otter (*Aonyx cinerea*) and large Indian civet (*Viverra zibetha*).

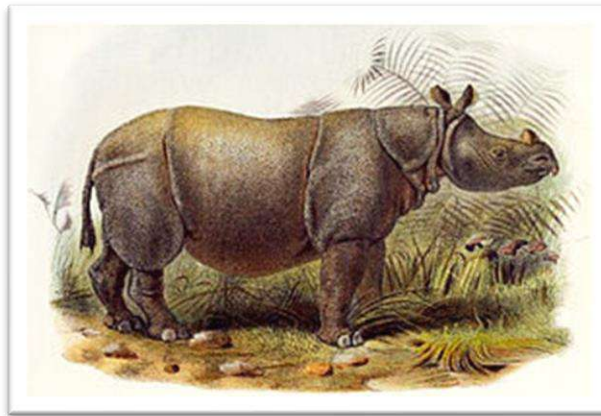


Figure 8 Extinct Java Rhino

## **Sundarban Tiger Reserve:**

Here are some key points of Sundarban Tiger Reserve.

- One of the first nine Tiger Reserves declared under the Project Tiger scheme in the year 1973.
- The National Park area of the Tiger Reserve is a natural World Heritage Site, which was declared in the year 1987.
- The Sundarban Tiger Reserve is a part of the Sundarban Biosphere Reserve, which is one of the few globally recognized Biosphere Reserves in the country. It was declared as a Biosphere Reserve in the year 1989.
- The Sundarbans has been classified as a Tiger Conservation Landscape of global priority, as it is the only mangrove habitat (along with the Bangladesh), which support a significant tiger population.
- The Tiger Reserve is home to a large number of endangered and globally threatened species like the tiger.
- The Tiger Reserve is home to a large number of endangered and globally threatened species like the tiger (*Panthera tigris tigris*), fishing cat (*Prionailurus viverrina*) and estuarine crocodile (*Crocodylus porosus*), Gangetic (*Platanista gangetica*) and Irrawady Dolphin (*Oracella brevirostris*), king cobra (*Ophiophagus hannah*), water monitor lizard (*Varanus salvator*) etc.

## Conclusion

Here, I have come to the end of the project on the topic Forest Ecosystem. I tried my best to include all the necessary points that are required related to the given topic. Some of the information I wrote in the project were taken from the internet and I have also referred to some books. This project contains information of sundarban ecosystem, its conservation, and many other topics. I do hope that my project will be interesting and may be even knowledgeable.

---

### Bibliography:

- <https://leeones.files.wordpress.com/2013/03/food-pyramid.png>
- <https://en.wikipedia.org/wiki/Sundarbans>
- [https://www.google.com/imgres?imgurl=https%3A%2F%2Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2Fthumb%2F%2F23%2FSundarban\\_Tiger.jpg%2F1200px-Sundarban\\_Tiger.jpg&imgrefurl=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FSundarbans\\_National\\_Park&tbnid=dGMHkbfJPMr58M&vet=12ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ..i&docid=RSMUbxg8wuSKIM&w=1200&h=800&itg=1&q=sundarbans&safe=active&ved=2ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ](https://www.google.com/imgres?imgurl=https%3A%2F%2Fupload.wikimedia.org%2Fwikipedia%2Fcommons%2Fthumb%2F%2F23%2FSundarban_Tiger.jpg%2F1200px-Sundarban_Tiger.jpg&imgrefurl=https%3A%2F%2Fen.wikipedia.org%2Fwiki%2FSundarbans_National_Park&tbnid=dGMHkbfJPMr58M&vet=12ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ..i&docid=RSMUbxg8wuSKIM&w=1200&h=800&itg=1&q=sundarbans&safe=active&ved=2ahUKEwi19YyLxsjxAhVhDrcAHQCVBgsQMygAegUIARDEAQ)
- [https://www.google.com/search?q=sundarbans&safe=active&sxsr=AleKk02Ki\\_K0Ekk7F3zxRZZ1s8khmbFKGA:1625371832537&source=lnms&tbn=isch&sa=X&ved=2ahUKEwie5tL1xcjxAhXL8HMBHaFsB6AQ\\_AUoAnoECAEQBA&cshid=1625371875491144&biw=1536&bih=750](https://www.google.com/search?q=sundarbans&safe=active&sxsr=AleKk02Ki_K0Ekk7F3zxRZZ1s8khmbFKGA:1625371832537&source=lnms&tbn=isch&sa=X&ved=2ahUKEwie5tL1xcjxAhXL8HMBHaFsB6AQ_AUoAnoECAEQBA&cshid=1625371875491144&biw=1536&bih=750)
- <https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf>
- [https://www.google.com/search?q=biochemical+cycle+mangrove&tbn=isch&ved=2ahUKEwjSr63tgsfxAhUSLHIKHl8BdkQ2-cCegQIABAA&oq=biochemical+cycle+mangrove&gs\\_lcp=CgNpbWcQAzoECCMQJzoCCAA6BAgAEB46BggAEAUQHjoECAAQGDogCAAQChAYUIJAWJ9jYLNlaABwAHgAgAGIAYgB-ggSAQMwLjmYAQCgAQGqAQtd3Mtd2l6LWltZ8ABAQ&scient=img&ei=LmjgYNLgDZLYyAPp-ZXIDQ&bih=704&biw=1522&safe=active&hl=en#imgrc=f8L0adBxw76ZZM](https://www.google.com/search?q=biochemical+cycle+mangrove&tbn=isch&ved=2ahUKEwjSr63tgsfxAhUSLHIKHl8BdkQ2-cCegQIABAA&oq=biochemical+cycle+mangrove&gs_lcp=CgNpbWcQAzoECCMQJzoCCAA6BAgAEB46BggAEAUQHjoECAAQGDogCAAQChAYUIJAWJ9jYLNlaABwAHgAgAGIAYgB-ggSAQMwLjmYAQCgAQGqAQtd3Mtd2l6LWltZ8ABAQ&scient=img&ei=LmjgYNLgDZLYyAPp-ZXIDQ&bih=704&biw=1522&safe=active&hl=en#imgrc=f8L0adBxw76ZZM)
- <http://sundarbantigerreserve.org/str/>

PROJECT WORK

AECC 2

ENVIRONMENTAL STUDIES

COLLEGE ID - PHSA20M594

CU ROLL – 203223-21-0065

CU REGISTRATION NO – 223-1111-0344-20

Checked  
24 out of  
30



## VISIT TO LOCAL POLLUTED SITE: OBSERVATION AND REMEDIAL MEASURES

### **INTRODUCTION**

Pollution is the action of polluting especially by environmental contamination with man made waste. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollutants, the components of pollution can be either foreign substance or naturally occurring contaminates. Different types of pollution are air pollution, land pollution, water pollution, noise pollution, light pollution ,thermal pollution, radioactive contamination, plastic pollution and so on.



### **Polluted site**

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

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

· **Electromagnetic pollution**: the over abundance of electromagnetic radiation in their non-ionizing form, like radio waves, e.t.c. that people are constantly exposed at, especially in large cities. It's still unknown whether or not those types of radiation have any effects on human health, though.

## **CONTAMINATED SITE**



· **Light pollution:** It is also called photo pollution, is the presence of anthropogenic and artificial light in the night environment.

· **Littering:** the criminal throwing of inappropriate man-made object onto public and private properties.

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

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

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

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

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

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

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

### **OBJECTIVES**

1. To study the cause and effect of pollution at Parsa , chitwan.
2. To find out the problems faced by people living near the polluted site.
3. To find out the mitigation measure of effects of pollution .
4. To find out the effect of pollution on different environment aspect.
5. To aware people living in the surrounding about the effects of pollution to their health and importance of pollution management.

## **METHODOLOGY**

### **Site selection:**

Land pollution located at Parsa chok , Chitwan was selected to prepare report on visit to polluted site.It is one of the polluted site in Parsa.I selected this site due to it easy accessible and my interest to know about that place.It is located 27 37 08 N and 84 34 33 E and 2004 above sea level. It has sub tropical zone with hot and humid summer and cold winter with average temperature 27 . It has loamy soil.

### **Data collection:**

#### **Primary method:**

Following primary method of data collection were used:

- A. Field visit:The polluted area was visited to observe the condition of land and its surrounding,I visited land polluted site of Khairahani municipality due to easy availability and low cost for visiting.The main source of income of the people living here in this municipality is commercial farming and remittance.
  
- B. Interview:Sets of questions were asked to local people( Rama Lama) about cause of pollution, its impact on their health and daily operation, their role in creation of pollution and their mitigation.

#### **Secondary method:**

Different report,news and journal on land pollution in Parsa , Chitwan was studied.

### **RESULT AND DISCUSSION:**

Land pollution is one of the major pollution in every part of our country including Chitwan. I have visited land polluted site at Parsa, chitwan. From my study I collected following information on cause of pollution:

- A. The major source of land pollution was garbage from household. Due lack of proper disposal management by local government people are obligate to throw garbage on open land.
- B. Industry waste, furniture waste and waste from local shop has also cause land pollution.
- C. Due to lack of awareness people throw all the waste on open land without any categorization of waste.

Above studied cause of land pollution in the site can be reduced by following remedial measures:

- A. Adequate management provision of household waste, industrial waste, and other waste should be done by responsible authorised local government.
- B. Awareness program on categorization of waste into degradable and non degradable waste should be carried on .
- C. Proper policy and laws like paying fines should be implemented.
- D. Degradable waste should be incorporated for fertility improvement of soil.

### **SUMMARY, CONCLUSION AND SUGGESTION**

Thus, in this way I visited a local polluted area(land pollution) ,observed its condition and find outs its mitigation measure.Land is one of the integral part of the environment,but increasing population,urbanisation , industrial development has cause it deterioration. Land pollution is one of the serious problem of our environment. Land pollution destroy the beauty of the place,invites many health problems like diarrhoea, cholera, dysentery to serious problem like skin cancer, respiratory problem.The toxic chemicals can reach our body through food and vegetables grow in polluted soil.Land pollution not only affect the human but it also affect animals and plants.

In order to reduce the effect of land pollution different mitigations measures should implemented.Proper management of garbage, reuse and recycle of recyclable waste,laws and policy made by government should be followed by people. People themselves are the causes of the land pollution so steps on land pollution mitigation should be started from each person .

PROJECT WORK

AECC 2

ENVIRONMENTAL STUDIES

COLLEGE ID - PHSA20M594

CU ROLL – 203223-21-0065

CU REGISTRATION NO – 223-1111-0344-20



## VISIT TO LOCAL POLLUTED SITE: OBSERVATION AND REMEDIAL MEASURES

### **INTRODUCTION**

Pollution is the action of polluting especially by environmental contamination with man made waste. Pollution is the introduction of contaminants into the natural environment that cause adverse change. Pollutants, the components of pollution can be either foreign substance or naturally occurring contaminates. Different types of pollution are air pollution, land pollution, water pollution, noise pollution, light pollution ,thermal pollution, radioactive contamination, plastic pollution and so on.



### **Polluted site**

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

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

· **Electromagnetic pollution**: the over abundance of electromagnetic radiation in their non-ionizing form, like radio waves, e.t.c. that people are constantly exposed at, especially in large cities. It's still unknown whether or not those types of radiation have any effects on human health, though.

## **CONTAMINATED SITE**



· **Light pollution:** It is also called photo pollution, is the presence of anthropogenic and artificial light in the night environment.

· **Littering:** the criminal throwing of inappropriate man-made object onto public and private properties.

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

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

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

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

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

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

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

### **OBJECTIVES**

1. To study the cause and effect of pollution at Parsa , chitwan.
2. To find out the problems faced by people living near the polluted site.
3. To find out the mitigation measure of effects of pollution .
4. To find out the effect of pollution on different environment aspect.
5. To aware people living in the surrounding about the effects of pollution to their health and importance of pollution management.

## **METHODOLOGY**

### **Site selection:**

Land pollution located at Parsa chok , Chitwan was selected to prepare report on visit to polluted site.It is one of the polluted site in Parsa.I selected this site due to it easy accessible and my interest to know about that place.It is located 27 37 08 N and 84 34 33 E and 2004 above sea level. It has sub tropical zone with hot and humid summer and cold winter with average temperature 27 . It has loamy soil.

### **Data collection:**

#### **Primary method:**

Following primary method of data collection were used:

- A. Field visit:The polluted area was visited to observe the condition of land and its surrounding,I visited land polluted site of Khairahani municipality due to easy availability and low cost for visiting.The main source of income of the people living here in this municipality is commercial farming and remittance.
  
- B. Interview:Sets of questions were asked to local people( Rama Lama) about cause of pollution, its impact on their health and daily operation, their role in creation of pollution and their mitigation.

#### **Secondary method:**

Different report,news and journal on land pollution in Parsa , Chitwan was studied.

### **RESULT AND DISCUSSION:**

Land pollution is one of the major pollution in every part of our country including Chitwan. I have visited land polluted site at Parsa, chitwan. From my study I collected following information on cause of pollution:

- A. The major source of land pollution was garbage from household. Due lack of proper disposal management by local government people are obligate to throw garbage on open land.
- B. Industry waste, furniture waste and waste from local shop has also cause land pollution.
- C. Due to lack of awareness people throw all the waste on open land without any categorization of waste.

Above studied cause of land pollution in the site can be reduced by following remedial measures:

- A. Adequate management provision of household waste, industrial waste, and other waste should be done by responsible authorised local government.
- B. Awareness program on categorization of waste into degradable and non degradable waste should be carried on .
- C. Proper policy and laws like paying fines should be implemented.
- D. Degradable waste should be incorporated for fertility improvement of soil.

### **SUMMARY, CONCLUSION AND SUGGESTION**

Thus, in this way I visited a local polluted area(land pollution) ,observed its condition and find outs its mitigation measure.Land is one of the integral part of the environment,but increasing population,urbanisation , industrial development has cause it deterioration. Land pollution is one of the serious problem of our environment. Land pollution destroy the beauty of the place,invites many health problems like diarrhoea, cholera, dysentery to serious problem like skin cancer, respiratory problem.The toxic chemicals can reach our body through food and vegetables grow in polluted soil.Land pollution not only affect the human but it also affect animals and plants.

In order to reduce the effect of land pollution different mitigations measures should implemented.Proper management of garbage, reuse and recycle of recyclable waste,laws and policy made by government should be followed by people. People themselves are the causes of the land pollution so steps on land pollution mitigation should be started from each person .

E. N. V. S. PROJECT

# Scottish Church College

B. Sc (SEM II)

Physics Department

The study of common plants, insects, fish, birds, mammals  
and basic principles of identification.

Checked  
25 out of  
30

Registration No.: 223-1111-0352-20

Roll No.: 203223-21-0069

SCC Roll No.: PHSA20M596



# CONTENTS

1. Acknowledgement

2. Introduction

3. Observations

Plants

Fish

Birds

Insects

Mammals

4. Conclusion

5. Bibliography

## Acknowledgement

I am very grateful to the Environmental Sciences professors whose guidance and teaching helped me a great deal during the making of this project report. I would also like to express my gratitude to Dr. Jayeeta Chowdhury, the head of department of physics at Scottish Church College for her guidance and supervision. Lastly, I would like to thank my class mates who helped a great deal to make this report.

Date: 4<sup>th</sup> July 2021

Mathew Paritosh John.

## INTRODUCTION:

- I. **PLANTS:** Plants are essential to all other life on planet Earth. They form the basis of almost every food chain and food web. Most plants are autotrophic, creating their own food by the use of sunlight, water and carbon dioxide via a process known as 'photosynthesis'. Some of the earliest plant fossils have been aged at around 3.8 billion years old, thus proving that plants have been around for longer than most other organisms. The idea of 'plant' which was once used to describe anything green and not an animal has now been divided into kingdoms; mainly being *Protista*, *Fungi* and *Plantae*.
- II. **INSECTS:** Insects are a class under the *Phylum Arthropoda*. They are small invertebrates with a hard-protective exoskeleton. Insects are the largest group of animals known to man with a staggering approximate of 900 thousand species that have been identified. New species of insects are continually being discovered and scientists estimate the number of undiscovered insect species to be from 2 million to around 30 million. Insects are six legged creatures and most possess wings. They are the first creatures to have attained the ability of flight. Insects are found all over the world, and in most percentage in tropical regions.
- III. **FISH:** Fish are aquatic, craniate, gill-bearing animals that lack limbs with digits. The earliest organisms that can be classified as fish were soft-bodied chordates that first appeared during the beginning of the Palaeozoic era. Although they lacked a true spine, they possessed notochords which allowed them to be more agile than their invertebrate counterparts. Many fish of the Palaeozoic developed external armour that protected them from predators. The first fish with jaws appeared around 444 million years ago, after which many such as sharks became formidable marine predators. Most fish are cold-blooded. With 34,300 described species, fish exhibit greater species diversity than any other group of vertebrates.
- IV. **BIRDS:** Birds are a group of warm-blooded vertebrates constituting the class *Aves*, characterised by feathers, toothless beaked jaws, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton. Birds live worldwide and range in size from the 5.5 cm (2.2 in) bee hummingbird to the 2.8 m (9 ft 2 in) ostrich. There are about ten thousand living species of birds. The digestive and respiratory systems of birds are also uniquely adapted for flight. Some bird species of aquatic environments have further evolved for swimming. Birds are descendants of the primitive avialans which first appeared about 160 million years ago.
- V. **MAMMALS:** Mammals are a group of vertebrate animals constituting the class *Mammalia*. Mammals are characterized by mammary glands present in females that produce milk for young ones. Mammals give birth by a process known as 'parturition', i.e. the foetus is developed inside the womb of the mother and is delivered fully developed. These characteristics distinguish mammals from most other creatures that lay eggs. Mammals first appeared around 323 million years ago. The most abundant mammals on Earth are human beings (*Homo sapiens*) and the largest known mammals are marine mammals, Blue whales (*Balaenoptera musculus*).

## OBSERVATION:

### I. PLANTS:

#### A. APPLE TREE:



- i. Common Name: Apple Tree
- ii. Scientific Name: *Malus domestica*
- iii. Distribution: Apple can be grown at altitudes 1,500-2,700 m. The temperature during the growing season is around 21-24°C. For optimum growth and fruiting, apple trees need 100-125 cm. of annual rainfall. Found in Himachal Pradesh covering the districts of Shimla, Siramour, Kullu, Mandi, Chamba and Kinnaur.
- iv. Characteristics: Apple trees are deciduous with alternate, toothed, oval leaves. The trees generally remain somewhat small, between 10 to 39 feet but can grow taller.

#### B. STINGING NETTLE:



- i. Common English Name: Stinging Nettle
- ii. Local Hindi Name: Bicchu Buti
- iii. Scientific Name: *Urtica dioica*
- iv. Distribution: It is a wild plant that requires moist soil to grow and is found in hilly regions, growing in large clusters.
- v. Characteristics: It has widely spreading rhizomes and stolons, which are bright yellow, as are the roots. The soft, green leaves are long and are borne oppositely on an erect, wiry, green stem. The leaves and stems have stinging hairs whose tips come off when touched, transforming the hair into a needle that can inject several chemicals causing a painful sting.

## ii. FISH:

### A. TROUT:



- i. Common Name: Trout
- ii. Scientific Name: *Oncorhynchus mykiss*
- iii. Distribution: Found in Fresh water, in the rivers Beas and Ravi.
- iv. Characteristics: Trout fish are of beautiful colours that shine on their skin. Their coloration varies widely in relation to gender, habitat, age and spawning condition. Colours on the back of these fish can range from brown, to olive, to dark blue. And almost all fish have a pinkish band running the length of their body, and a silver underside that fades to pearl white. And there are also some small black spots on their back, fins and tail. Average body length of these fish is between 20 and 30 inches. But they can grow as long as 4 feet.

### B. MAHSEER:



- i. Common Name: Mahseer
- ii. Scientific Name: *Tor putitora*
- iii. Distribution: A fresh water fish found in the Rivers Beas and Giri.
- iv. Characteristics: Mahseer have large, thick scales, powerful jaws, and protrusible, sometimes very fleshy, lips adapted for taking food from the bottom. Among the largest of Indian river fishes, mahseer attain a maximum size of some 2 m, with a weight of about 90 kg.

### III. BIRDS:

#### A. GREAT BARBET:



- i. Common Name: Great Barbet
- ii. Scientific Name: *Megalaima virens*
- iii. Distribution: The great barbet is a resident breeder in the lower-to-middle altitudes of the Himalayas, ranging across northern India, Nepal and Bhutan, Bangladesh and some parts of Southeast Asia
- iv. Characteristics: The great barbet has a blue head, large yellow bill, brown and green-streaked body, belly and a red vent. The plumage is green. It is the largest barbet species with a body length of 32–35 cm and a weight of 192–295 g.

#### B. STREAK-THROATED WOODPECKER:



- i. Common Name: Streak-throated Woodpecker
- ii. Scientific Name: *Picus xanthopygaeus*
- iii. Distribution: Widespread from India to southeast Asia; found in China, Tibet, Nepal. Eastern and Western Himalayas, Sri Lanka, Bangladesh, Bhutan, Myanmar, Laos, Vietnam, Cambodia and Thailand.
- iv. Characteristics: It is a medium-sized, green woodpecker with streaked throat and scaly whitish underparts. Green above with yellowish rump, white supercilia and white and black moustache. The crown is red in males and blackish in females. Small, dark bill.

#### iv. INSECTS:

##### A. CHINESE PEACOCK SWALLOWTAIL BUTTERFLY:



- i. Common Name: Chinese Peacock Butterfly
- ii. Scientific Name: *Papilio bianor*
- iii. Distribution: This is a commonly found butterfly in the northern states of India like Himachal Pradesh, Uttarakhand, Delhi and even West Bengal.
- iv. Characteristics: This species is variable in size. The forewings are black with dark veining and green scales. The undersides are brown, turning white distally with dark veining. The hindwings are tailed and have ridged edges containing reddish eyespots. The body is black with green scales.

##### B. INDIAN HUNTSMAN SPIDER:



- i. Common Name: Indian Huntsman Spider
- ii. Scientific Name: *Heteropoda venatoria*
- iii. Distribution: They are native to tropical and warm temperate regions worldwide. considered an invasive species from Asia. Because of their speed, they commonly hunt and eat cockroaches and are found in many homes.
- iv. Characteristics: Huntsman spiders can generally be identified by their legs, which, rather than being jointed vertically relative to the body, are twisted in such a way that in some attitudes the legs extend forward in a crab-like fashion. The main colours of huntsman spiders are inconspicuous shades of brown or grey.

## v. MAMMALS:

### A. SNOW LEOPARD:



- i. Common Name: Snow Leopard
- ii. Scientific Name: *Panthera uncia*
- iii. Distribution: Snow leopard habitat in the Indian Himalayas is mainly in Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh.
- iv. Characteristics: The snow leopard's fur is whitish to grey with black spots on head and neck, with larger rosettes on the back, flanks and bushy tail. The belly is whitish. Its eyes are pale green or grey in colour. Its muzzle is short and its forehead domed. Its nasal cavities are large. The fur is thick. Its body is stocky, short-legged, and slightly smaller than the other cats of the genus *Panthera*. It weighs between 22 and 55 kg. Its canine teeth are long and are slender than those of the other *Panthera* species.

### B. DOMESTIC HIMALAYAN YAK:



- i. Common Name: Himalayan Yak
- ii. Scientific Name: *Bos grunniens*
- iii. Distribution: They are found throughout the Himalayan region of the Indian subcontinent, the Tibetan Plateau, Northern Myanmar, Yunnan, Sichuan and as far north as Mongolia and Siberia. It is descended from the wild yak.
- iv. Characteristics: They have bulky frames, sturdy legs, rounded, cloven hooves, and extremely dense, long fur. Domestic yaks are quite variable in colour, often having patches of rusty brown and cream. They have small ears and wide foreheads, with smooth horns that are generally dark in colour. In males (bulls), the horns sweep out from the sides of the head, and then curve forward. The horns of females (cows) are smaller, and have a more upright shape. Both sexes have a short neck with a pronounced hump over the shoulders, although this is larger and more visible in males.



## CONCLUSION:

From this project, not only have we gotten a look at the common flora and fauna of Shimla, Himachal Pradesh: but we have been able to study examples of the common plants, birds, insects, fish and mammals of Shimla and learn about their basic identification principles.

## BIBLIOGRAPHY:

During the making of this project I used the internet to access Wikipedia.

E. N. V. S. PROJECT

# Scottish Church College

B. Sc (SEM II)

Physics Department

The study of common plants, insects, fish, birds, mammals  
and basic principles of identification.

Registration No.: 223-1111-0352-20

Roll No.: 203223-21-0069

SCC Roll No.: PHSA20M596

# CONTENTS

1. Acknowledgement

2. Introduction

3. Observations

Plants

Fish

Birds

Insects

Mammals

4. Conclusion

5. Bibliography

## Acknowledgement

I am very grateful to the Environmental Sciences professors whose guidance and teaching helped me a great deal during the making of this project report. I would also like to express my gratitude to Dr. Jayeeta Chowdhury, the head of department of physics at Scottish Church College for her guidance and supervision. Lastly, I would like to thank my class mates who helped a great deal to make this report.

Date: 4<sup>th</sup> July 2021

Mathew Paritosh John.

## INTRODUCTION:

- I. **PLANTS:** Plants are essential to all other life on planet Earth. They form the basis of almost every food chain and food web. Most plants are autotrophic, creating their own food by the use of sunlight, water and carbon dioxide via a process known as 'photosynthesis'. Some of the earliest plant fossils have been aged at around 3.8 billion years old, thus proving that plants have been around for longer than most other organisms. The idea of 'plant' which was once used to describe anything green and not an animal has now been divided into kingdoms; mainly being *Protista*, *Fungi* and *Plantae*.
- II. **INSECTS:** Insects are a class under the *Phylum Arthropoda*. They are small invertebrates with a hard-protective exoskeleton. Insects are the largest group of animals known to man with a staggering approximate of 900 thousand species that have been identified. New species of insects are continually being discovered and scientists estimate the number of undiscovered insect species to be from 2 million to around 30 million. Insects are six legged creatures and most possess wings. They are the first creatures to have attained the ability of flight. Insects are found all over the world, and in most percentage in tropical regions.
- III. **FISH:** Fish are aquatic, craniate, gill-bearing animals that lack limbs with digits. The earliest organisms that can be classified as fish were soft-bodied chordates that first appeared during the beginning of the Palaeozoic era. Although they lacked a true spine, they possessed notochords which allowed them to be more agile than their invertebrate counterparts. Many fish of the Palaeozoic developed external armour that protected them from predators. The first fish with jaws appeared around 444 million years ago, after which many such as sharks became formidable marine predators. Most fish are cold-blooded. With 34,300 described species, fish exhibit greater species diversity than any other group of vertebrates.
- IV. **BIRDS:** Birds are a group of warm-blooded vertebrates constituting the class *Aves*, characterised by feathers, toothless beaked jaws, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton. Birds live worldwide and range in size from the 5.5 cm (2.2 in) bee hummingbird to the 2.8 m (9 ft 2 in) ostrich. There are about ten thousand living species of birds. The digestive and respiratory systems of birds are also uniquely adapted for flight. Some bird species of aquatic environments have further evolved for swimming. Birds are descendants of the primitive avialans which first appeared about 160 million years ago.
- V. **MAMMALS:** Mammals are a group of vertebrate animals constituting the class *Mammalia*. Mammals are characterized by mammary glands present in females that produce milk for young ones. Mammals give birth by a process known as 'parturition', i.e. the foetus is developed inside the womb of the mother and is delivered fully developed. These characteristics distinguish mammals from most other creatures that lay eggs. Mammals first appeared around 323 million years ago. The most abundant mammals on Earth are human beings (*Homo sapiens*) and the largest known mammals are marine mammals, Blue whales (*Balaenoptera musculus*).

## OBSERVATION:

### I. PLANTS:

#### A. APPLE TREE:



- i. Common Name: Apple Tree
- ii. Scientific Name: *Malus domestica*
- iii. Distribution: Apple can be grown at altitudes 1,500-2,700 m. The temperature during the growing season is around 21-24°C. For optimum growth and fruiting, apple trees need 100-125 cm. of annual rainfall. Found in Himachal Pradesh covering the districts of Shimla, Siramour, Kullu, Mandi, Chamba and Kinnaur.
- iv. Characteristics: Apple trees are deciduous with alternate, toothed, oval leaves. The trees generally remain somewhat small, between 10 to 39 feet but can grow taller.

#### B. STINGING NETTLE:



- i. Common English Name: Stinging Nettle
- ii. Local Hindi Name: Bicchu Buti
- iii. Scientific Name: *Urtica dioica*
- iv. Distribution: It is a wild plant that requires moist soil to grow and is found in hilly regions, growing in large clusters.
- v. Characteristics: It has widely spreading rhizomes and stolons, which are bright yellow, as are the roots. The soft, green leaves are long and are borne oppositely on an erect, wiry, green stem. The leaves and stems have stinging hairs whose tips come off when touched, transforming the hair into a needle that can inject several chemicals causing a painful sting.

## ii. FISH:

### A. TROUT:



- i. Common Name: Trout
- ii. Scientific Name: *Oncorhynchus mykiss*
- iii. Distribution: Found in Fresh water, in the rivers Beas and Ravi.
- iv. Characteristics: Trout fish are of beautiful colours that shine on their skin. Their coloration varies widely in relation to gender, habitat, age and spawning condition. Colours on the back of these fish can range from brown, to olive, to dark blue. And almost all fish have a pinkish band running the length of their body, and a silver underside that fades to pearl white. And there are also some small black spots on their back, fins and tail. Average body length of these fish is between 20 and 30 inches. But they can grow as long as 4 feet.

### B. MAHSEER:



- i. Common Name: Mahseer
- ii. Scientific Name: *Tor putitora*
- iii. Distribution: A fresh water fish found in the Rivers Beas and Giri.
- iv. Characteristics: Mahseer have large, thick scales, powerful jaws, and protrusible, sometimes very fleshy, lips adapted for taking food from the bottom. Among the largest of Indian river fishes, mahseer attain a maximum size of some 2 m, with a weight of about 90 kg.

### III. BIRDS:

#### A. GREAT BARBET:



- i. Common Name: Great Barbet
- ii. Scientific Name: *Megalaima virens*
- iii. Distribution: The great barbet is a resident breeder in the lower-to-middle altitudes of the Himalayas, ranging across northern India, Nepal and Bhutan, Bangladesh and some parts of Southeast Asia
- iv. Characteristics: The great barbet has a blue head, large yellow bill, brown and green-streaked body, belly and a red vent. The plumage is green. It is the largest barbet species with a body length of 32–35 cm and a weight of 192–295 g.

#### B. STREAK-THROATED WOODPECKER:



- i. Common Name: Streak-throated Woodpecker
- ii. Scientific Name: *Picus xanthopygaeus*
- iii. Distribution: Widespread from India to southeast Asia; found in China, Tibet, Nepal. Eastern and Western Himalayas, Sri Lanka, Bangladesh, Bhutan, Myanmar, Laos, Vietnam, Cambodia and Thailand.
- iv. Characteristics: It is a medium-sized, green woodpecker with streaked throat and scaly whitish underparts. Green above with yellowish rump, white supercilia and white and black moustache. The crown is red in males and blackish in females. Small, dark bill.



#### iv. INSECTS:

##### A. CHINESE PEACOCK SWALLOWTAIL BUTTERFLY:



- i. Common Name: Chinese Peacock Butterfly
- ii. Scientific Name: *Papilio bianor*
- iii. Distribution: This is a commonly found butterfly in the northern states of India like Himachal Pradesh, Uttarakhand, Delhi and even West Bengal.
- iv. Characteristics: This species is variable in size. The forewings are black with dark veining and green scales. The undersides are brown, turning white distally with dark veining. The hindwings are tailed and have ridged edges containing reddish eyespots. The body is black with green scales.

##### B. INDIAN HUNTSMAN SPIDER:



- i. Common Name: Indian Huntsman Spider
- ii. Scientific Name: *Heteropoda venatoria*
- iii. Distribution: They are native to tropical and warm temperate regions worldwide. considered an invasive species from Asia. Because of their speed, they commonly hunt and eat cockroaches and are found in many homes.
- iv. Characteristics: Huntsman spiders can generally be identified by their legs, which, rather than being jointed vertically relative to the body, are twisted in such a way that in some attitudes the legs extend forward in a crab-like fashion. The main colours of huntsman spiders are inconspicuous shades of brown or grey.

## v. MAMMALS:

### A. SNOW LEOPARD:



- i. Common Name: Snow Leopard
- ii. Scientific Name: *Panthera uncia*
- iii. Distribution: Snow leopard habitat in the Indian Himalayas is mainly in Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh.
- iv. Characteristics: The snow leopard's fur is whitish to grey with black spots on head and neck, with larger rosettes on the back, flanks and bushy tail. The belly is whitish. Its eyes are pale green or grey in colour. Its muzzle is short and its forehead domed. Its nasal cavities are large. The fur is thick. Its body is stocky, short-legged, and slightly smaller than the other cats of the genus *Panthera*. It weighs between 22 and 55 kg. Its canine teeth are long and are slender than those of the other *Panthera* species.

### B. DOMESTIC HIMALAYAN YAK:



- i. Common Name: Himalayan Yak
- ii. Scientific Name: *Bos grunniens*
- iii. Distribution: They are found throughout the Himalayan region of the Indian subcontinent, the Tibetan Plateau, Northern Myanmar, Yunnan, Sichuan and as far north as Mongolia and Siberia. It is descended from the wild yak.
- iv. Characteristics: They have bulky frames, sturdy legs, rounded, cloven hooves, and extremely dense, long fur. Domestic yaks are quite variable in colour, often having patches of rusty brown and cream. They have small ears and wide foreheads, with smooth horns that are generally dark in colour. In males (bulls), the horns sweep out from the sides of the head, and then curve forward. The horns of females (cows) are smaller, and have a more upright shape. Both sexes have a short neck with a pronounced hump over the shoulders, although this is larger and more visible in males.

## CONCLUSION:

From this project, not only have we gotten a look at the common flora and fauna of Shimla, Himachal Pradesh: but we have been able to study examples of the common plants, birds, insects, fish and mammals of Shimla and learn about their basic identification principles.

## BIBLIOGRAPHY:

During the making of this project I used the internet to access Wikipedia.

# PROJECT REPORT

Checked  
25 out of  
30

## SEMESTER- 2

COURSE: AECC2(ENVIRONMENTAL SCIENCE)

## PROJECT TITLE:

STUDY OF COMMON  
PLANTS,FISH,BIRDS,MAMMELS AND BASIC  
PRINCIPALS OF IDENTIFICATION

- COLLEGE ROLL NO: PHSA20M598
- CU REGISTRATION NUMBER : 223-1111-0361-20
- CU ROLL NUMBER : 203223-21-0075

# **1.INTRODUCTION:**

The aim of E.V.S(ENVIRONMENTAL SCIENCE) is to develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge,skills,attitudes,motivations and commitment to work individually and collectively towards solution of current problems and prevention of new ones.in this project we will study about the local flora(Flora is all the plant life present in a particular region or time, generally the naturally occurring (indigenous) native plants) and fauna(Fauna is all of the animal life present in a particular region or time) of a region. The local species we see are mainly belong to plants,mammals,fish,bird and insects.here is a short discussion about them-

**Plants**-Plants are mainly multicellular organisms, predominantly photosynthetic eukaryotes of the kingdom Plantae.

**Mammals**-Mammals are a group of vertebrate animals constituting the class Mammalia, and characterized by the presence of mammary glands which in females produce milk for feeding their young, a neocortex, fur or hair, and three middle ear bones.

**Fish** -Fish are aquatic, craniate, gill-bearing animals that lack limbs with digits.

**Bird** -Birds are a group of warm-blooded vertebrates constituting the class Aves, characterised by feathers, toothless beaked jaws, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton.

**Insect** -Insects or Insecta are pancrustacean hexapod invertebrates and the largest group within the arthropod phylum.

# **2.AREA OF STUDY:**

The area is in Hooghly (chinsurah,bandel,chandangar) district.

# **3.METHOD OF STUDY:**

Making this project we use internet and book collect information about bird,mammals,plants ,fish ,insect.This following books are used to collect information-

1.THE BOOK OF INDIAN ANIMALS- S.H.PRATER

2.THE BOOK OF INDIAN BIRDS- SALIM ALI and many more.

## **4.OBSERVATION:**

### **A.PLANTS:**

#### **1.BANYAN:**

**Scientific name:** Ficus benghalensis

**Rarity:** very common

**Habitat:** WEST BENGAL, SOUTH INDIA

#### **Usage-**

The wood of the Banyan tree is used in making door panels, boxes and the other items. Its bark is used for making paper and ropes. The milky latex that comes from its leaves and stems is used in many Ayurvedic medicines.

#### **2.BANANA:**

**Scientific name:** Musa acuminata

**Rarity:** very common

**Habitat:** almost all part of india

#### **Usage:**

All parts of the banana plant have medicinal applications: the flowers in bronchitis and dysentery and on ulcers; cooked flowers are given to diabetics; the astringent plant sap in cases of hysteria, epilepsy, leprosy, fevers, hemorrhages, acute dysentery and diarrhea, and it is applied on hemorrhoids, insect and other diseases.

#### **3.BASIL:**

**Scientific name:** Ocimum basilicum

**Rarity:** common

**Habitat:** It is indigenous to the lower hills of Punjab and Himachal Pradesh and is cultivated throughout India.



### **Usage:**

Basil is an herb. The parts of the plant that grow above the ground are used to make medicine. Basil is commonly used for stomach problems such as spasms, loss of appetite, intestinal gas, diarrhea, constipation, and many other conditions, but there is no good scientific evidence to support these uses.

### **4.PAPAYA:**

**Scientific name:** Carica papaya

**Rarity:** very common

**Habitat:** It is seen in the States of Andhra Pradesh, Karnataka, Gujarat, Orissa, West Bengal, Assam, Kerala, Madhya Pradesh and Maharashtra.

### **Usage:**

Papaya is a plant. The leaves are used to make medicine. Papaya is used for preventing and treating gastrointestinal tract disorders, intestinal parasite infections, and as a sedative and diuretic. It is also used for nerve pains (neuralgia) and elephantoid growths.



### **5.ROSE:**

**Scientific name:** Rosa indica

**Rarity:** common

**Habitat:** All over india (mostly is gardens)

### **Usage:**

Roses are best known as ornamental plants grown for their flowers in the garden and sometimes indoors. They have been also used for commercial perfumery and commercial cut flower crops. Some are used as landscape plants, for hedging and for other utilitarian purposes such as game cover and slope stabilization.



## **6.MANGO:**

**Scientific name:** Mangifera indica

**Rarity:** very common

**Habitat:** The major mango-growing states are Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat and Tamil Nadu, west bengal.

**Usage:**

Mangifera indica (MI), also known as mango, aam, it has been an important herb in the Ayurvedic and indigenous medical systems for over 4000 years. ... Mango possesses antidiabetic, anti-oxidant, anti-viral, cardiotonic, hypotensive, anti-inflammatory properties. Wood of the Mango tree is relatively easy to work on and the best wood for carpenters.



## **7.COCONUT:**

**Scientific name:** Cocos nucifera

**Rarity:** common

**Habitat:** coastal areas of India, sometimes in gardens also

**Usage:**

It is one of the most useful trees in the world and is often referred to as the "tree of life". It provides food, fuel, cosmetics, folk medicine and building materials, among many other uses.



## **8.LEMON:**

**Scientific name:** Citrus limon

**Rarity:** common

**Habitat:** Lemon is, however, cultivated all over the india in the subtropical strip, where the climate is sufficiently hot and humid.





### **Usage:**

Lemon is a type of citrus fruit. The fruit, juice, and peel are used to make medicine. People use lemon for conditions such as the common cold, a disease caused by vitamin C deficiency (scurvy), skin care, morning sickness, and many others, but there is no good scientific evidence to support these uses.

### **9.ALOEVERA:**

**Scientific name:** Aloe vera

**Rarity:** Rare

**Habitat:** The aloe grows wild in tropical and subtropical territories in India.

The plant thrives in arid sandy conditions, dry earth which contains clay and lime and can easily be cultivated.



### **Usage:**

Aloe vera is a rich source of antioxidants and vitamins that may help protect your skin. The important compounds in have also been shown to neutralize the effects of ultraviolet (UV) radiation, repair your skin from existing UV damage, and help prevent fine lines and wrinkles.

### **10.JACKFRUIT:**

**Scientific name:** Artocarpus heterophyllus

**Rarity:** very common

**Habitat:** Almost all over the India

### **Usage:**

Due to its fibrous texture, people often use jackfruit flesh as a meat substitute in vegetarian or vegan dishes. In this article, we explore some of the potential health benefits of jackfruit. We also look into its nutritional contents, any risks and considerations, and how to add it to the diet.



## **11.NEEM:**

**Scientific name:** Azadirachta indica

**Rarity:** common

**Habitat:** Neem tree is found throughout India. It is a popular village tree.

**Usage:**

Neem leaf is used for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems. The leaf is also used for birth control and to cause abortions.



## **12.HIBISCUS:**

**Scientific name:** Hibiscus rosa-sinensis

**Rarity:** common

**Habitat:** The Hibiscus can be found anywhere. It grows on its own in sub-tropic and tropic regions of the India.

**Usage:**

All parts of hibiscus plants are used traditionally. Due to their soothing (demulcent) and astringent properties, the flowers and leaves have been traditionally used to treat conditions such as cancer and gallbladder attacks, to lower blood pressure , to relieve dry coughs , and topically to treat skin afflictions .



## **13.GUAVA:**

**Scientific name:** Psidium guajava

**Rarity:** common

**Habitat:** Bihar is the leading state in guava production followed by Andhra Pradesh and Uttar Pradesh, west Bengal.



### **Usage:**

The fruit is commonly eaten fresh or made into beverages, jams, and other foods. Various parts of the plant, including the leaf and the fruit, are used as medicine. People use guava leaf for stomach and intestinal conditions, pain, diabetes, and wound healing. The fruit is used for high blood pressure.

### **14.ASHVATTHA:**

**Scientific name:** Ficus religiosa

**Rarity:** very common

**Habitat:** Ashvattha trees are native to Indian subcontinent and thrive in hot, humid weather. They prefer full sunlight and can grow in all soil types, though loam is the best.



### **Usage:**

According to the science of Ayurveda, every part of the - the leaf, bark, shoot, seeds and its fruit has several medicinal benefits, and it is being used since ancient times to cure many diseases. ... Peepal fruit can also be taken for cough, pitta, blood-related problems, burning sensation and vomiting etc.

### **15.JASMINE:**

**Scientific name:** Holarrhena pubescens

**Rarity:** common

**Habitat:** Jasmines are native to tropical and subtropical regions of India.



### **Usage:**

Jasmine has been used for liver disease (hepatitis), pain due to liver scarring (cirrhosis), and abdominal pain due to severe diarrhea (dysentery). It is also used to prevent stroke, to cause relaxation (as a sedative) and in cancer treatment.

# **B.ANIMALS:**

## **INSECTS:**

### **1.MOSQUITO:**

**Scientific name:** Culicidae

**Rarity:** very common

**Habitat:** Some mosquitoes like living near people, while others prefer forests, marshes, or tall grasses. All mosquitoes like water because mosquito larvae and pupae live in the water with little or no flow.

#### **Impact:**

Mosquito bites may be transmission of serious diseases and viruses such as malaria, dengue virus, Zika and West Nile virus, which can lead to disabling and potentially deadly effects (such as encephalitis, meningitis and microcephaly).



### **2.BUTTERFLY:**

**Scientific name:** Rhopalocera

**Rarity:** common

**Habitat:** Butterflies are generally found within the open, sunny glades and rides of woods but some prefer the tree canopy.

#### **Impact:**

Butterflies help flowers pollinate, eat plenty of weedy plants and provide a food source for other animals. In addition, their presence or absence can tell us a lot about the local environment.



### **3.SPIDER:**

**Scientific name:** Araneae

**Rarity:** common

**Habitat:** Spiders live in almost every habitat on earth. The only places where there are no spiders are the polar regions, the highest mountains and the oceans. A few spider species have invaded the ocean's edge, living in the rock and coral crevices of the intertidal zone.



**Impact:**

Spiders deliver many benefits to both our ecosystem and inside our homes. For example, spiders like to feast on pesky insects, like roaches, aphids, moths, and earwigs, which help keep their population in check. This also helps alleviate the spread of diseases and the destruction of our farmland crops.

### **BIRDS:**

#### **1.PIGEON:**

**Scientific name:** Columba livia

**Rarity:** very common

**Habitat:** Pigeons inhabit forests such as rainforests, temperate deciduous forests, swamp forests and arboreal forests. Pigeons inhabit desert areas where they get water by eating succulent plants, and they also live on islands, in mangrove forests, in chaparral and in almost every other environment on Earth.



**Impact:** Pigeons play a vital role in the environment, they serve as food for peregrine falcons, hawks, foxes and martins. They also maintain and regulate insect species in an environment as well as weeds such as thistles. These birds also play a part in seed dispersal by eating seeds and distributing them.

## **2.CROW:**

**Scientific name:** Corvus corax

**Rarity:** very common

**Habitat:** Crows live in open and forest habitats across western and northern North America. This includes deciduous and evergreen forests up to treeline, as well as high desert, sea coast, sagebrush, tundra, and grasslands. They do well around people, particularly rural settlements but also some towns and cities.



### **Impact:**

Crows can be harmful to crops, but they also may prevent damage by eating insect pests. Recent studies have shown that 60 to 90 percent of insects eaten by crows are agricultural pests. As foragers, they also clean up dead animals and garbage.

## **3.KINGFISHER:**

**Scientific name:** Alcedo atthis

**Rarity:** Rare

**Habitat:** Kingfishers occupy a wide range of habitats. While they are often associated with rivers and lakes, over half the world's species are found in forests and forested streams. They also occupy a wide range of other habitats.



### **Impact:**

Kingfishers serve as a good indicator of the health of an ecosystem. As they feed on small aquatic animals, toxins in the water affect them severely. ... Common kingfishers are also important predators throughout their range of small fish from freshwater habitats, thus controlling their populations.

# **MAMMLAS:**

## **1.DOG:**

**Scientific name:** Canis lupus familiaris

**Rarity:** very common

**Habitat:** Dogs live in many habitats, including prairies, deserts, grasslands, forests, rain forests, coastal regions and arctic zones. Dogs are highly adaptable, yet some evolved for specific environments, such as breeds that developed heavy coats to withstand freezing climates.



## **Impact:**

At Dogs for Good we know that dogs bring health, social and economic benefits to all of us. The health benefits of dogs to people are fairly well documented and researched – better physical health through exercise, lower risks of cardiovascular disease, increased immunity to allergies and fewer visits to the doctors.

## **2.CAT:**

**Scientific name:** Felis catus

**Rarity:** very common

**Habitat:** **Cats** are found in **habitats** ranging from icy mountains to steamy tropical jungles to scorching deserts. The only places they are not native to are Australia, its surrounding islands, and Antarctica.



## **Impact:**

Cats help our mental health just by being themselves. Their ability to reduce stress, offer companionship, heal with purrs, and offer their services as therapy animals makes them the ideal champions for mental health. However Outdoor domestic cats are a recognized threat to global biodiversity. Cats have contributed to the extinction of 63 species of birds, mammals, and reptiles in the wild.

### **3.GRAY LANGUR:**

**Scientific name:** Semnopithecus entellus

**Rarity:** Rare

**Habitat:** Gray langurs can adapt to a variety of habitats. They inhabit arid habitats like deserts, tropical habitats like tropical rainforests and temperate habitats like coniferous forests, deciduous habitats and mountains habitats. They are found at sea level to altitudes up to 4,000 m (13,000 ft).



**Impact:**

Langurs will raid crops and steal food from houses, and this causes people to persecute them. While people may feed them in temples, they do not extend such care to monkeys at their homes. Langurs stealing and biting people to get food in urban areas may also contribute to more persecutions.

### **4.COW:**

**Scientific name:** Bos Indicus

**Rarity:** very common

**Habitat:** Nowadays, cattle live in pastures and ranges of open area. Some of the different types of habitats they utilize include savannas, scrub forests, and even desert edges. As long as they have lots of space and plenty of grass, Cows are happy.



**Impact:**

Cow are able to convert the energy in a way that we as humans could not do. cow also provide us with many other by-products – parts of the cow that are used to make products for home, health, food and industry. Byproducts are value-added products other than beef that come from cow.



## **5.CONCLUSION:**

E.V.S is an exciting subject and the topic assigned to me for my file project was interesting. I collected all the required data after thorough analysis of my topic. The pictures added are genuine and there are several websites that offers help on varied EVS topics. A huge amount of effort was put in the work from my end and overall I just loved doing this project. I like to thank our professor for giving me the opportunity to do such a nice project.

**END.**

# **PROJECT REPORT**

## **SEMESTER- 2**

**COURSE: AECC2(ENVIRONMENTAL SCIENCE)**

## **PROJECT TITLE:**

**STUDY OF COMMON**  
**PLANTS,FISH,BIRDS,MAMMELS AND BASIC**  
**PRINCIPALS OF IDENTIFICATION**

- **COLLEGE ROLL NO: PHSA20M598**
- **CU REGISTRATION NUMBER : 223-1111-0361-20**
- **CU ROLL NUMBER : 203223-21-0075**

# **1.INTRODUCTION:**

The aim of E.V.S(ENVIRONMENTAL SCIENCE) is to develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge,skills,attitudes,motivations and commitment to work individually and collectively towards solution of current problems and prevention of new ones.in this project we will study about the local flora(Flora is all the plant life present in a particular region or time, generally the naturally occurring (indigenous) native plants) and fauna(Fauna is all of the animal life present in a particular region or time) of a region. The local species we see are mainly belong to plants,mammals,fish,bird and insects.here is a short discussion about them-

**Plants**-Plants are mainly multicellular organisms, predominantly photosynthetic eukaryotes of the kingdom Plantae.

**Mammals**-Mammals are a group of vertebrate animals constituting the class Mammalia, and characterized by the presence of mammary glands which in females produce milk for feeding their young, a neocortex, fur or hair, and three middle ear bones.

**Fish** -Fish are aquatic, craniate, gill-bearing animals that lack limbs with digits.

**Bird** -Birds are a group of warm-blooded vertebrates constituting the class Aves, characterised by feathers, toothless beaked jaws, the laying of hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton.

**Insect** -Insects or Insecta are pancrustacean hexapod invertebrates and the largest group within the arthropod phylum.

# **2.AREA OF STUDY:**

The area is in Hooghly (chinsurah,bandel,chandangar) district.

# **3.METHOD OF STUDY:**

Making this project we use internet and book collect information about bird,mammals,plants ,fish ,insect.This following books are used to collect information-

1.THE BOOK OF INDIAN ANIMALS- S.H.PRATER

2.THE BOOK OF INDIAN BIRDS- SALIM ALI and many more.

## **4.OBSERVATION:**

### **A.PLANTS:**

#### **1.BANYAN:**

**Scientific name:** Ficus benghalensis

**Rarity:** very common

**Habitat:** WEST BENGAL, SOUTH INDIA

#### **Usage-**

The wood of the Banyan tree is used in making door panels, boxes and the other items. Its bark is used for making paper and ropes. The milky latex that comes from its leaves and stems is used in many Ayurvedic medicines.

#### **2.BANANA:**

**Scientific name:** Musa acuminata

**Rarity:** very common

**Habitat:** almost all part of india

#### **Usage:**

All parts of the banana plant have medicinal applications: the flowers in bronchitis and dysentery and on ulcers; cooked flowers are given to diabetics; the astringent plant sap in cases of hysteria, epilepsy, leprosy, fevers, hemorrhages, acute dysentery and diarrhea, and it is applied on hemorrhoids, insect and other diseases.

#### **3.BASIL:**

**Scientific name:** Ocimum basilicum

**Rarity:** common

**Habitat:** It is indigenous to the lower hills of Punjab and Himachal Pradesh and is cultivated throughout India.



### **Usage:**

Basil is an herb. The parts of the plant that grow above the ground are used to make medicine. Basil is commonly used for stomach problems such as spasms, loss of appetite, intestinal gas, diarrhea, constipation, and many other conditions, but there is no good scientific evidence to support these uses.

### **4.PAPAYA:**

**Scientific name:** Carica papaya

**Rarity:** very common

**Habitat:** It is seen in the States of Andhra Pradesh, Karnataka, Gujarat, Orissa, West Bengal, Assam, Kerala, Madhya Pradesh and Maharashtra.

### **Usage:**

Papaya is a plant. The leaves are used to make medicine. Papaya is used for preventing and treating gastrointestinal tract disorders, intestinal parasite infections, and as a sedative and diuretic. It is also used for nerve pains (neuralgia) and elephantoid growths.



### **5.ROSE:**

**Scientific name:** Rosa indica

**Rarity:** common

**Habitat:** All over india (mostly is gardens)

### **Usage:**

Roses are best known as ornamental plants grown for their flowers in the garden and sometimes indoors. They have been also used for commercial perfumery and commercial cut flower crops. Some are used as landscape plants, for hedging and for other utilitarian purposes such as game cover and slope stabilization.



## **6.MANGO:**

**Scientific name:** Mangifera indica

**Rarity:** very common

**Habitat:** The major mango-growing states are Andhra Pradesh, Uttar Pradesh, Karnataka, Bihar, Gujarat and Tamil Nadu, west bengal.

**Usage:**

Mangifera indica (MI), also known as mango, aam, it has been an important herb in the Ayurvedic and indigenous medical systems for over 4000 years. ... Mango possesses antidiabetic, anti-oxidant, anti-viral, cardiotonic, hypotensive, anti-inflammatory properties. Wood of the Mango tree is relatively easy to work on and the best wood for carpenters.



## **7.COCONUT:**

**Scientific name:** Cocos nucifera

**Rarity:** common

**Habitat:** coastal areas of India, sometimes in gardens also

**Usage:**

It is one of the most useful trees in the world and is often referred to as the "tree of life". It provides food, fuel, cosmetics, folk medicine and building materials, among many other uses.



## **8.LEMON:**

**Scientific name:** Citrus limon

**Rarity:** common

**Habitat:** Lemon is, however, cultivated all over the india in the subtropical strip, where the climate is sufficiently hot and humid.



### **Usage:**

Lemon is a type of citrus fruit. The fruit, juice, and peel are used to make medicine. People use lemon for conditions such as the common cold, a disease caused by vitamin C deficiency (scurvy), skin care, morning sickness, and many others, but there is no good scientific evidence to support these uses.

### **9.ALOEVERA:**

**Scientific name:** Aloe vera

**Rarity:** Rare

**Habitat:** The aloe grows wild in tropical and subtropical territories in India.

The plant thrives in arid sandy conditions, dry earth which contains clay and lime and can easily be cultivated.



### **Usage:**

Aloe vera is a rich source of antioxidants and vitamins that may help protect your skin. The important compounds in have also been shown to neutralize the effects of ultraviolet (UV) radiation, repair your skin from existing UV damage, and help prevent fine lines and wrinkles.

### **10.JACKFRUIT:**

**Scientific name:** Artocarpus heterophyllus

**Rarity:** very common

**Habitat:** Almost all over the India

### **Usage:**

Due to its fibrous texture, people often use jackfruit flesh as a meat substitute in vegetarian or vegan dishes. In this article, we explore some of the potential health benefits of jackfruit. We also look into its nutritional contents, any risks and considerations, and how to add it to the diet.



## **11.NEEM:**

**Scientific name:** Azadirachta indica

**Rarity:** common

**Habitat:** Neem tree is found throughout India. It is a popular village tree.

**Usage:**

Neem leaf is used for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, loss of appetite, skin ulcers, diseases of the heart and blood vessels (cardiovascular disease), fever, diabetes, gum disease (gingivitis), and liver problems. The leaf is also used for birth control and to cause abortions.



## **12.HIBISCUS:**

**Scientific name:** Hibiscus rosa-sinensis

**Rarity:** common

**Habitat:** The Hibiscus can be found anywhere. It grows on its own in sub-tropic and tropic regions of the India.

**Usage:**

All parts of hibiscus plants are used traditionally. Due to their soothing (demulcent) and astringent properties, the flowers and leaves have been traditionally used to treat conditions such as cancer and gallbladder attacks, to lower blood pressure , to relieve dry coughs , and topically to treat skin afflictions .



## **13.GUAVA:**

**Scientific name:** Psidium guajava

**Rarity:** common

**Habitat:** Bihar is the leading state in guava production followed by Andhra Pradesh and Uttar Pradesh, west Bengal.





### **Usage:**

The fruit is commonly eaten fresh or made into beverages, jams, and other foods. Various parts of the plant, including the leaf and the fruit, are used as medicine. People use guava leaf for stomach and intestinal conditions, pain, diabetes, and wound healing. The fruit is used for high blood pressure.

### **14.ASHVATTHA:**

**Scientific name:** Ficus religiosa

**Rarity:** very common

**Habitat:** Ashvattha trees are native to Indian subcontinent and thrive in hot, humid weather. They prefer full sunlight and can grow in all soil types, though loam is the best.



### **Usage:**

According to the science of Ayurveda, every part of the - the leaf, bark, shoot, seeds and its fruit has several medicinal benefits, and it is being used since ancient times to cure many diseases. ... Peepal fruit can also be taken for cough, pitta, blood-related problems, burning sensation and vomiting etc.

### **15.JASMINE:**

**Scientific name:** Holarrhena pubescens

**Rarity:** common

**Habitat:** Jasmines are native to tropical and subtropical regions of India.



### **Usage:**

Jasmine has been used for liver disease (hepatitis), pain due to liver scarring (cirrhosis), and abdominal pain due to severe diarrhea (dysentery). It is also used to prevent stroke, to cause relaxation (as a sedative) and in cancer treatment.

# **B.ANIMALS:**

## **INSECTS:**

### **1.MOSQUITO:**

**Scientific name:** Culicidae

**Rarity:** very common

**Habitat:** Some mosquitoes like living near people, while others prefer forests, marshes, or tall grasses. All mosquitoes like water because mosquito larvae and pupae live in the water with little or no flow.

#### **Impact:**

Mosquito bites may be transmission of serious diseases and viruses such as malaria, dengue virus, Zika and West Nile virus, which can lead to disabling and potentially deadly effects (such as encephalitis, meningitis and microcephaly).



### **2.BUTTERFLY:**

**Scientific name:** Rhopalocera

**Rarity:** common

**Habitat:** Butterflies are generally found within the open, sunny glades and rides of woods but some prefer the tree canopy.

#### **Impact:**

Butterflies help flowers pollinate, eat plenty of weedy plants and provide a food source for other animals. In addition, their presence or absence can tell us a lot about the local environment.



### **3.SPIDER:**

**Scientific name:** Araneae

**Rarity:** common

**Habitat:** Spiders live in almost every habitat on earth. The only places where there are no spiders are the polar regions, the highest mountains and the oceans. A few spider species have invaded the ocean's edge, living in the rock and coral crevices of the intertidal zone.



**Impact:**

Spiders deliver many benefits to both our ecosystem and inside our homes. For example, spiders like to feast on pesky insects, like roaches, aphids, moths, and earwigs, which help keep their population in check. This also helps alleviate the spread of diseases and the destruction of our farmland crops.

### **BIRDS:**

#### **1.PIGEON:**

**Scientific name:** Columba livia

**Rarity:** very common

**Habitat:** Pigeons inhabit forests such as rainforests, temperate deciduous forests, swamp forests and arboreal forests. Pigeons inhabit desert areas where they get water by eating succulent plants, and they also live on islands, in mangrove forests, in chaparral and in almost every other environment on Earth.



**Impact:** Pigeons play a vital role in the environment, they serve as food for peregrine falcons, hawks, foxes and martins. They also maintain and regulate insect species in an environment as well as weeds such as thistles. These birds also play a part in seed dispersal by eating seeds and distributing them.

## **2.CROW:**

**Scientific name:** Corvus corax

**Rarity:** very common

**Habitat:** Crows live in open and forest habitats across western and northern North America. This includes deciduous and evergreen forests up to treeline, as well as high desert, sea coast, sagebrush, tundra, and grasslands. They do well around people, particularly rural settlements but also some towns and cities.



### **Impact:**

Crows can be harmful to crops, but they also may prevent damage by eating insect pests. Recent studies have shown that 60 to 90 percent of insects eaten by crows are agricultural pests. As foragers, they also clean up dead animals and garbage.

## **3.KINGFISHER:**

**Scientific name:** Alcedo atthis

**Rarity:** Rare

**Habitat:** Kingfishers occupy a wide range of habitats. While they are often associated with rivers and lakes, over half the world's species are found in forests and forested streams. They also occupy a wide range of other habitats.



### **Impact:**

Kingfishers serve as a good indicator of the health of an ecosystem. As they feed on small aquatic animals, toxins in the water affect them severely. ... Common kingfishers are also important predators throughout their range of small fish from freshwater habitats, thus controlling their populations.

# **MAMMALS:**

## **1.DOG:**

**Scientific name:** Canis lupus familiaris

**Rarity:** very common

**Habitat:** Dogs live in many habitats, including prairies, deserts, grasslands, forests, rain forests, coastal regions and arctic zones. Dogs are highly adaptable, yet some evolved for specific environments, such as breeds that developed heavy coats to withstand freezing climates.



## **Impact:**

At Dogs for Good we know that dogs bring health, social and economic benefits to all of us. The health benefits of dogs to people are fairly well documented and researched – better physical health through exercise, lower risks of cardiovascular disease, increased immunity to allergies and fewer visits to the doctors.

## **2.CAT:**

**Scientific name:** Felis catus

**Rarity:** very common

**Habitat:** **Cats** are found in **habitats** ranging from icy mountains to steamy tropical jungles to scorching deserts. The only places they are not native to are Australia, its surrounding islands, and Antarctica.



## **Impact:**

Cats help our mental health just by being themselves. Their ability to reduce stress, offer companionship, heal with purrs, and offer their services as therapy animals makes them the ideal champions for mental health. However Outdoor domestic cats are a recognized threat to global biodiversity. Cats have contributed to the extinction of 63 species of birds, mammals, and reptiles in the wild.

### **3.GRAY LANGUR:**

**Scientific name:** Semnopithecus entellus

**Rarity:** Rare

**Habitat:** Gray langurs can adapt to a variety of habitats. They inhabit arid habitats like deserts, tropical habitats like tropical rainforests and temperate habitats like coniferous forests, deciduous habitats and mountains habitats. They are found at sea level to altitudes up to 4,000 m (13,000 ft).



**Impact:**

Langurs will raid crops and steal food from houses, and this causes people to persecute them. While people may feed them in temples, they do not extend such care to monkeys at their homes. Langurs stealing and biting people to get food in urban areas may also contribute to more persecutions.

### **4.COW:**

**Scientific name:** Bos Indicus

**Rarity:** very common

**Habitat:** Nowadays, cattle live in pastures and ranges of open area. Some of the different types of habitats they utilize include savannas, scrub forests, and even desert edges. As long as they have lots of space and plenty of grass, Cows are happy.



**Impact:**

Cow are able to convert the energy in a way that we as humans could not do. cow also provide us with many other by-products – parts of the cow that are used to make products for home, health, food and industry. Byproducts are value-added products other than beef that come from cow.

## **5.CONCLUSION:**

E.V.S is an exciting subject and the topic assigned to me for my file project was interesting. I collected all the required data after thorough analysis of my topic. The pictures added are genuine and there are several websites that offers help on varied EVS topics. A huge amount of effort was put in the work from my end and overall I just loved doing this project. I like to thank our professor for giving me the opportunity to do such a nice project.

**END.**

Checked  
24 out of  
30

PROJECT WORK

AECC 2

ENVIRONMENTAL STUDIES

COLLEGE ID - PHSA20M599

CU ROLL – 203223-21-0078

CU Registration no- 223-1111-0366-20





## . A Report on A visit to a Local Water Polluted Site

### Introduction:

Pollution can be defined as the undesirable change in natural system. It may also define as the unwanted change in the characteristics of air, water, soil and other environmental factors. Pollution adversely affects the health, survival or other activities of human and other animals. It is the main problem at present both at local level as well as at a global level. In Nepal, the pollution is the growing concern. But there are only limited studies done so far to quantify the level of pollution. Thus the availability of the data is very poor. The monitoring activities are virtually significant. The effects of water pollution include decreasing the quantity of drinkable water available, lowering water supplies for crop irrigation, and impacting fish and wildlife populations that require water of a certain purity for survival. Consumption of polluted water causes various water borne diseases which are effecting the human health in long term and short term. with the movement of industrialization and urbanization the pollution situation has become quite visible in some industrial locations and major urban centers. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollutants include solid, liquid or gaseous substances present in greater than natural abundance produced due to human activity, which have detrimental effect on our environment. Pollution can affect: air, water, soil and biodiversity that directly affect the plant and animal life. There are various types of pollution. Some are listed below: air pollution, water pollution, land pollution and noise pollution. The systematic pollution of our environment is one of the biggest hazards that humanity faces today. People are becoming increasingly aware of the threat posed by pollution and governments are enacting legislations aimed at protecting the environment.

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

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

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

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

### **Water pollution:**

Water pollution is defined as the contamination of water by harmful substances which is detrimental to living beings. Industrial wastes, household garbages, non-decomposable materials from schools, chemicals, pesticides releasing from agricultural activities are major cause to pollute water bodies. The effects of water pollution include decreasing the quantity of drinkable water available, lowering water supplies for crop irrigation, and impacting fish and wildlife populations that require water of a certain purity for survival. Consumption of polluted water causes various water borne diseases which are effecting the human health in long term and short term.

### **Land Pollution :**

Soil or land pollution is contamination of the soil that prevents natural growth and balance in the land. Many micro and macro flora and fauna are affected by land pollution since they obtain minerals, nutrition from soil itself. Soil contamination can lead to poor growth and reduced crop yields, loss of wildlife habitat, water and visual pollution, soil erosion, and desertification.

### **Noise Pollution :**

Noise pollution refers to undesirable levels of noises caused by human activity that disrupt the standard of living in the affected area. Noise pollution cause mental stress, depression, damage to the ear drum which can cause deafness. Other forms of pollution include radioactive pollution, thermal pollution, light pollution and plastic pollution.

But our concern during our visit was Water Pollution. There has grown up a serious concern all over. The visited area about the river and small rivulets turning into polluted site. Water is the most important natural resource of environment that supports life on the Earth. There is various classification of water pollution. Pollution of water is classified into two categories based on their source:

a) **Point sources:** It refers to the contaminants that enter the waterway from a single identifiable source Such as pipe or ditch. E.g.: discharge from factory

b) **Non-point sources:** It means pollutants are emitted from multiple sources. E.g.: surface run off from agricultural land.





***polluted pond with wastes***



### **Objectives:**

- 1) To identify the major reason, extent and type of the pollution near the visited site.
- 2) To identify the adverse effect of pollution in that vicinity
- 3) To explore the extent of pollution in the given specified region.
- 4) To study the visible effects of pollution.
- 5) To study the visible effects of pollution.
- 6) To study about the direct and indirect causes of pollution
- 7) To formulate the possible strategies in order to control various pollution
- 8) To suggest control measures to minimize pollution.

### **Methodology:**

Firstly, we visited around polluted pond site and small watershed in the vicinity of our house in DumDum cantonment. Further, analysis was done by following two methods:

A. **Primary method:** The polluted site was properly observed and information was gathered up.

B. **Secondary method:** Different literary books and journals related to pollution were consulted. Internet sites were also cited and desk study was done for obtaining different information about the polluted place.

**Discussion:** The pond and small watershed in front of our house were selected for the report preparation which is located in North 24 paraganas districts in Dumdum cantonment zone in



southern Region.

During our visit, we saw the river as dumping location i.e. there were pile of decomposed materials that came from residing places. We observed following materials or pollutants on the river bank: 1. Wastes from nearby hospitals 2. Wastes from near brick kiln 3. Plastic bags 4. Plastic bottles 5. Waste food materials 6. Damaged domestic wares 7. Man and animal excreta 8. Dead bodies of animals 9. Plant materials 10. Wastes from nearby garage 11. Fuel materials from vehicles 12. Old clothes and various residues from nearby market

The main factors/causes that results the pollution was found are as follows:

- A. Different animals wallow in the pond.
- B. People are disposing different waste materials coming from household and small industrial activities.
- C. Random fishing and overfishing in the pond by using poisons.

### **Consequences:**

The pond is being polluted due to different human activities which is not eco-friendly. The heap of pollutants in pond looked as if it is a dumping site not a river. It has totally damaged the beautiful scenario of river. Very bad smell could be easily felt while walking by the water sources. The water has become impure and unusable for human and animals. Extreme eutrophication has been observed in the river which has resulted in the reduction of the available oxygen in the river. Increase in nutrient content and biological growth is causing consequent decrease of oxygen supplies. Water quality seemed to be totally degraded and when it is used for domestic purposes, it may cause water related illness such as typhoid, cholera, dysentery, skin allergies etc. Loss of soil fertility and productivity is also a major problems caused by the pond pollution. Due to the foul smell of the pond and the other pollutants the recreational value of pond has decreased. Freshwater is a finite and limited resource on Earth and, increasingly, much of it is polluted, by both pathogenic microbes and chemical contaminant. Human demand for freshwater is increasing; in particular, water is required to irrigate crops to feed the rapidly expanding human population. Water cycles globally, through the oceans, the atmosphere and freshwater river systems. At certain points in the cycle, water is purified, both naturally and by treatment plants. Freshwater is very unevenly distributed in the world, such that a large proportion of the world's human population has insufficient water for growing crops, for drinking and for sanitation. at you are happy with this. However, you can change your cookie settings at any time. Freshwater is a finite and limited resource on Earth and, increasingly, much of it is polluted, by both pathogenic microbes and chemical contaminants. Human demand for freshwater is increasing; in particular, water is required to irrigate crops to feed the rapidly expanding human population. Water cycles globally, through the oceans, the atmosphere and freshwater river systems. At certain points in the cycle, water is purified, both naturally and by treatment plants. Freshwater is very unevenly distributed in the world, such that a large proportion of the world's human population has insufficient water for growing crops, for drinking and for sanitation. Climate change is altering the global distribution of water,

causing droughts in some regions, flooding in others. The chemical and physical properties of water are such that, over the range of temperatures that occur on Earth, it supports a rich diversity of plants and animals. An enormous variety of chemical compounds, produced by human activities, pollute natural water bodies, causing both acute and chronic pollution. Evidence for the effect of chemical pollution is provided by ecotoxicology, the study of the impact of xenobiotic chemicals on wildlife in natural situations. As chemical pollutants pass through natural food chains, bioaccumulation causes high levels to build up at certain points, e.g. in the fat reserves of predatory fish and birds. As a result, these animals and their offspring can be exposed to a very high dose. DDT is an effective insecticide that is toxic to wildlife, but is also a vital means for combating malaria. Levels of mercury compounds in the environment are increasing; they are a threat to wildlife and to people who eat a lot of fish, and especially to their children. Levels of nitrogen compounds in the environment are increasing very rapidly. These are toxic to humans at high levels but, more importantly, at lower levels they cause widespread environmental changes, especially eutrophication of water. A large number of xenobiotic chemicals, called endocrine disruptors, cause major disruption to the reproductive development of freshwater animals; their possible effects on humans are uncertain

Here are some measures suggested to reduce the problems faced due to the pond water pollution:

1. The major cause of pollution is human behavior. It should be changed.
2. Proper selection and management of dumping sites.
3. Use of Bio-degradable substances as compost manures.
4. Application of '3 R' principle; Recycle, Reduce, Reuse
5. Management of dustbins by household itself and municipality in several places.
6. Development of new residential areas without sanitation provision should be prohibited.
7. Proper implementation of rules and regulations, programs for removal of heap of pollutants by the side of pond by the Municipality or other Governmental sectors.
8. Establishment of toilet in every house for the safe disposal and provision for reuse of disposed material in field should be made .
9. Wallowing of animals in water resources should be strictly controlled.
10. Planting ground cover and stabilizing erosion prone areas.
11. Controlled fishing, using of poison during fishing is strictly prohibited.
12. Cleaning campaign must be launched from local level.
13. Strict implementation of "polluters' pay" principle.
14. Shifting of Dande market to the area far from water resources may be the one solution to reduce the water pollution near the site.



15. Government should formulate and implement waste management strategies in the region of polluted areas.
16. Solid wastes must be reuse and recycle.
17. Public awareness against water pollution must be raised
18. For management of water wastes ,recycling factories must be established.
19. Proper dumping site must be established for non-degradable solid wastes.
20. Every home, school, offices must be use dustbin separately.
21. Farmers must be given awareness about excessive use of chemical fertilizers and pesticides.
22. Various NGOs, INGOs should conduct community sanitation programme.
23. Strict government act must be passed.
24. Use of decomposable materials and discard using of non renewable materials
25. Emphasis on using renewable solid materials and proper utilization with reuse must be done



**Contaminated water**



**Conclusion:** Water is the most important natural resource of environment that supports life on the Earth. The visited locality is undergoing rapid pollution because what most of the people fail to realize is that they will never truly destroy the natural resources and the resources will always remain. This trend is creating more and more pollution in the environment. So, there is utmost need of changing peoples' thought about their activities. Bacterial, viral and parasitic diseases are spreading through polluted water and affecting



human health. It is recommended that there should be proper waste disposal system and waste should be treated before entering in to river. Educational and awareness programs should be organized to control the pollution. Water is a natural resource that is vital to human health. It is also a resource that is undergoing a major crisis; its capacity to support plant and animal life is rapidly being destroyed by human activities. The message of this course is that human health and the health of the natural environment are intimately linked to one another.

‘Perhaps the time has come to cease calling it the “environmentalist view”, as though it were a lobbying effort outside the mainstream of human activity, and start calling it the real-world view.’

E. O. Wilson (American biologist and environmental campaigner)



***Wastes from household contaminates the water***

**BIBLIOGRAPHY:**

Environmental Studies Calcutta University Semester – II In English (Paperback, Dr. Sujan Kumar Bala)



**ACKNOWLEDGEMENT:**

I would like to express my special thanks to our Class teacher Dr. Jayeeta Chowdhury to assign such a great topic for project. This project gave me an Oppurtunity to study and know interesting things about environment.





PROJECT WORK

AECC 2

ENVIRONMENTAL STUDIES

COLLEGE ID - PHSA20M599

CU ROLL – 203223-21-0078

CU Registration no- 223-1111-0366-20



## . A Report on A visit to a Local Water Polluted Site

### Introduction:

Pollution can be defined as the undesirable change in natural system. It may also define as the unwanted change in the characteristics of air, water, soil and other environmental factors. Pollution adversely affects the health, survival or other activities of human and other animals. It is the main problem at present both at local level as well as at a global level. In Nepal, the pollution is the growing concern. But there are only limited studies done so far to quantify the level of pollution. Thus the availability of the data is very poor. The monitoring activities are virtually significant. The effects of water pollution include decreasing the quantity of drinkable water available, lowering water supplies for crop irrigation, and impacting fish and wildlife populations that require water of a certain purity for survival. Consumption of polluted water causes various water borne diseases which are effecting the human health in long term and short term. with the movement of industrialization and urbanization the pollution situation has become quite visible in some industrial locations and major urban centers. Pollutants, the components of pollution, can be either foreign substances/energies or naturally occurring contaminants. Pollutants include solid, liquid or gaseous substances present in greater than natural abundance produced due to human activity, which have detrimental effect on our environment. Pollution can affect: air, water, soil and biodiversity that directly affect the plant and animal life. There are various types of pollution. Some are listed below: air pollution, water pollution, land pollution and noise pollution. The systematic pollution of our environment is one of the biggest hazards that humanity faces today. People are becoming increasingly aware of the threat posed by pollution and governments are enacting legislations aimed at protecting the environment.

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

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

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

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

### **Water pollution:**

Water pollution is defined as the contamination of water by harmful substances which is detrimental to living beings. Industrial wastes, household garbages, non-decomposable materials from schools, chemicals, pesticides releasing from agricultural activities are major cause to pollute water bodies. The effects of water pollution include decreasing the quantity of drinkable water available, lowering water supplies for crop irrigation, and impacting fish and wildlife populations that require water of a certain purity for survival. Consumption of polluted water causes various water borne diseases which are effecting the human health in long term and short term.

### **Land Pollution :**

Soil or land pollution is contamination of the soil that prevents natural growth and balance in the land. Many micro and macro flora and fauna are affected by land pollution since they obtain minerals, nutrition from soil itself. Soil contamination can lead to poor growth and reduced crop yields, loss of wildlife habitat, water and visual pollution, soil erosion, and desertification.

### **Noise Pollution :**

Noise pollution refers to undesirable levels of noises caused by human activity that disrupt the standard of living in the affected area. Noise pollution cause mental stress, depression, damage to the ear drum which can cause deafness. Other forms of pollution include radioactive pollution, thermal pollution, light pollution and plastic pollution.

But our concern during our visit was Water Pollution. There has grown up a serious concern all over. The visited area about the river and small rivulets turning into polluted site. Water is the most important natural resource of environment that supports life on the Earth. There is various classification of water pollution. Pollution of water is classified into two categories based on their source:

a) **Point sources:** It refers to the contaminants that enter the waterway from a single identifiable source Such as pipe or ditch. E.g.: discharge from factory

b) **Non-point sources:** It means pollutants are emitted from multiple sources. E.g.: surface run off from agricultural land.





***polluted pond with wastes***



### **Objectives:**

- 1) To identify the major reason, extent and type of the pollution near the visited site.
- 2) To identify the adverse effect of pollution in that vicinity
- 3) To explore the extent of pollution in the given specified region.
- 4) To study the visible effects of pollution.
- 5) To study the visible effects of pollution.
- 6) To study about the direct and indirect causes of pollution
- 7) To formulate the possible strategies in order to control various pollution
- 8) To suggest control measures to minimize pollution.

### **Methodology:**

Firstly, we visited around polluted pond site and small watershed in the vicinity of our house in DumDum cantonment. Further, analysis was done by following two methods:

A. **Primary method:** The polluted site was properly observed and information was gathered up.

B. **Secondary method:** Different literary books and journals related to pollution were consulted. Internet sites were also cited and desk study was done for obtaining different information about the polluted place.

**Discussion:** The pond and small watershed in front of our house were selected for the report preparation which is located in North 24 paraganas districts in Dumdum cantonment zone in



southern Region.

During our visit, we saw the river as dumping location i.e. there were pile of decomposed materials that came from residing places. We observed following materials or pollutants on the river bank: 1. Wastes from nearby hospitals 2. Wastes from near brick kiln 3. Plastic bags 4. Plastic bottles 5. Waste food materials 6. Damaged domestic wares 7. Man and animal excreta 8. Dead bodies of animals 9. Plant materials 10. Wastes from nearby garage 11. Fuel materials from vehicles 12. Old clothes and various residues from nearby market

The main factors/causes that results the pollution was found are as follows:

- A. Different animals wallow in the pond.
- B. People are disposing different waste materials coming from household and small industrial activities.
- C. Random fishing and overfishing in the pond by using poisons.

### **Consequences:**

The pond is being polluted due to different human activities which is not eco-friendly. The heap of pollutants in pond looked as if it is a dumping site not a river. It has totally damaged the beautiful scenario of river. Very bad smell could be easily felt while walking by the water sources. The water has become impure and unusable for human and animals. Extreme eutrophication has been observed in the river which has resulted in the reduction of the available oxygen in the river. Increase in nutrient content and biological growth is causing consequent decrease of oxygen supplies. Water quality seemed to be totally degraded and when it is used for domestic purposes, it may cause water related illness such as typhoid, cholera, dysentery, skin allergies etc. Loss of soil fertility and productivity is also a major problems caused by the pond pollution. Due to the foul smell of the pond and the other pollutants the recreational value of pond has decreased. Freshwater is a finite and limited resource on Earth and, increasingly, much of it is polluted, by both pathogenic microbes and chemical contaminant. Human demand for freshwater is increasing; in particular, water is required to irrigate crops to feed the rapidly expanding human population. Water cycles globally, through the oceans, the atmosphere and freshwater river systems. At certain points in the cycle, water is purified, both naturally and by treatment plants. Freshwater is very unevenly distributed in the world, such that a large proportion of the world's human population has insufficient water for growing crops, for drinking and for sanitation. at you are happy with this. However, you can change your cookie settings at any time. Freshwater is a finite and limited resource on Earth and, increasingly, much of it is polluted, by both pathogenic microbes and chemical contaminants. Human demand for freshwater is increasing; in particular, water is required to irrigate crops to feed the rapidly expanding human population. Water cycles globally, through the oceans, the atmosphere and freshwater river systems. At certain points in the cycle, water is purified, both naturally and by treatment plants. Freshwater is very unevenly distributed in the world, such that a large proportion of the world's human population has insufficient water for growing crops, for drinking and for sanitation. Climate change is altering the global distribution of water,

causing droughts in some regions, flooding in others. The chemical and physical properties of water are such that, over the range of temperatures that occur on Earth, it supports a rich diversity of plants and animals. An enormous variety of chemical compounds, produced by human activities, pollute natural water bodies, causing both acute and chronic pollution. Evidence for the effect of chemical pollution is provided by ecotoxicology, the study of the impact of xenobiotic chemicals on wildlife in natural situations. As chemical pollutants pass through natural food chains, bioaccumulation causes high levels to build up at certain points, e.g. in the fat reserves of predatory fish and birds. As a result, these animals and their offspring can be exposed to a very high dose. DDT is an effective insecticide that is toxic to wildlife, but is also a vital means for combating malaria. Levels of mercury compounds in the environment are increasing; they are a threat to wildlife and to people who eat a lot of fish, and especially to their children. Levels of nitrogen compounds in the environment are increasing very rapidly. These are toxic to humans at high levels but, more importantly, at lower levels they cause widespread environmental changes, especially eutrophication of water. A large number of xenobiotic chemicals, called endocrine disruptors, cause major disruption to the reproductive development of freshwater animals; their possible effects on humans are uncertain

Here are some measures suggested to reduce the problems faced due to the pond water pollution:

1. The major cause of pollution is human behavior. It should be changed.
2. Proper selection and management of dumping sites.
3. Use of Bio-degradable substances as compost manures.
4. Application of '3 R' principle; Recycle, Reduce, Reuse
5. Management of dustbins by household itself and municipality in several places.
6. Development of new residential areas without sanitation provision should be prohibited.
7. Proper implementation of rules and regulations, programs for removal of heap of pollutants by the side of pond by the Municipality or other Governmental sectors.
8. Establishment of toilet in every house for the safe disposal and provision for reuse of disposed material in field should be made .
9. Wallowing of animals in water resources should be strictly controlled.
10. Planting ground cover and stabilizing erosion prone areas.
11. Controlled fishing, using of poison during fishing is strictly prohibited.
12. Cleaning campaign must be launched from local level.
13. Strict implementation of "polluters' pay" principle.
14. Shifting of Dande market to the area far from water resources may be the one solution to reduce the water pollution near the site.



15. Government should formulate and implement waste management strategies in the region of polluted areas.
16. Solid wastes must be reuse and recycle.
17. Public awareness against water pollution must be raised
18. For management of water wastes ,recycling factories must be established.
19. Proper dumping site must be established for non-degradable solid wastes.
20. Every home, school, offices must be use dustbin separately.
21. Farmers must be given awareness about excessive use of chemical fertilizers and pesticides.
22. Various NGOs, INGOs should conduct community sanitation programme.
23. Strict government act must be passed.
24. Use of decomposable materials and discard using of non renewable materials
25. Emphasis on using renewable solid materials and proper utilization with reuse must be done



**Contaminated water**



**Conclusion:** Water is the most important natural resource of environment that supports life on the Earth. The visited locality is undergoing rapid pollution because what most of the people fail to realize is that they will never truly destroy the natural resources and the resources will always remain. This trend is creating more and more pollution in the environment. So, there is utmost need of changing peoples' thought about their activities. Bacterial, viral and parasitic diseases are spreading through polluted water and affecting



human health. It is recommended that there should be proper waste disposal system and waste should be treated before entering in to river. Educational and awareness programs should be organized to control the pollution. Water is a natural resource that is vital to human health. It is also a resource that is undergoing a major crisis; its capacity to support plant and animal life is rapidly being destroyed by human activities. The message of this course is that human health and the health of the natural environment are intimately linked to one another.

‘Perhaps the time has come to cease calling it the “environmentalist view”, as though it were a lobbying effort outside the mainstream of human activity, and start calling it the real-world view.’

E. O. Wilson (American biologist and environmental campaigner)



***Wastes from household contaminates the water***

**BIBLIOGRAPHY:**

Environmental Studies Calcutta University Semester – II In English (Paperback, Dr. Sujan Kumar Bala)





**ACKNOWLEDGEMENT:**

I would like to express my special thanks to our Class teacher Dr. Jayeeta Chowdhury to assign such a great topic for project. This project gave me an Oppurtunity to study and know interesting things about environment.



# PROJECT REPORT

## SEMESTER II

COURSE:AECC2(Environmental Studies)

Ecosystem

Checked  
24 out of  
30

**College Roll No. : PHSA20M602**

**CU Registration No. : 223-1111-0382-20**

**CU Roll No. : 203223-21-0088**

- **What is an Ecosystem?**

➤ An ecosystem is a natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.

- **Types of Ecosystem:**

➤ An ecosystem can be as small as an oasis in desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem:

o Terrestrial Ecosystem

o Aquatic Ecosystem

- **Components of Ecosystem:**

➤ Abiotic or Non-living components:

1. Inorganic substances
2. Organic compounds
3. Climatic factors

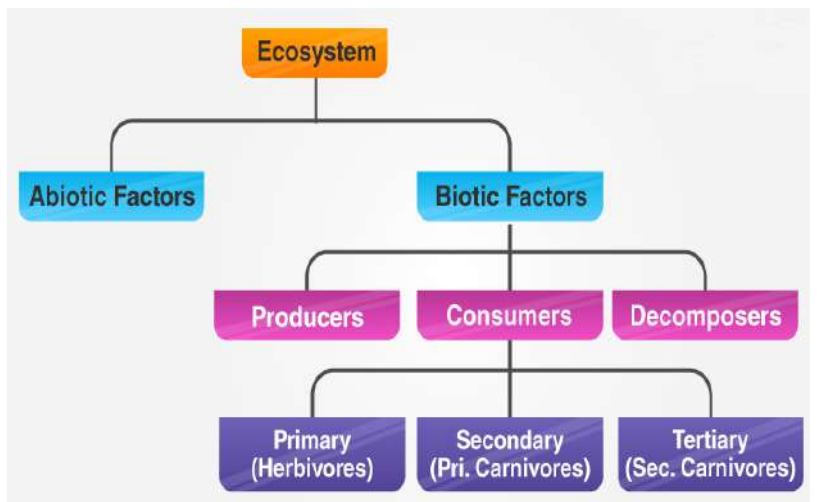
➤ Biotic or Living components:

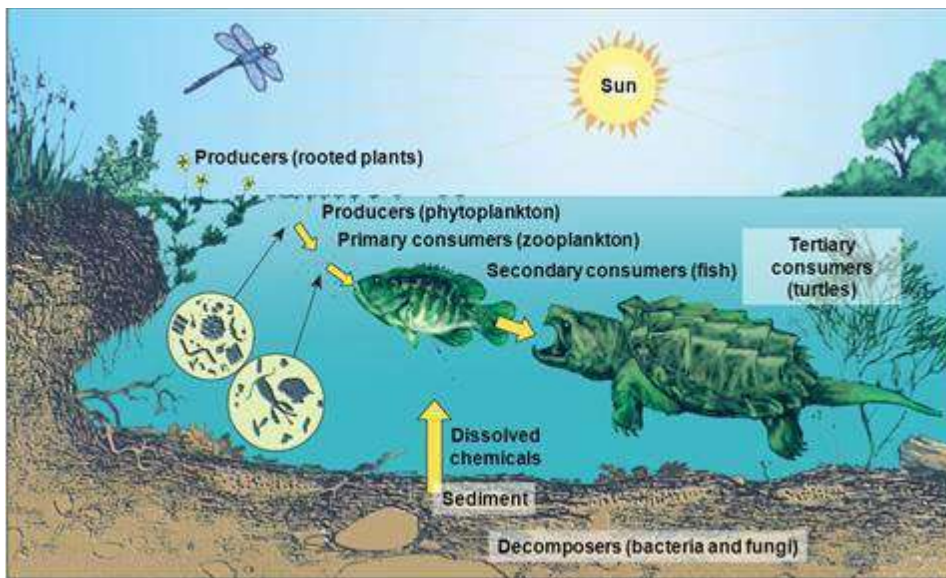
1. Autotrophs or Producers
2. Heterotrophs or Consumers
3. Decomposers or Saprotrophs

- **Examples of Ecosystem:**

1. Ecosystem of Pond:

The pond is a small body of standing water and the pond ecosystem is complex interactions between its biotic and abiotic components.





o Abiotic components: Light, temperature, water, Soil, O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, nitrates, carbonates, carbohydrates, proteins, amino acids

o Biotic components :

Producers:

Phytoplanktons: Spirogyra, Zygnema, Volvox, Oedogonium.

Submerged plants: those, which are submerged in water, are submerged plants eg Hydrilla and Utricularia

Floating plants: those, which float freely in water surface, are called floating plants eg. Pistia, Nymphaea etc.

Consumers:

Primary consumers: Zooplankton, Neckton

Secondary consumers: Insects, fishes, frogs, crab etc.

Tertiary consumers: Large fishes and frogs.

Top consumers: Water snake, water birds etc.

Decomposers: These include micro organisms such as bacteria fungi, which break down the organic complex food from dead producers and consumers into simple inorganic compounds made available to the producers.

## 2. Ecosystem of Forest :

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem.

o Abiotic Components: Light,temperature, water,Soil,air,carbohydrates, proteins

o Biotic Components:

Producer: 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.

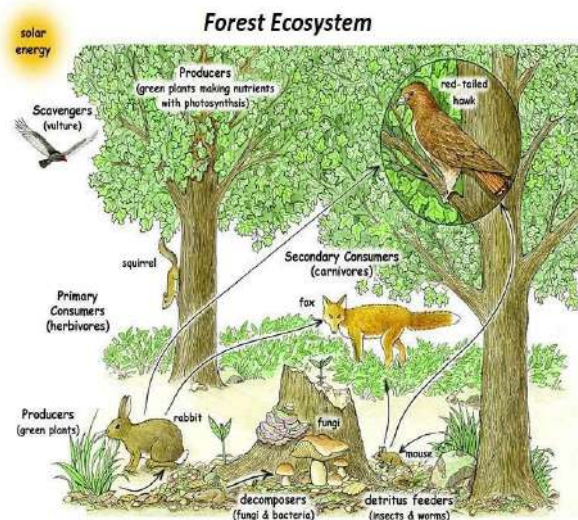
Consumers:

Primary consumers: Herbivorous animals, like- rat,guinea pig,buffalo,giraffe,deer

Secondary consumers: Insectivorous birds,frog,hyena,wolf etc.

Tertiary consumers: Tiger, Lion, Eagle,Hawk,Falcon etc.

Decomposers: These include micro organisms such as bacteria, fungi .

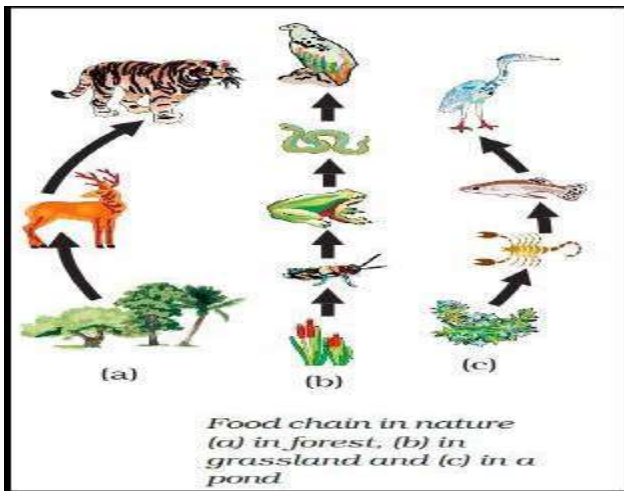


## 3. Ecosystem of Wetland:

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil.

#### 4. Ecosystem of Estuary:

These are areas where both ocean and land contribute to a unique ecosystem. A basic feature is the instability of an estuary due to the ebb and flood of the tide. Plant and animal wastes are washed away, sediment is shifted and fresh and salt water are mixed.



#### • Important Ecological Concepts:

##### 1. Food Chain:

A food chain is a linear network of links in a food web starting from producer

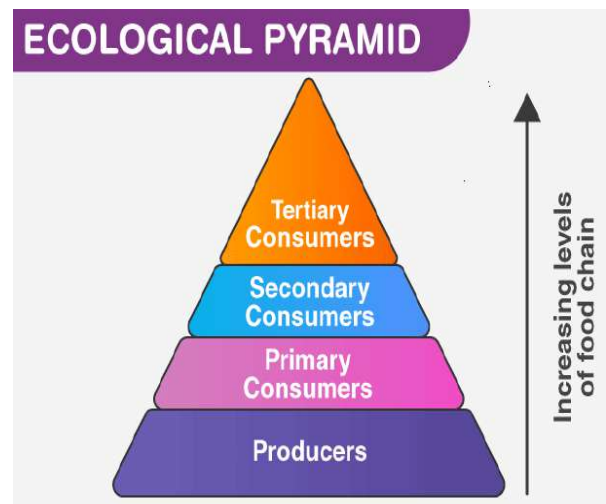
organisms and ending at an apex predator species, detritivores, or decomposer

species. A food chain also shows how organisms are related to each other by the

food they eat. Each level of a food chain represents a different trophic level.

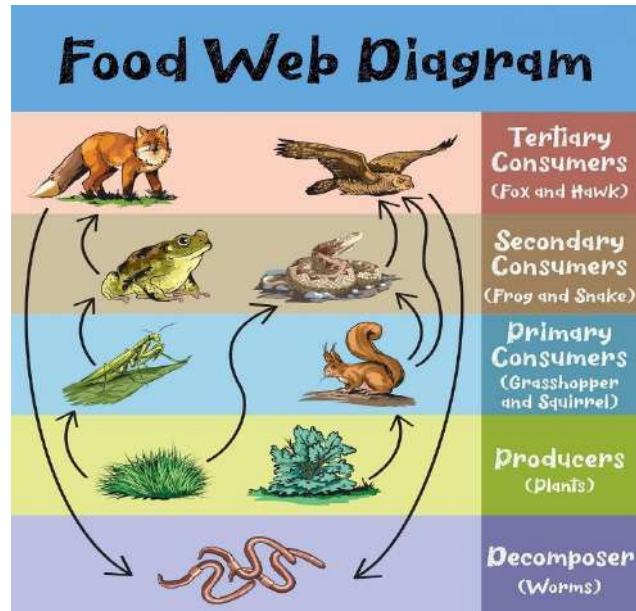
##### 2. Ecological Pyramids:

An ecological pyramid (also trophic pyramid, Eltonian pyramid, energy pyramid, or sometimes food pyramid) is a graphical representation designed to show the biomass or bioproductivity at each trophic level in a given ecosystem.



### 3. Food Web:

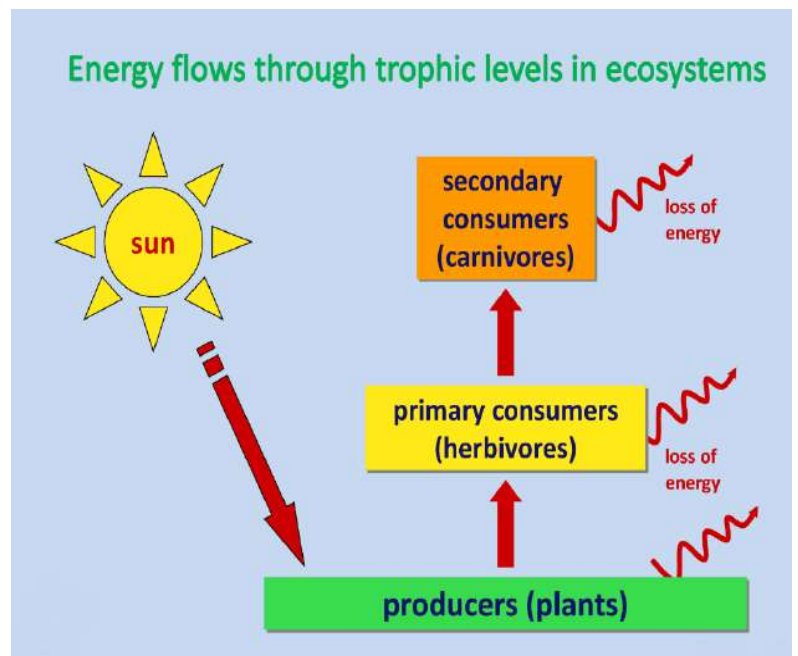
Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer.



#### • ENERGY FLOW THROUGH THE ECOSYSTEM:

The transfer of energy and matter takes place in the process of predator and prey relationship in a food chain. The original source of energy is the energy from the sun.

Out of the enormous amount of energy continuously radiated by the sun, most of it is reflected or refracted back (by atmosphere, earth surface and object like plants). Only a very small fraction, about one per cent, of the solar energy received by the plant is used through the process of photosynthesis.



• **Importance of Ecosystem:**

1. It provides habitat to wild plants and animals.
2. It promotes various food chains and food webs.
3. It controls essential ecological processes and promotes lives.
4. Involved in the recycling of nutrients between biotic and abiotic components.
5. It helps in maintaining the usual flow of energy in an ecosystem including- Carbon Cycle, Energy Cycle, Nitrogen Cycle, Oxygen Cycle, and Water Cycle.

Apart from these importances, the ecosystem also plays an important role in controlling weeds, rotation of crop, management of grasslands, forests, biological surveys, conservation of soil, wildlife, etc.

• **The Five Global Threats to Ecosystem Viability:**

1. Depletion of world's tropical forests
2. Extinction of species
3. Rapid population growth
4. Shortage of fresh water resources
5. Threats to human health
6. Climate change

• **Reference**

[www.google.com](http://www.google.com)

[www.ecosia.org](http://www.ecosia.org)

[www.wikipedia.com](http://www.wikipedia.com)

<https://byjus.com>



# **PROJECT REPORT**

## **SEMESTER II**

**COURSE:AECC2(Environmental Studies)**

**Ecosystem**

**College Roll No. : PHSA20M602**

**CU Registration No. : 223-1111-0382-20**

**CU Roll No. : 203223-21-0088**

- **What is an Ecosystem?**

➤ An ecosystem is a natural unit consisting of all plants, animals and micro-organisms (biotic factors) in an area functioning together with all of the non-living physical (abiotic) factors of the environment.

- **Types of Ecosystem:**

➤ An ecosystem can be as small as an oasis in desert, or as big as an ocean, spanning thousands of miles. There are two types of ecosystem:

- o Terrestrial Ecosystem

- o Aquatic Ecosystem

- **Components of Ecosystem:**

➤ Abiotic or Non-living components:

1. Inorganic substances
2. Organic compounds
3. Climatic factors

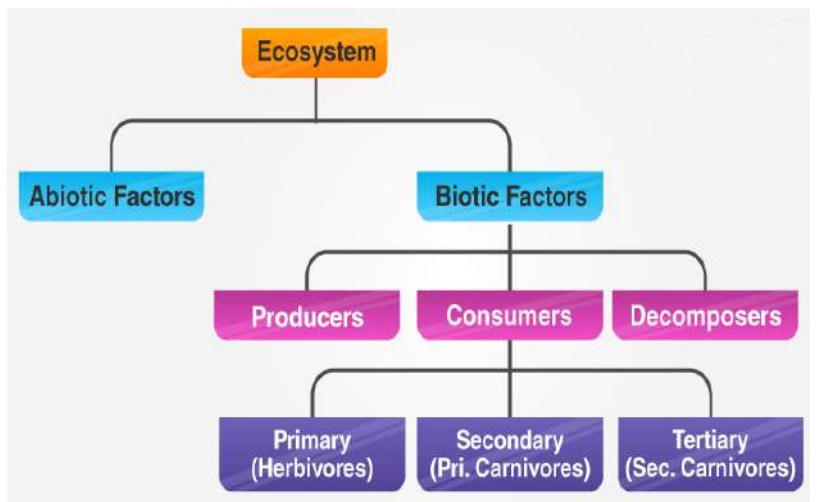
➤ Biotic or Living components:

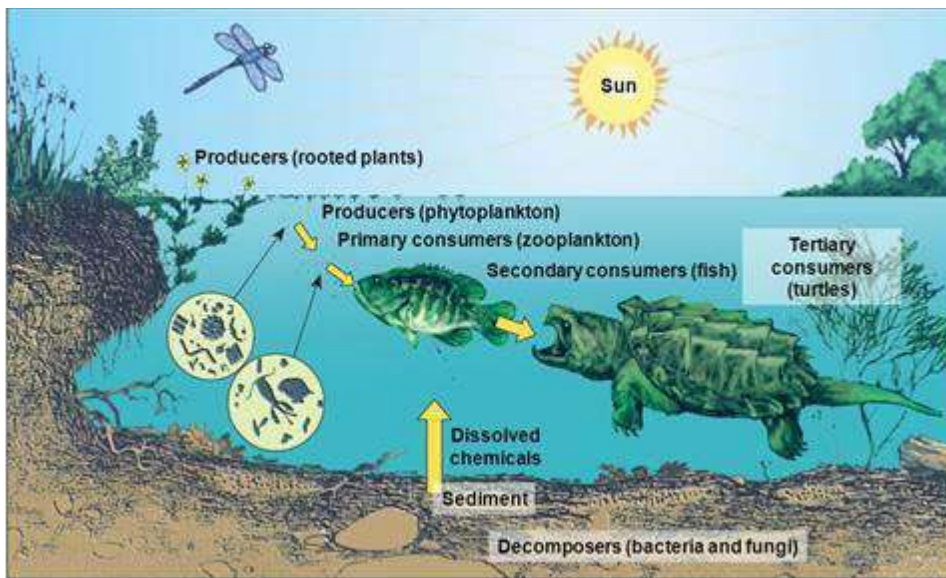
1. Autotrophs or Producers
2. Heterotrophs or Consumers
3. Decomposers or Saprotrophs

- **Examples of Ecosystem:**

1. Ecosystem of Pond:

The pond is a small body of standing water and the pond ecosystem is complex interactions between its biotic and abiotic components.





o Abiotic components: Light, temperature, water, Soil, O<sub>2</sub>, CO<sub>2</sub>, N<sub>2</sub>, nitrates, carbonates, carbohydrates, proteins, amino acids

o Biotic components :

Producers:

Phytoplanktons: Spirogyra, Zygnema, Volvox, Oedogonium.

Submerged plants: those, which are submerged in water, are submerged plants eg Hydrilla and Utricularia

Floating plants: those, which float freely in water surface, are called floating plants eg. Pistia, Nymphaea etc.

Consumers:

Primary consumers: Zooplankton, Neckton

Secondary consumers: Insects, fishes, frogs, crab etc.

Tertiary consumers: Large fishes and frogs.

Top consumers: Water snake, water birds etc.

Decomposers: These include micro organisms such as bacteria fungi, which break down the organic complex food from dead producers and consumers into simple inorganic compounds made available to the producers.

## 2. Ecosystem of Forest :

A forest ecosystem is a functional unit or a system which comprises of soil, trees, insects, animals, birds, and man as its interacting units. A forest is a large and complex ecosystem.

o Abiotic Components: Light,temperature, water,Soil,air,carbohydrates, proteins

o Biotic Components:

Producer: 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.

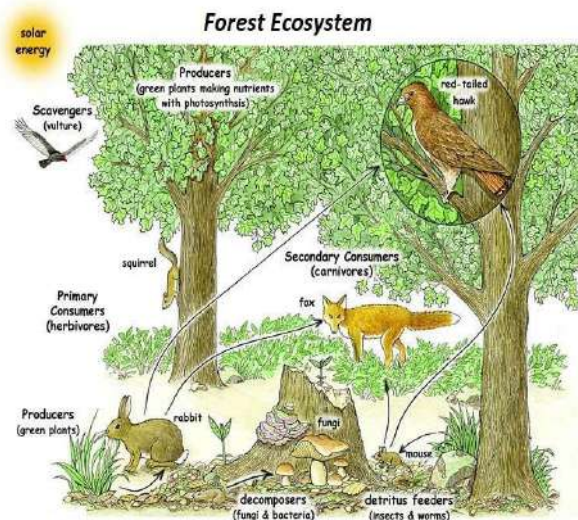
Consumers:

Primary consumers: Herbivorous animals, like- rat,guinea pig,buffalo,giraffe,deer

Secondary consumers: Insectivorous birds,frog,hyena,wolf etc.

Tertiary consumers: Tiger, Lion, Eagle,Hawk,Falcon etc.

Decomposers: These include micro organisms such as bacteria, fungi .

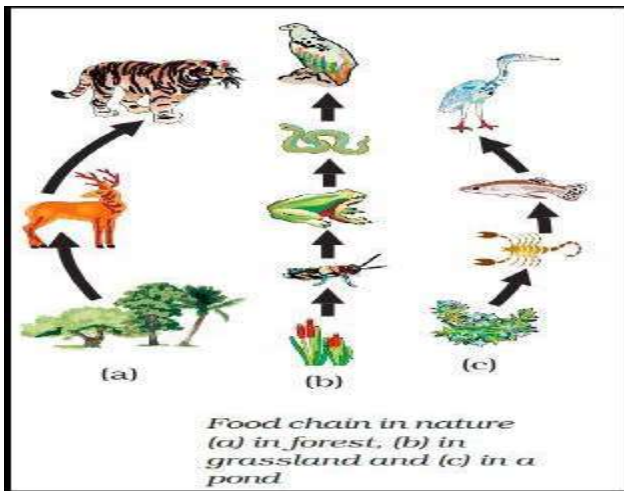


## 3. Ecosystem of Wetland:

A wetland is a distinct ecosystem that is flooded by water, either permanently or seasonally, where oxygen-free processes prevail. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil.

#### 4. Ecosystem of Estuary:

These are areas where both ocean and land contribute to a unique ecosystem. A basic feature is the instability of an estuary due to the ebb and flood of the tide. Plant and animal wastes are washed away, sediment is shifted and fresh and salt water are mixed.



#### • Important Ecological Concepts:

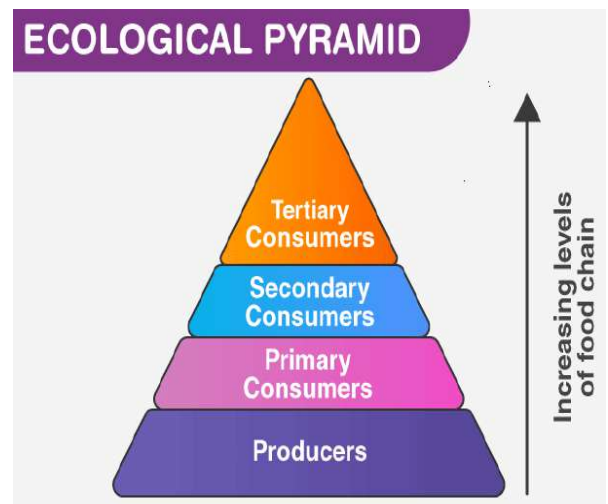
##### 1. Food Chain:

A food chain is a linear network of links in a food web starting from producer organisms and ending at an apex predator species, detritivores, or decomposer

species. A food chain also shows how organisms are related to each other by the food they eat. Each level of a food chain represents a different trophic level.

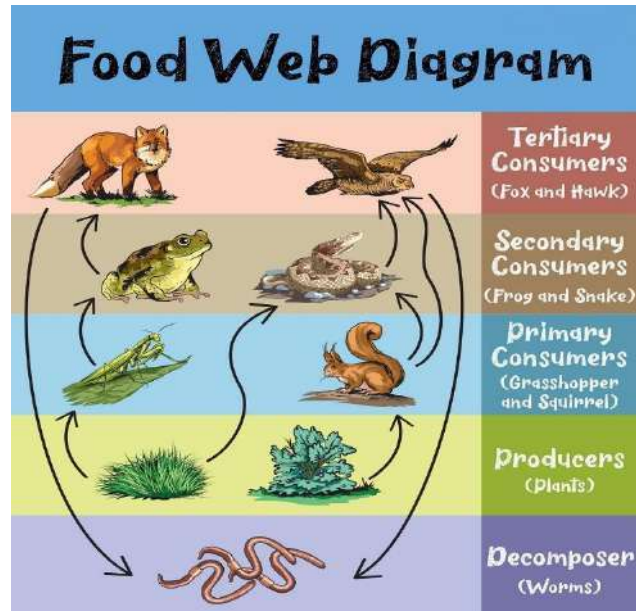
##### 2. Ecological Pyramids:

An ecological pyramid (also trophic pyramid, Eltonian pyramid, energy pyramid, or sometimes food pyramid) is a graphical representation designed to show the biomass or bioproductivity at each trophic level in a given ecosystem.



### 3. Food Web:

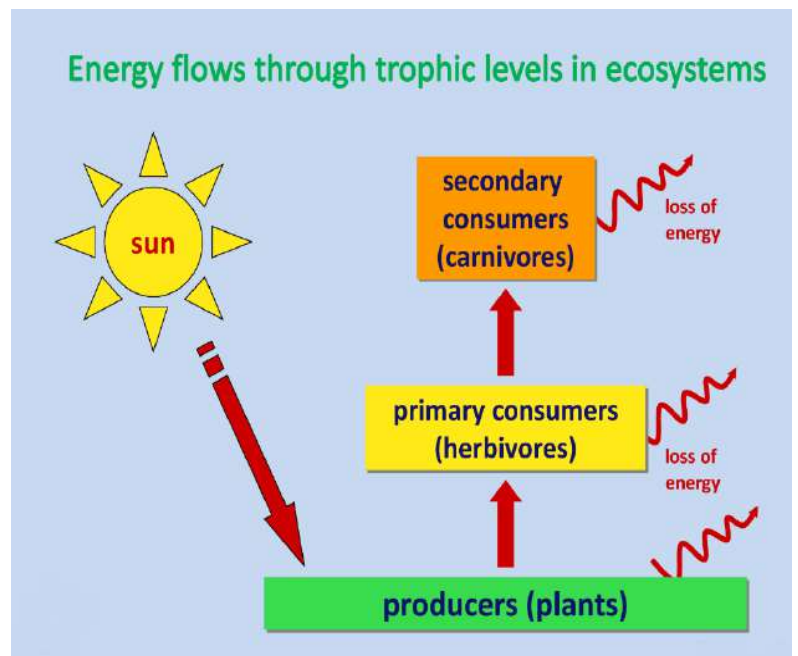
Food web is a network of interconnected food chains. It comprises all the food chains within a single ecosystem. It helps in understanding that plants lay the foundation of all the food chains. In a marine environment, phytoplankton forms the primary producer.



#### • ENERGY FLOW THROUGH THE ECOSYSTEM:

The transfer of energy and matter takes place in the process of predator and prey relationship in a food chain. The original source of energy is the energy from the sun.

Out of the enormous amount of energy continuously radiated by the sun, most of it is reflected or refracted back (by atmosphere, earth surface and object like plants). Only a very small fraction, about one per cent, of the solar energy received by the plant is used through the process of photosynthesis.



• **Importance of Ecosystem:**

1. It provides habitat to wild plants and animals.
2. It promotes various food chains and food webs.
3. It controls essential ecological processes and promotes lives.
4. Involved in the recycling of nutrients between biotic and abiotic components.
5. It helps in maintaining the usual flow of energy in an ecosystem including- Carbon Cycle, Energy Cycle, Nitrogen Cycle, Oxygen Cycle, and Water Cycle.

Apart from these importances, the ecosystem also plays an important role in controlling weeds, rotation of crop, management of grasslands, forests, biological surveys, conservation of soil, wildlife, etc.

• **The Five Global Threats to Ecosystem Viability:**

1. Depletion of world's tropical forests
2. Extinction of species
3. Rapid population growth
4. Shortage of fresh water resources
5. Threats to human health
6. Climate change

• **Reference**

[www.google.com](http://www.google.com)

[www.ecosia.org](http://www.ecosia.org)

[www.wikipedia.com](http://www.wikipedia.com)

<https://byjus.com>

# PROJECT FILE

## SAVE THE ENVIROMENT

### *THE BEST SOLUTION*

## GREEN EVOLUTION

## TO ARREST POLLUTION



SEMESTER 2

COURSE :AECC 2 (ENVS)

COLLEGE ROLL NO: PHSA20M605

CU ROLL NO: 203223-21-0097

CU REG. NO: 223-1111-0402-20

Checked  
24 out of  
30



## INTRODUCTION

Pollution is the introduction of harmful materials into the environment. These harmful materials are called pollutants. Pollutants can be natural, such as volcanic ash. They can also be created by human activity, such as trash or runoff produced by factories. Pollutants damage the quality of air, water, and land.

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.

In the past, visitors to Big Bend National Park in the U.S. state of Texas could see 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.

## AIR POLLUTION

Sometimes, air pollution is visible. A person can see dark smoke pour from the exhaust pipes of large trucks or factories, for example. More often, however, air pollution is invisible.

Polluted air can be dangerous, even if the pollutants are invisible. It can make people's eyes burn and make them have difficulty breathing. It can also increase the risk of lung cancer.

Sometimes, air pollution kills quickly. In 1984, an accident at a pesticide plant in Bhopal, India, released a deadly gas into the air. At least 8,000 people died within days.

Hundreds of thousands more were permanently injured.

Natural disasters can also cause air pollution to increase quickly. When volcanoes erupt, they eject volcanic ash and gases into the atmosphere. Volcanic ash can discolor the sky for months. After the eruption of the Indonesian volcano of Krakatoa in 1883, ash darkened the sky around the world. The dimmer sky caused fewer crops to be harvested as far away as Europe and North America. For years, meteorologists tracked what was known as the "equatorial smoke stream." In fact, this smoke stream was a jet stream, a wind high in Earth's atmosphere that Krakatoa's air pollution made visible.

Volcanic gases, such as sulfur dioxide, can kill nearby residents and make the soil infertile for years.. Most victims of Vesuvius were not killed by lava or landslides caused by the eruptin. Most were killed by toxic gases.

## WATER POLLUTION

Some polluted water looks muddy, smells bad, and has garbage floating in it. Some polluted water looks clean, but is filled with harmful chemicals you can't see or smell.

Polluted water is unsafe for drinking and swimming. Some people who drink polluted water are exposed to hazardous chemicals that may make them sick years later. Others consume bacteria and other tiny aquatic organisms that cause disease. The United Nations estimates that 4,000 children die every day from drinking dirty water.

Sometimes, polluted water harms people indirectly. They get sick because the fish that live in polluted water are unsafe to eat. They have too many pollutants in their flesh.

There are some natural sources of water pollution. Oil and natural gas, for example, can leak into oceans and lakes from natural underground sources. These sites are called petroleum seeps. The world's largest petroleum seep is the Coal Oil Point Seep, off the coast of the U.S. state of California. The Coal Oil Point Seep releases so much oil that tar balls wash up on nearby beaches. Tar balls are small, sticky pieces of pollution that eventually decompose in the ocean.

Human activity also contributes to water pollution.

Chemicals and oils from factories are sometimes dumped or seep into waterways. These chemicals are called runoff. Chemicals in runoff can create a toxic environment for aquatic life. Runoff can also help create a fertile

environment for cyanobacteria, also called blue-green algae. Cyanobacteria reproduce rapidly, creating a harmful algal bloom (HAB). Harmful algal blooms prevent organisms such as plants and fish from living in the ocean. They are associated with “dead zones” in the world’s lakes and rivers, places where little life exists below surface water.

Mining and drilling can also contribute to water pollution. Acid mine drainage (AMD) is a major contributor to pollution of rivers and streams near coal mines. Acid helps miners remove coal from the surrounding rocks. The acid is washed into streams and rivers, where it reacts with rocks and sand. It releases chemical sulfur from the rocks and sand, creating a river rich in sulfuric acid. Sulfuric acid is toxic to plants, fish, and other aquatic organisms. Sulfuric acid is also toxic to people, making rivers polluted by AMD dangerous sources of water for drinking and hygiene.

Oil spills are another source of water pollution. In April 2010, the Deepwater Horizon oil rig exploded in the Gulf of Mexico, causing oil to gush from the ocean floor.



## LAND POLLUTION

Many of the same pollutants that foul the water also harm the land. Mining sometimes leaves the soil contaminated with dangerous chemicals.

Pesticides and fertilizers from agricultural fields are blown by the wind. They can harm plants, animals, and sometimes people. Some fruits and vegetables absorb the pesticides that help them grow. When people consume the fruits and vegetables, the pesticides enter their bodies.

Some pesticides can cause cancer and other diseases.

A pesticide called DDT (dichlorodiphenyltrichloroethane) was once commonly used to kill insects, especially mosquitoes. In many parts of the world, mosquitoes carry a disease called malaria, which kills a million people every year. Swiss chemist Paul Hermann Muller was awarded the Nobel Prize for his understanding of how DDT can control insects and other pests. DDT is responsible for reducing malaria in places such as Taiwan and Sri Lanka.

In 1962, American biologist Rachel Carson wrote a book called *Silent Spring*, which discussed the dangers of DDT. She argued that it could contribute to cancer in humans. She also explained how it was destroying bird eggs, which caused the number of bald eagles, brown pelicans, and ospreys to drop. In 1972, the United States banned the use of DDT. Many other countries also banned it. But DDT didn't disappear entirely. Today, many governments support the use of DDT because it remains the most effective way to combat malaria.

Trash is another form of land pollution. Around the world, paper, cans, glass jars, plastic products, and junked cars and appliances mar the landscape. Litter makes it difficult for plants and other producers in the food web to create nutrients. Animals can die if they mistakenly eat plastic.

Garbage often contains dangerous pollutants such as oils, chemicals, and ink. These pollutants can leech into the soil and harm plants, animals, and people. Inefficient garbage collection systems contribute to land pollution. Often, the garbage is picked up and brought to a dump, or landfill. Garbage is buried in landfills. Sometimes, communities produce so much garbage that their landfills are filling up. They are running out of places to dump their trash.



# PROJECT FILE

## SAVE THE ENVIROMENT

### *THE BEST SOLUTION*

## GREEN EVOLUTION

## TO ARREST POLLUTION



SEMESTER 2

COURSE :AECC 2 (ENVS)

COLLEGE ROLL NO: PHSA20M605

CU ROLL NO: 203223-21-0097

CU REG. NO: 223-1111-0402-20

## INTRODUCTION

Pollution is the introduction of harmful materials into the environment. These harmful materials are called pollutants. Pollutants can be natural, such as volcanic ash. They can also be created by human activity, such as trash or runoff produced by factories. Pollutants damage the quality of air, water, and land.

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.

In the past, visitors to Big Bend National Park in the U.S. state of Texas could see 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.



## AIR POLLUTION

Sometimes, air pollution is visible. A person can see dark smoke pour from the exhaust pipes of large trucks or factories, for example. More often, however, air pollution is invisible.

Polluted air can be dangerous, even if the pollutants are invisible. It can make people's eyes burn and make them have difficulty breathing. It can also increase the risk of lung cancer.

Sometimes, air pollution kills quickly. In 1984, an accident at a pesticide plant in Bhopal, India, released a deadly gas into the air. At least 8,000 people died within days.

Hundreds of thousands more were permanently injured.

Natural disasters can also cause air pollution to increase quickly. When volcanoes erupt, they eject volcanic ash and gases into the atmosphere. Volcanic ash can discolor the sky for months. After the eruption of the Indonesian volcano of Krakatoa in 1883, ash darkened the sky around the world. The dimmer sky caused fewer crops to be harvested as far away as Europe and North America. For years, meteorologists tracked what was known as the "equatorial smoke stream." In fact, this smoke stream was a jet stream, a wind high in Earth's atmosphere that Krakatoa's air pollution made visible.

Volcanic gases, such as sulfur dioxide, can kill nearby residents and make the soil infertile for years.. Most victims of Vesuvius were not killed by lava or landslides caused by the eruptin. Most were killed by toxic gases.

## WATER POLLUTION

Some polluted water looks muddy, smells bad, and has garbage floating in it. Some polluted water looks clean, but is filled with harmful chemicals you can't see or smell.

Polluted water is unsafe for drinking and swimming. Some people who drink polluted water are exposed to hazardous chemicals that may make them sick years later. Others consume bacteria and other tiny aquatic organisms that cause disease. The United Nations estimates that 4,000 children die every day from drinking dirty water.

Sometimes, polluted water harms people indirectly. They get sick because the fish that live in polluted water are unsafe to eat. They have too many pollutants in their flesh.

There are some natural sources of water pollution. Oil and natural gas, for example, can leak into oceans and lakes from natural underground sources. These sites are called petroleum seeps. The world's largest petroleum seep is the Coal Oil Point Seep, off the coast of the U.S. state of California. The Coal Oil Point Seep releases so much oil that tar balls wash up on nearby beaches. Tar balls are small, sticky pieces of pollution that eventually decompose in the ocean.

Human activity also contributes to water pollution.

Chemicals and oils from factories are sometimes dumped or seep into waterways. These chemicals are called runoff. Chemicals in runoff can create a toxic environment for aquatic life. Runoff can also help create a fertile

environment for cyanobacteria, also called blue-green algae. Cyanobacteria reproduce rapidly, creating a harmful algal bloom (HAB). Harmful algal blooms prevent organisms such as plants and fish from living in the ocean. They are associated with “dead zones” in the world’s lakes and rivers, places where little life exists below surface water.

Mining and drilling can also contribute to water pollution. Acid mine drainage (AMD) is a major contributor to pollution of rivers and streams near coal mines. Acid helps miners remove coal from the surrounding rocks. The acid is washed into streams and rivers, where it reacts with rocks and sand. It releases chemical sulfur from the rocks and sand, creating a river rich in sulfuric acid. Sulfuric acid is toxic to plants, fish, and other aquatic organisms. Sulfuric acid is also toxic to people, making rivers polluted by AMD dangerous sources of water for drinking and hygiene.

Oil spills are another source of water pollution. In April 2010, the Deepwater Horizon oil rig exploded in the Gulf of Mexico, causing oil to gush from the ocean floor.



## LAND POLLUTION

Many of the same pollutants that foul the water also harm the land. Mining sometimes leaves the soil contaminated with dangerous chemicals.

Pesticides and fertilizers from agricultural fields are blown by the wind. They can harm plants, animals, and sometimes people. Some fruits and vegetables absorb the pesticides that help them grow. When people consume the fruits and vegetables, the pesticides enter their bodies.

Some pesticides can cause cancer and other diseases.

A pesticide called DDT (dichlorodiphenyltrichloroethane) was once commonly used to kill insects, especially mosquitoes. In many parts of the world, mosquitoes carry a disease called malaria, which kills a million people every year. Swiss chemist Paul Hermann Muller was awarded the Nobel Prize for his understanding of how DDT can control insects and other pests. DDT is responsible for reducing malaria in places such as Taiwan and Sri Lanka.

In 1962, American biologist Rachel Carson wrote a book called *Silent Spring*, which discussed the dangers of DDT. She argued that it could contribute to cancer in humans. She also explained how it was destroying bird eggs, which caused the number of bald eagles, brown pelicans, and ospreys to drop. In 1972, the United States banned the use of DDT. Many other countries also banned it. But DDT didn't disappear entirely. Today, many governments support the use of DDT because it remains the most effective way to combat malaria.

Trash is another form of land pollution. Around the world, paper, cans, glass jars, plastic products, and junked cars and appliances mar the landscape. Litter makes it difficult for plants and other producers in the food web to create nutrients. Animals can die if they mistakenly eat plastic.

Garbage often contains dangerous pollutants such as oils, chemicals, and ink. These pollutants can leech into the soil and harm plants, animals, and people. Inefficient garbage collection systems contribute to land pollution. Often, the garbage is picked up and brought to a dump, or landfill. Garbage is buried in landfills. Sometimes, communities produce so much garbage that their landfills are filling up. They are running out of places to dump their trash.



# PROJECT REPORT

---

## SEMESTER II

**COURSE : AECC 2 (ENVIRONMENTAL STUDIES)**

**STUDY OF ECOSYSTEMS**

**(POND)**

Checked  
24 out of  
30

**COLLEGE ROLL NO :- PHSA20M607**

**CU REGISTRATION NO :- 223-1111-0410-20**

**CU ROLL NO :- 203223-21-0100**

# INDEX

---

<b>TOPIC</b>	<b>PAGE NO</b>
<b>ACKNOWLEDGEMENT</b>	<b>3</b>
<b>POND ECOSYSTEM</b>	
<b>A.INTRODUCTION</b>	<b>4</b>
<b>B.BIOTIC COMPONENT</b>	<b>5</b>
<b>C.ABIOTIC COMPONENT</b>	<b>6</b>
<b>D.IMPORTANCE OF POND ECOSYSTEM</b>	<b>9</b>
<b>CONCLUSION</b>	<b>10</b>

# ACKNOWLEDGEMENT

---

I am highly indebted to all the professors of Environmental Science Department of our Scottish Church College for their guidance and support. I am highly obliged to Dr. Jayeeta Choudhry, HOD of Physics, Scottish Church College for her constant guidance and supervision. I would also like to express my gratitude towards my batch mates for their help.

Date: July 5, 2021

Chiranjeeb Mahato



## POND ECOSYSTEM :

### Introduction :

The ecosystem is a basic unit in ecology, formed by the interaction of plants, animals and microorganisms forming biotic factors with their physical environment or the abiotic factors. A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms



that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 – 15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there. On the basis of water

depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

- I. Littoral
- II. limnetic
- III. pro-fundal

**I. Littoral zone** – It is the shallow water region which is usually occupied by rooted plants.

**II. Limnetic-zone-** ranges from the shallow to the depth of effective light penetration and associated organisms are small crustaceans, rotifers, insects, and their larvae and algae.

**III. Pro-fundal zone-** It is the deep-water parts where there is no effective light penetration. The associated organism are mussels, crab, worms etc. The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them. Two main components of pond ecosystems are as follows

I. Biotic component 2. Abiotic component

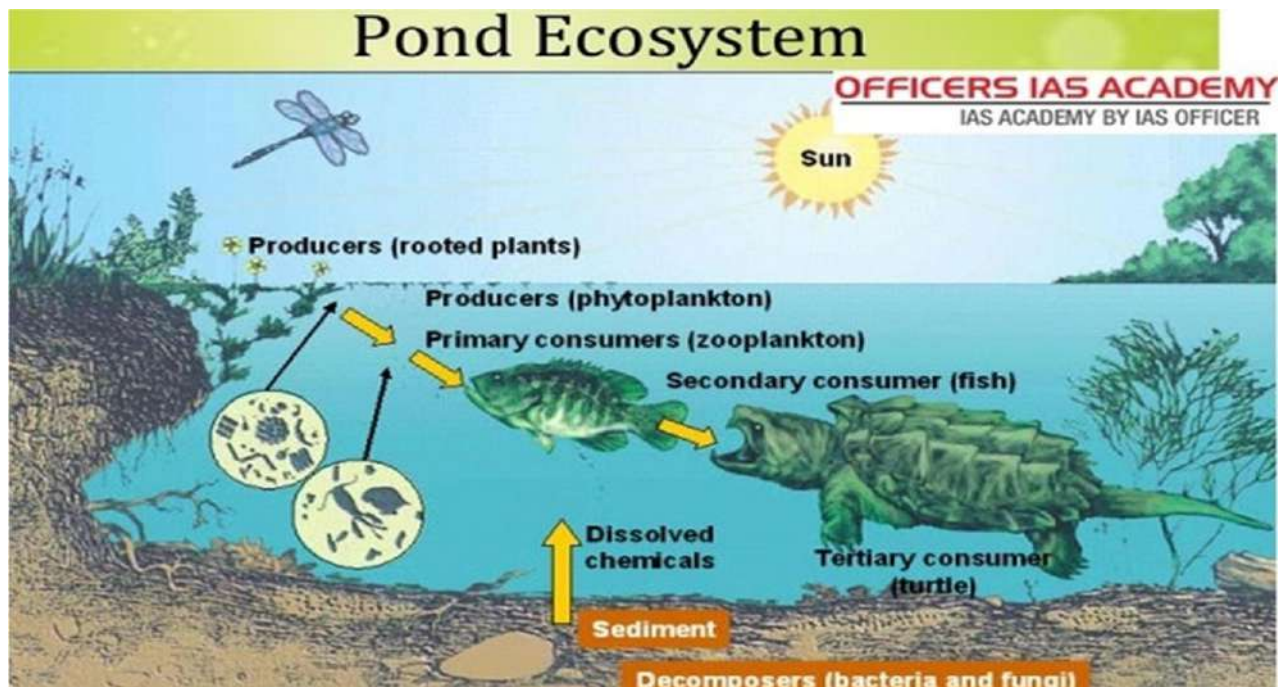
## **Biotic component**

---

### **Producers**

---

The main producers in pond or lake ecosystem are algae and other aquatic plants, such as Azolla, Hydrilla, Potamogeton, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Jussiaea, etc. These are either floating or suspended or rooted at the bottom. The green plants convert the radiant energy into chemical energy through photosynthesis. The chemical energy stored in the form of food is utilized by all the organisms. Oxygen evolved by producers in photosynthesis is utilized by all the living organisms in respiration.



## Consumers

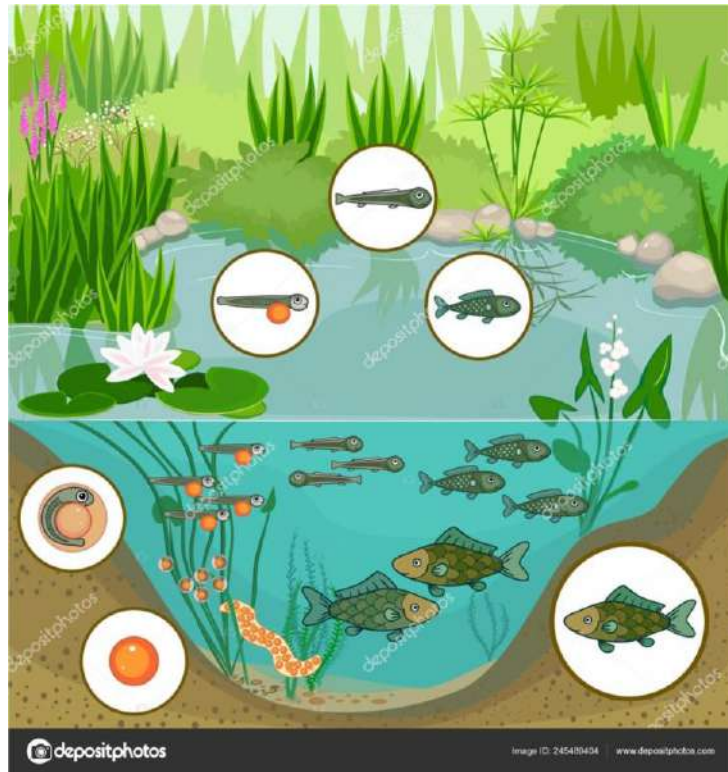
In a pond ecosystem, the primary consumers are tadpole larvae of frogs, fishes and other aquatic animals which consume green plants and algae as their food. These herbivorous aquatic animals are the food of secondary consumers. Frogs, big fishes, water snakes, crabs are secondary consumers. In the pond, besides the secondary consumers, there are consumers of highest order, such as water-birds, turtles, etc.

## Decomposers and Transformers

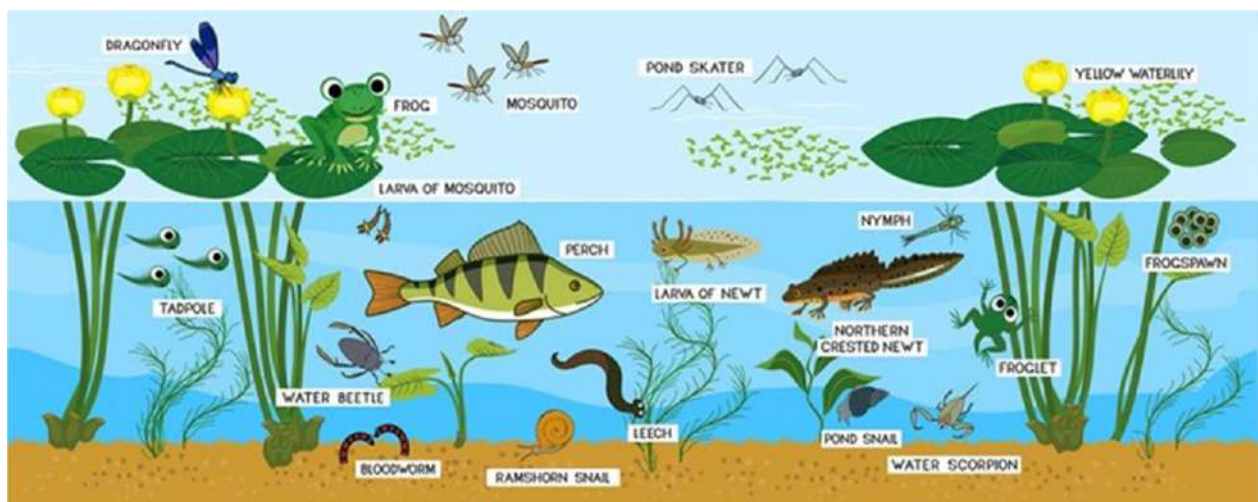
When aquatic plants and animals die, a large number of bacteria and fungi attack their dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers. Chemical elements liberated by decomposers are again utilized by green plants in their nutrition.

## Abiotic component

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. The plants need light for photosynthesis so they can produce oxygen not only above the



water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature. The change of seasons has an impact on the pond. In the winter time, because of the low temperatures, ice can form over top of the pond and block oxygen and sunlight from going into the water which puts the fish under stress; oxygen from the water can even disappear from in the water if it is too cold. Also, plants above the water will freeze and die. In the Summer, the temperature of the water can become too warm and again hold



shutterstock.com · 1941903688

less oxygen for the aquatic organisms. Too much sunlight can impact the pond because the algae is growing too fast therefore crowding space for the fish.

## **Importance of pond ecosystems :-**

---

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

### **1. Biodiversity :-**

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

### **2. Ubiquity :-**

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

**3. Abundance :-** Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

### **4. Source of hydration :-**

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

### **5. Beauty :-**

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond we can feel inspired, calm and in touch with nature.

## **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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions. Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems.

# **PROJECT REPORT**

---

## **SEMESTER II**

**COURSE : AECC 2 (ENVIRONMENTAL STUDIES)**

**STUDY OF ECOSYSTEMS**

**(POND)**

**COLLEGE ROLL NO :- PHSA20M607**

**CU REGISTRATION NO :- 223-1111-0410-20**

**CU ROLL NO :- 203223-21-0100**



# INDEX

---

<b>TOPIC</b>	<b>PAGE NO</b>
<b>ACKNOWLEDGEMENT</b>	<b>3</b>
<b>POND ECOSYSTEM</b>	
<b>A.INTRODUCTION</b>	<b>4</b>
<b>B.BIOTIC COMPONENT</b>	<b>5</b>
<b>C.ABIOTIC COMPONENT</b>	<b>6</b>
<b>D.IMPORTANCE OF POND ECOSYSTEM</b>	<b>9</b>
<b>CONCLUSION</b>	<b>10</b>

# ACKNOWLEDGEMENT

---

I am highly indebted to all the professors of Environmental Science Department of our Scottish Church College for their guidance and support. I am highly obliged to Dr. Jayeeta Choudhry, HOD of Physics, Scottish Church College for her constant guidance and supervision. I would also like to express my gratitude towards my batch mates for their help.

Date: July 5, 2021

Chiranjeeb Mahato

## POND ECOSYSTEM :

### Introduction :

The ecosystem is a basic unit in ecology, formed by the interaction of plants, animals and microorganisms forming biotic factors with their physical environment or the abiotic factors. A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms



that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 – 15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there. On the basis of water

depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

- I. Littoral
- II. limnetic
- III. pro-fundal

**I. Littoral zone** – It is the shallow water region which is usually occupied by rooted plants.

**II. Limnetic-zone-** ranges from the shallow to the depth of effective light penetration and associated organisms are small crustaceans, rotifers, insects, and their larvae and algae.

**III. Pro-fundal zone-** It is the deep-water parts where there is no effective light penetration. The associated organism are mussels, crab, worms etc. The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them. Two main components of pond ecosystems are as follows

I. Biotic component 2. Abiotic component

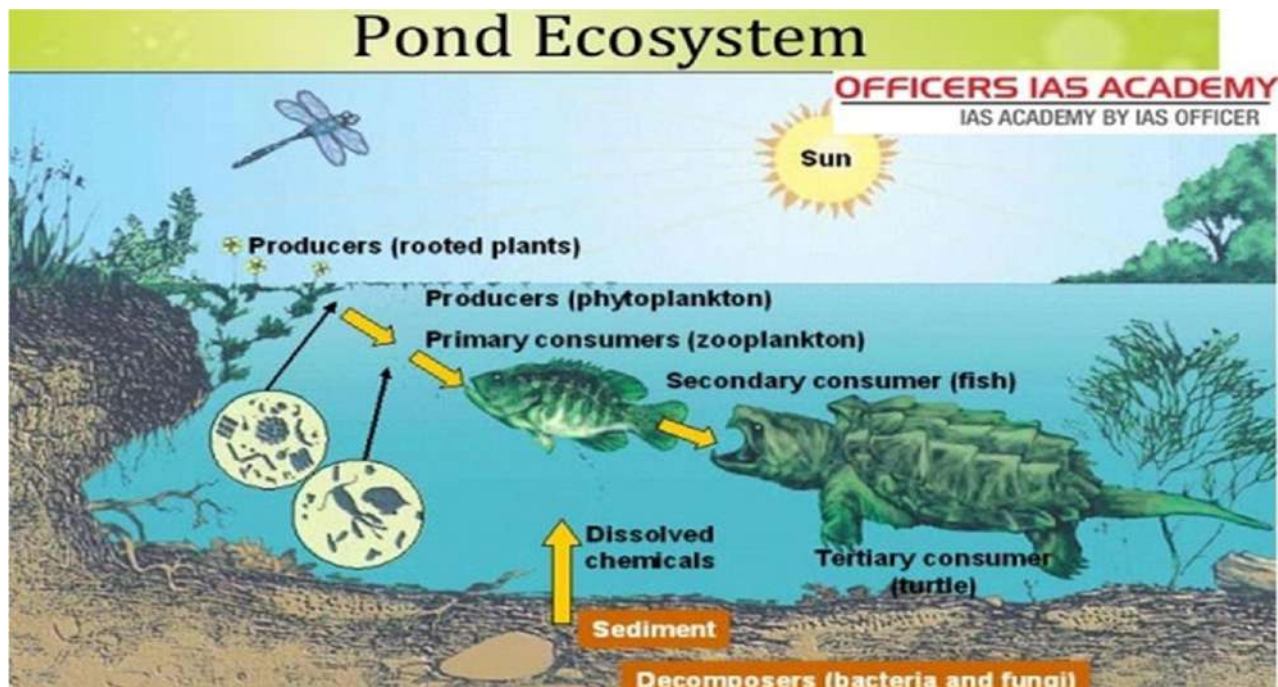
## **Biotic component**

---

### **Producers**

---

The main producers in pond or lake ecosystem are algae and other aquatic plants, such as Azolla, Hydrilla, Potamogeton, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Jussiaea, etc. These are either floating or suspended or rooted at the bottom. The green plants convert the radiant energy into chemical energy through photosynthesis. The chemical energy stored in the form of food is utilized by all the organisms. Oxygen evolved by producers in photosynthesis is utilized by all the living organisms in respiration.



## Consumers

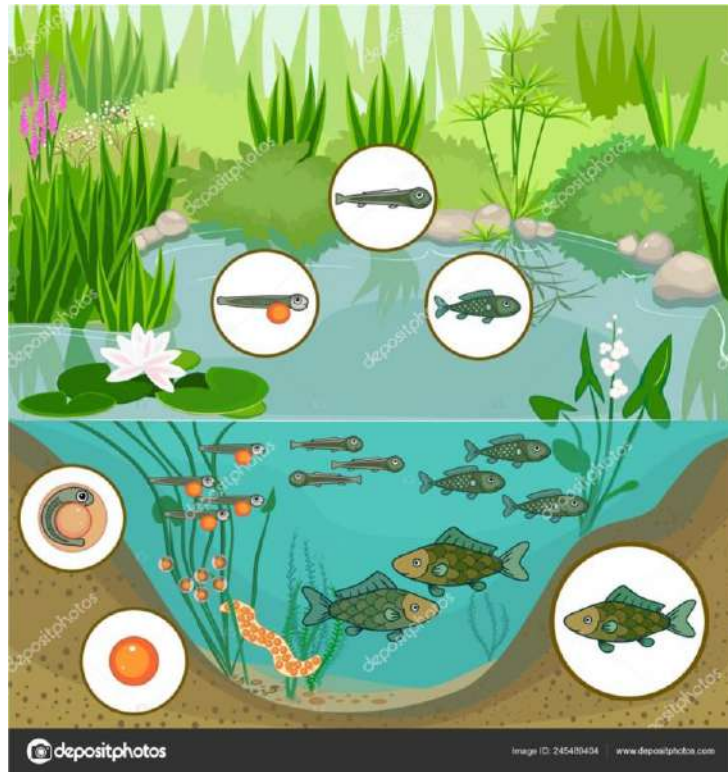
In a pond ecosystem, the primary consumers are tadpole larvae of frogs, fishes and other aquatic animals which consume green plants and algae as their food. These herbivorous aquatic animals are the food of secondary consumers. Frogs, big fishes, water snakes, crabs are secondary consumers. In the pond, besides the secondary consumers, there are consumers of highest order, such as water-birds, turtles, etc.

## Decomposers and Transformers

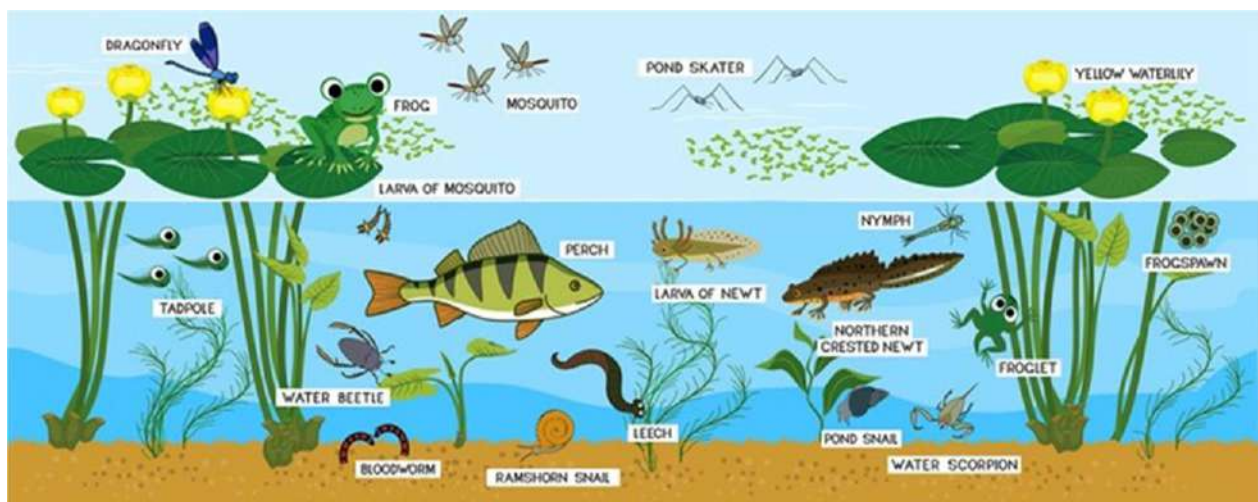
When aquatic plants and animals die, a large number of bacteria and fungi attack their dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers. Chemical elements liberated by decomposers are again utilized by green plants in their nutrition.

## Abiotic component

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. The plants need light for photosynthesis so they can produce oxygen not only above the



water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature. The change of seasons has an impact on the pond. In the winter time, because of the low temperatures, ice can form over top of the pond and block oxygen and sunlight from going into the water which puts the fish under stress; oxygen from the water can even disappear from in the water if it is too cold. Also, plants above the water will freeze and die. In the Summer, the temperature of the water can become too warm and again hold



shutterstock.com · 1941903688

less oxygen for the aquatic organisms. Too much sunlight can impact the pond because the algae is growing too fast therefore crowding space for the fish.

## **Importance of pond ecosystems :-**

---

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

### **1. Biodiversity :-**

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

### **2. Ubiquity :-**

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

**3. Abundance :-** Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

### **4. Source of hydration :-**

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

### **5. Beauty :-**

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond we can feel inspired, calm and in touch with nature.



## **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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions. Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems.

# **PROJECT REPORT**

Checked  
24 out of  
30

**SEMESTER – II**

**COURSE :- AECC2(ENVIRONMENTAL SCIENCE)**

**TOPIC:- STUDY OF ECOSYSTEM-POND**

**COLLEGE ROLL NO.:- PHSA20M609**

**CU ROLL NO.:- 2032-2321-0106**

**CU REGISTRATION NO.:- 223-1111-0419-20**

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to our respected Environmental Science(ENVS) teachers, for giving me this wonderful opportunity to do a case study on Pond Ecosystem. They provided me continuous support, guidance and encouragement throughout the project. Without those motivation, help and guidance, the successful completion of this project work would not be possible.

Secondly I would like to express my humble gratitude towards our respected Principal Dr. MadhuManjari Mondal and our entire college for giving me the support and providing the environment needed to complete this project work during this pandemic time.

And Lastly, I would like to give thanks to my dear friends who helped me a lot in finalizing this project within the limited time span.

**Principal's Signature**

**Teacher's Signature**

# CONTENT

1. Definitions of Pond in Literature
2. The ecosystem
  - Littoral
  - limnetic
  - pro-fundall.
  - *Biotic component*
  - *Abiotic component*
3. Ponds as instruments for water security
4. Ponds as Structures for Carbon Sequestration
5. Monitoring of pond water bodies in India
  - Studies conducted on some pond water bodies in India
6. Conclusion
7. bibliography

### Definitions of Pond in Literature

The word 'pond' has its origin from the word 'pound' which means a confining enclosure. This denotes that water is enclosed in a pond. There are many definitions of ponds based on criteria such as presence of wave action, occurrence of rooted macrophytes, or light penetration. However, none of these are satisfactory in the context of its reliability and ease of measurement. Biggs *et al.* describe ponds as water bodies with an area between 1 square metre and 2 hectares (20,000 square metres), which may be seasonal or permanent, including both natural and man-made water bodies. Dubey in a published literature entitled "*the biodiversity of the ponds*" explains many existing criteria to describe ponds — for examples, International Ramsar Wetlands Convention sets 8 hectares as the upper limit of the water body to classify as a pond; some regions of the United States classify pond as a surface water body having surface area less than 10 acres ( $\approx 40,000$  square metres); and many European Biologists adopt upper limit of pond as 5 hectares. Thus, there exists no universal agreement on the definition of the term pond. In simplest terms, ponds can be defined as a body of standing surface water either natural or man-made (artificial) which is quite smaller than a lake.

## The ecosystem

It is a basic unit in ecology, formed by the interaction of plants, animals and microorganisms forming biotic factors with their physical environment or the abiotic factors.

A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 –15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there.

On the basis of water depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

### **I.Littoral**

### **II.limnetic**

### **III.pro-fundall.**

**Littoral zone** –It is the shallow water region which is usually occupied by rooted plants.

**II.Limnetic-zone**-ranges from the shallow to the depth of effective light penetration and associated organisms are small crustaceans, rotifers, insects, and their larvae and algae.

**III.Pro-fundal zone**-It is the deep-water parts where there is no effective light penetration. The associated organisms are mussels, crab, worms etc.

The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them.

Two main components of pond ecosystems are as follows-

- I. **Biotic component**
- II. **Abiotic component**

### **Producers**

The main producers in pond or lake ecosystem are algae and other aquatic plants, such as Azolla, Hydrilla, Potamogeton, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Jussiaea, etc. These are either floating or suspended or rooted at the bottom. The green plants convert the radiant energy into chemical energy through photosynthesis. The chemical energy stored in the form of food is utilized by all the organisms. Oxygen evolved by producers in photosynthesis is utilized by all the living organisms in respiration.

### **Consumers**

In a pond ecosystem, the primary consumers are tadpole larvae of frogs, fishes and other aquatic animals which consume green plants and algae as their food. These herbivorous aquatic animals are the food of secondary consumers. Frogs, big fishes, water snakes, crabs are secondary consumers. In the pond, besides the secondary consumers, there are consumers of highest order, such as water-birds, turtles, etc.

### **Decomposers and Transformers**

When aquatic plants and animals die, a large number of bacteria and fungi attack their dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers. Chemical elements liberated by decomposers are again utilized by green plants in their nutrition.

### **Abiotic component**

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the

pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive. Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature. The change of seasons has an impact on the pond. Spring and Fall are the seasons that keep the ecosystem healthy and the risk of negative effects on the organisms that inhabit the environment very low. This is because the temperature and climate are not extreme enough to have a great impact on the oxygen and nutrient level. It can be evenly distributed between the different water levels. In the winter time, because of the low temperatures, ice can form over top of the pond and block oxygen and sunlight from going into the water which puts the fish under stress; oxygen from the water can even disappear from the water if it is too cold. Also, plants above the water will freeze and die. In the Summer, the temperature of the water can become too warm and again hold less oxygen for the aquatic organisms. Too much sunlight can impact the pond because the algae is growing too fast therefore crowding space for the fish.

### **Ponds as instruments for water security**

Ponds are a major asset which provides enormous opportunities in water security sector. Climate change is likely to amplify rainfall variability in many places, even in those places where the total amount of rainfall increases. Even high rainfall



areas encounter water scarcity problems during non-rainy months. The change in rainfall pattern will affect all important water sources. For example, increase in variability in recharge of groundwater. To deal with this variability, water storage, even on relatively small volume scales, provides a suitable mechanism to strengthen water security, agricultural production, other economic growth and adaptive capacity. To safeguard livelihoods and to reduce poverty level, especially in rural areas, water storage can make substantial contribution. During dry periods small volumes of stored water can safeguard domestic supplies and provide support to crops and/or livestock. Ponds are one of the possible water storage options. They store relatively small volumes of water but are often vitally important. Interventions employing small scale water storage options, with proper planning, can contribute significantly to both food security and rise in economic prosperity of the community at the local level. Protection and creation of ponds should be a part of the important policy decisions for the management of the agricultural landscapes. These small water resources are being increasingly appreciated as a significant contributor to the development of local communities, especially lower income households, even in urban and peri-urban areas. Because ponds are special components of urban water resources, their proper sustainable management is absolutely necessary. Construction of strategically located pond networks can significantly reduce water loss by capturing water of a heavy rainfall event before they become a problem. They are essential receptors for harvesting rainwater and in maintaining groundwater levels.

### **Ponds as Structures for Carbon Sequestration**

Ponds provide sustainable solutions to problems such as climate change and management of scarce water resources. Ponds have a significant role in the global carbon balance and amelioration of climate change. Small water bodies can have an immense carbon processing intensity. These water bodies may be more heterotrophic than large ecosystems, processing considerable quantities of terrestrial or external carbon. Ponds tend to have low oxygen concentrations than

large water bodies, which enhance their carbon sequestration capacity. Ponds and small lakes cover around one third of the area of continental waters which, in biosphere, may be the most important sites for organic carbon sequestration. Sediment organic carbon burial in small water bodies is more than large aquatic systems. For example, the earth's farm ponds, because of their huge numbers, alone seem to sequester more organic carbon each year than what is done by the oceans and 33% as much as the earth's river systems deliver to the sea. A single pond with an area of 500 square metres can sequester yearly around 1000 kg of carbon which is equivalent to the amount a car produces during the same time period. Collectively ponds have more surface area than large lakes and they also store more carbon than the latter.

### **Monitoring of pond water bodies in India**

The quality of an aquatic ecosystem depends on its physicochemical qualities as well as biological diversity. Different studies on ponds in India have been taken with the underlying concept that the physicochemical qualities of pond water directly impact pond aquatic ecosystem as a whole. In Indian scenario, the monitoring of pond ecosystems is meagre. The reports available in scientific literature and print and electronic media are discussed henceforth.

Under the National Water Quality Monitoring Programme, the CPCB (Central Pollution Control Board) conducts monitoring of some ponds spread across 11 states and the union territories (UTs). The number of pond water quality monitoring stations (monitoring network) is 60. The number of monitoring stations present in selected 11 states and UTs is provided in Figure 2. Most of the sampling stations (60%) are located in the North-Eastern part of India (States of Assam and Manipur) followed by the Eastern India (States of Bihar, Jharkhand and Odisha) at 15%. The Southern India (Andhra Pradesh, Kerala and Lakshadweep), Northern India (Uttar Pradesh and Delhi) and Western India (only Gujarat) have around 13%, 8%, and 3% of the sampling stations respectively (Figures 3 and 4). The study conducted by the CPCB in the duration 2010-2011 displayed that the BOD (Biochemical Oxygen Demand) data of most of the states recorded significantly high or extremely high number of observations violating the environmental norms (Table 1). For example, 45% of observations with respect to DO (Dissolved Oxygen) and 100% of observation with respect to BOD violated desired levels in

Andhra Pradesh. Some specific cases of BOD values in pond water ecosystems include: Elangabeel system pond (Assam) = 44 mg/l; Laxmi pond (Uttar Pradesh) = 33 mg/l; Swetaganga pond (Odisha) = 21 mg/l; Bindusagar pond (Odisha) = 18 mg/l; and Olpad pond (Gujarat) = 11 mg/l.

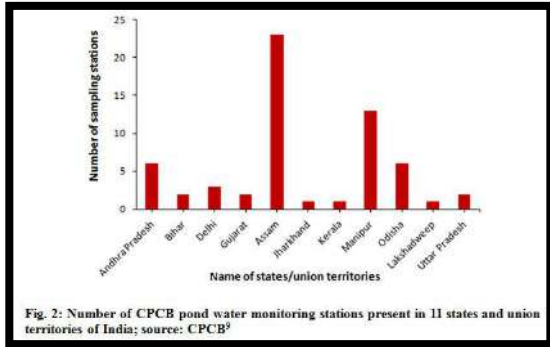


Fig. 2: Number of CPCB pond water monitoring stations present in 11 states and union territories of India; source: CPCB<sup>9</sup>

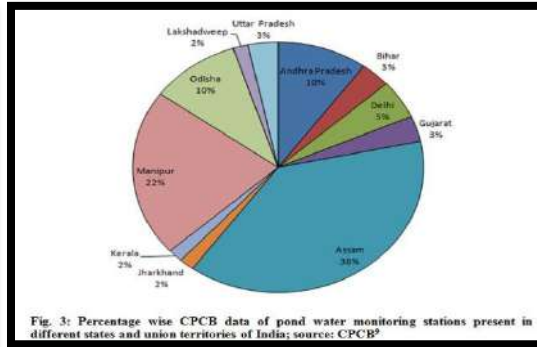


Fig. 3: Percentage wise CPCB data of pond water monitoring stations present in different states and union territories of India; source: CPCB<sup>9</sup>

State	% observations violating desirable limits	
	DO	BOD
Andhra Pradesh	45	100
Assam	10	80
Bihar	0	50
Gujarat	13	25
Kerala	0	58
Odisha	0	83
Uttar Pradesh	25	50

Investigations conducted by the independent researchers on pond water ecosystems are also available. Some of the investigations conducted on pond ecosystems are displayed in Table 2. The Indian studies have predominantly focused on physicochemical investigations and hydrobiological inventories, though researches on other areas also exist. For the convenience we have categorised the studies into 5 areas (Figure 5), namely, ‘only physicochemical

studies', 'only hydrobiological studies', 'combined physicochemical and hydrobiological studies', 'habitat loss and biological impact studies', and 'microbiological studies (for cholera epidemic)'. Where studies on physicochemical parameters, hydrobiological inventories and microbiological diseases were found together, the microbiological parameters were taken as separate studies to calculate the percentage of different types of pond environment investigations. It is noted that most of the studies have concentrated on 'only physicochemical studies' of pond water qualities (60%) followed by 'combined physicochemical and hydrobiological studies' (20%). The 'microbiological studies (for cholera epidemic)' comprise 10% of investigations while 'only hydrobiological studies' and 'habitat loss and biological impact studies' occupy 5% share each (Figure 5).

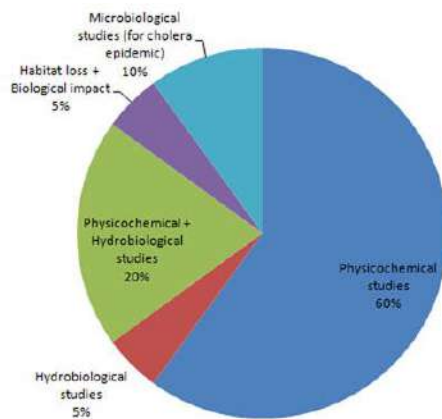


Fig. 5: Different categories of the pond environment investigations taken up by the Indian researchers (in %)

**Table 2: Studies conducted on some pond water bodies in India**

<b>Study area/Name of ponds</b>	<b>Publication year</b>	<b>Authors*</b>
Airongmara; Barak Valley, Assam	2007	Bhuiyan and Gupta
Ayodhya-Faizabad region, Uttar Pradesh	2007	Chaurasia and Pandey
Vadodara, Gujarat	2008	Soni and Bhatt
Bilaspur, Chhattisgarh	2008	Shrivastava <i>et al.</i>
Bhadra project, Karnataka	2010	Kiran
Villages located in southern part of West Bengal State	2011	Mukherjee <i>et al.</i>
Badrinath, Uttarakhand	2012	Kumar <i>et al.</i>
Khajod temple, Surat, Gujarat	2012	Ekhalkar <i>et al.</i>
Pallipuram, Kerala	2012	Dhanya <i>et al.</i>
Bhilwara, Rajasthan	2013	Tripathi and Chishty
Urban Vadodara, Gujarat	2013	Taylor and Mankodi
Tapti ponds, Madhya Pradesh	2013	Gajanand <i>et al.</i>
Santiniketan-Bolpur-Sriniketan zone, West Bengal	2013	Manoj <i>et al.</i>
Chidambaram, Tamil Nadu	2014	Elayaraj and Selvraju
Khandwa, Madhya Pradesh	2014	Mahajan and Billore
Varanasi city, Uttar Pradesh	2014	Mishra <i>et al.</i>
Santiniketan area, West Bengal	2014	Nag and Gupta
Erode city, Tamil Nadu	2014	Parithabhanu <i>et al.</i>
Samastipur, Bihar	2014	Sinha <i>et al.</i>

## **CONCLUSION**

It was a wonderful and learning experience for me while working on this project. This project took me through the various phases of project development and gave me real knowledge about The Ecology and It's Ecosystem. The joy of work and the thrill involved while tackling the various problems and challenge gave me a feel of the competitive world in which we all are present.

I enjoyed each and every bit of work that I had done and put into this project.

## **BIBLIOGRAPHY**

Help from the following websites and books have been taken for the completion of this project.-

- Environmental Studies under CBCS by N.Arumugam and V.Kumaresan.
- [www.wikipedia.org](http://www.wikipedia.org)
- <http://www.cwejournal.org>
- <http://rcscollegemanjhaul.org>

# **PROJECT REPORT**

**SEMESTER – II**

**COURSE :- AECC2(ENVIRONMENTAL SCIENCE)**

**TOPIC:- STUDY OF ECOSYSTEM-POND**

**COLLEGE ROLL NO.:- PHSA20M609**

**CU ROLL NO.:- 2032-2321-0106**

**CU REGISTRATION NO.:- 223-1111-0419-20**

## **ACKNOWLEDGEMENT**

I would like to express my sincere gratitude to our respected Environmental Science(ENVS) teachers, for giving me this wonderful opportunity to do a case study on Pond Ecosystem. They provided me continuous support, guidance and encouragement throughout the project. Without those motivation, help and guidance, the successful completion of this project work would not be possible.

Secondly I would like to express my humble gratitude towards our respected Principal Dr. MadhuManjari Mondal and our entire college for giving me the support and providing the environment needed to complete this project work during this pandemic time.

And Lastly, I would like to give thanks to my dear friends who helped me a lot in finalizing this project within the limited time span.

**Principal's Signature**

**Teacher's Signature**



# CONTENT

1. Definitions of Pond in Literature
2. The ecosystem
  - Littoral
  - limnetic
  - pro-fundall.
  - *Biotic component*
  - *Abiotic component*
3. Ponds as instruments for water security
4. Ponds as Structures for Carbon Sequestration
5. Monitoring of pond water bodies in India
  - Studies conducted on some pond water bodies in India
6. Conclusion
7. bibliography

### Definitions of Pond in Literature

The word 'pond' has its origin from the word 'pound' which means a confining enclosure. This denotes that water is enclosed in a pond. There are many definitions of ponds based on criteria such as presence of wave action, occurrence of rooted macrophytes, or light penetration. However, none of these are satisfactory in the context of its reliability and ease of measurement. Biggs *et al.* describe ponds as water bodies with an area between 1 square metre and 2 hectares (20,000 square metres), which may be seasonal or permanent, including both natural and man-made water bodies. Dubey in a published literature entitled "*the biodiversity of the ponds*" explains many existing criteria to describe ponds — for examples, International Ramsar Wetlands Convention sets 8 hectares as the upper limit of the water body to classify as a pond; some regions of the United States classify pond as a surface water body having surface area less than 10 acres ( $\approx 40,000$  square metres); and many European Biologists adopt upper limit of pond as 5 hectares. Thus, there exists no universal agreement on the definition of the term pond. In simplest terms, ponds can be defined as a body of standing surface water either natural or man-made (artificial) which is quite smaller than a lake.

## The ecosystem

It is a basic unit in ecology, formed by the interaction of plants, animals and microorganisms forming biotic factors with their physical environment or the abiotic factors.

A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 –15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there.

On the basis of water depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

### **I.Littoral**

### **II.limnetic**

### **III.pro-fundall.**

**Littoral zone** –It is the shallow water region which is usually occupied by rooted plants.

**II.Limnetic-zone**-ranges from the shallow to the depth of effective light penetration and associated organisms are small crustaceans, rotifers, insects, and their larvae and algae.

**III.Pro-fundal zone**-It is the deep-water parts where there is no effective light penetration. The associated organisms are mussels, crab, worms etc.

The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them.

Two main components of pond ecosystems are as follows-

- I. **Biotic component**
- II. **Abiotic component**

### **Producers**

The main producers in pond or lake ecosystem are algae and other aquatic plants, such as Azolla, Hydrilla, Potamogeton, Pistia, Wolffia, Lemna, Eichhornia, Nymphaea, Jussiaea, etc. These are either floating or suspended or rooted at the bottom. The green plants convert the radiant energy into chemical energy through photosynthesis. The chemical energy stored in the form of food is utilized by all the organisms. Oxygen evolved by producers in photosynthesis is utilized by all the living organisms in respiration.

### **Consumers**

In a pond ecosystem, the primary consumers are tadpole larvae of frogs, fishes and other aquatic animals which consume green plants and algae as their food. These herbivorous aquatic animals are the food of secondary consumers. Frogs, big fishes, water snakes, crabs are secondary consumers. In the pond, besides the secondary consumers, there are consumers of highest order, such as water-birds, turtles, etc.

### **Decomposers and Transformers**

When aquatic plants and animals die, a large number of bacteria and fungi attack their dead bodies and convert the complex organic substances into simpler inorganic compounds and elements. These micro-organisms are called decomposers. Chemical elements liberated by decomposers are again utilized by green plants in their nutrition.

### **Abiotic component**

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the

pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive. Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature. The change of seasons has an impact on the pond. Spring and Fall are the seasons that keep the ecosystem healthy and the risk of negative effects on the organisms that inhabit the environment very low. This is because the temperature and climate are not extreme enough to have a great impact on the oxygen and nutrient level. It can be evenly distributed between the different water levels. In the winter time, because of the low temperatures, ice can form over top of the pond and block oxygen and sunlight from going into the water which puts the fish under stress; oxygen from the water can even disappear from the water if it is too cold. Also, plants above the water will freeze and die. In the Summer, the temperature of the water can become too warm and again hold less oxygen for the aquatic organisms. Too much sunlight can impact the pond because the algae is growing too fast therefore crowding space for the fish.

### **Ponds as instruments for water security**

Ponds are a major asset which provides enormous opportunities in water security sector. Climate change is likely to amplify rainfall variability in many places, even in those places where the total amount of rainfall increases. Even high rainfall

areas encounter water scarcity problems during non-rainy months. The change in rainfall pattern will affect all important water sources. For example, increase in variability in recharge of groundwater. To deal with this variability, water storage, even on relatively small volume scales, provides a suitable mechanism to strengthen water security, agricultural production, other economic growth and adaptive capacity. To safeguard livelihoods and to reduce poverty level, especially in rural areas, water storage can make substantial contribution. During dry periods small volumes of stored water can safeguard domestic supplies and provide support to crops and/or livestock. Ponds are one of the possible water storage options. They store relatively small volumes of water but are often vitally important. Interventions employing small scale water storage options, with proper planning, can contribute significantly to both food security and rise in economic prosperity of the community at the local level. Protection and creation of ponds should be a part of the important policy decisions for the management of the agricultural landscapes. These small water resources are being increasingly appreciated as a significant contributor to the development of local communities, especially lower income households, even in urban and peri-urban areas. Because ponds are special components of urban water resources, their proper sustainable management is absolutely necessary. Construction of strategically located pond networks can significantly reduce water loss by capturing water of a heavy rainfall event before they become a problem. They are essential receptors for harvesting rainwater and in maintaining groundwater levels.

### **Ponds as Structures for Carbon Sequestration**

Ponds provide sustainable solutions to problems such as climate change and management of scarce water resources. Ponds have a significant role in the global carbon balance and amelioration of climate change. Small water bodies can have an immense carbon processing intensity. These water bodies may be more heterotrophic than large ecosystems, processing considerable quantities of terrestrial or external carbon. Ponds tend to have low oxygen concentrations than

large water bodies, which enhance their carbon sequestration capacity. Ponds and small lakes cover around one third of the area of continental waters which, in biosphere, may be the most important sites for organic carbon sequestration. Sediment organic carbon burial in small water bodies is more than large aquatic systems. For example, the earth's farm ponds, because of their huge numbers, alone seem to sequester more organic carbon each year than what is done by the oceans and 33% as much as the earth's river systems deliver to the sea. A single pond with an area of 500 square metres can sequester yearly around 1000 kg of carbon which is equivalent to the amount a car produces during the same time period. Collectively ponds have more surface area than large lakes and they also store more carbon than the latter.

### **Monitoring of pond water bodies in India**

The quality of an aquatic ecosystem depends on its physicochemical qualities as well as biological diversity. Different studies on ponds in India have been taken with the underlying concept that the physicochemical qualities of pond water directly impact pond aquatic ecosystem as a whole. In Indian scenario, the monitoring of pond ecosystems is meagre. The reports available in scientific literature and print and electronic media are discussed henceforth.

Under the National Water Quality Monitoring Programme, the CPCB (Central Pollution Control Board) conducts monitoring of some ponds spread across 11 states and the union territories (UTs). The number of pond water quality monitoring stations (monitoring network) is 60. The number of monitoring stations present in selected 11 states and UTs is provided in Figure 2. Most of the sampling stations (60%) are located in the North-Eastern part of India (States of Assam and Manipur) followed by the Eastern India (States of Bihar, Jharkhand and Odisha) at 15%. The Southern India (Andhra Pradesh, Kerala and Lakshadweep), Northern India (Uttar Pradesh and Delhi) and Western India (only Gujarat) have around 13%, 8%, and 3% of the sampling stations respectively (Figures 3 and 4). The study conducted by the CPCB in the duration 2010-2011 displayed that the BOD (Biochemical Oxygen Demand) data of most of the states recorded significantly high or extremely high number of observations violating the environmental norms (Table 1). For example, 45% of observations with respect to DO (Dissolved Oxygen) and 100% of observation with respect to BOD violated desired levels in

Andhra Pradesh. Some specific cases of BOD values in pond water ecosystems include: Elangabeel system pond (Assam) = 44 mg/l; Laxmi pond (Uttar Pradesh) = 33 mg/l; Swetaganga pond (Odisha) = 21 mg/l; Bindusagar pond (Odisha) = 18 mg/l; and Olpad pond (Gujarat) = 11 mg/l.

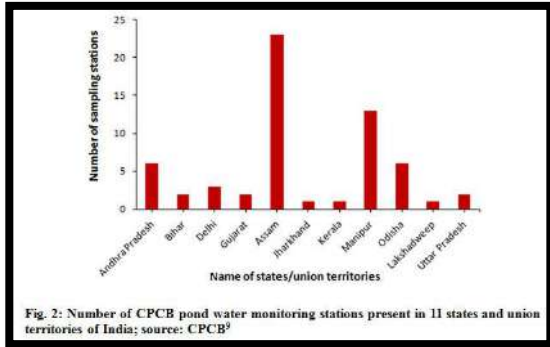


Fig. 2: Number of CPCB pond water monitoring stations present in 11 states and union territories of India; source: CPCB<sup>9</sup>

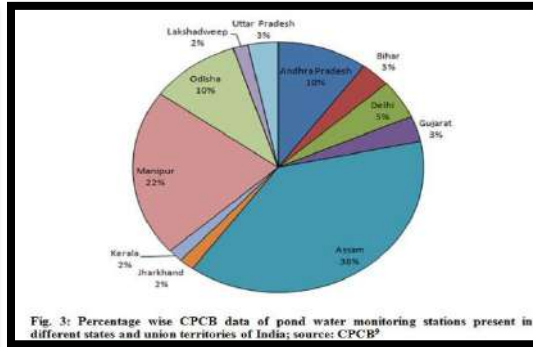


Fig. 3: Percentage wise CPCB data of pond water monitoring stations present in different states and union territories of India; source: CPCB<sup>9</sup>

State	% observations violating desirable limits	
	DO	BOD
Andhra Pradesh	45	100
Assam	10	80
Bihar	0	50
Gujarat	13	25
Kerala	0	58
Odisha	0	83
Uttar Pradesh	25	50

Investigations conducted by the independent researchers on pond water ecosystems are also available. Some of the investigations conducted on pond ecosystems are displayed in Table 2. The Indian studies have predominantly focused on physicochemical investigations and hydrobiological inventories, though researches on other areas also exist. For the convenience we have categorised the studies into 5 areas (Figure 5), namely, 'only physicochemical



studies', 'only hydrobiological studies', 'combined physicochemical and hydrobiological studies', 'habitat loss and biological impact studies', and 'microbiological studies (for cholera epidemic)'. Where studies on physicochemical parameters, hydrobiological inventories and microbiological diseases were found together, the microbiological parameters were taken as separate studies to calculate the percentage of different types of pond environment investigations. It is noted that most of the studies have concentrated on 'only physicochemical studies' of pond water qualities (60%) followed by 'combined physicochemical and hydrobiological studies' (20%). The 'microbiological studies (for cholera epidemic)' comprise 10% of investigations while 'only hydrobiological studies' and 'habitat loss and biological impact studies' occupy 5% share each (Figure 5).

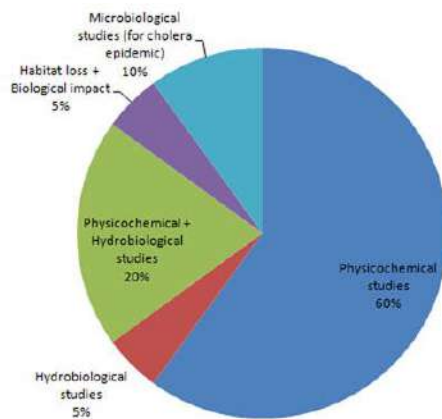


Fig. 5: Different categories of the pond environment investigations taken up by the Indian researchers (in %)

**Table 2: Studies conducted on some pond water bodies in India**

<b>Study area/Name of ponds</b>	<b>Publication year</b>	<b>Authors*</b>
Airongmara; Barak Valley, Assam	2007	Bhuiyan and Gupta
Ayodhya-Faizabad region, Uttar Pradesh	2007	Chaurasia and Pandey
Vadodara, Gujarat	2008	Soni and Bhatt
Bilaspur, Chhattisgarh	2008	Shrivastava <i>et al.</i>
Bhadra project, Karnataka	2010	Kiran
Villages located in southern part of West Bengal State	2011	Mukherjee <i>et al.</i>
Badrinath, Uttarakhand	2012	Kumar <i>et al.</i>
Khajod temple, Surat, Gujarat	2012	Ekhalkar <i>et al.</i>
Pallipuram, Kerala	2012	Dhanya <i>et al.</i>
Bhilwara, Rajasthan	2013	Tripathi and Chishty
Urban Vadodara, Gujarat	2013	Tailor and Mankodi
Tapti ponds, Madhya Pradesh	2013	Gajanand <i>et al.</i>
Santiniketan-Bolpur-Sriniketan zone, West Bengal	2013	Manoj <i>et al.</i>
Chidambaram, Tamil Nadu	2014	Elayaraj and Selvraju
Khandwa, Madhya Pradesh	2014	Mahajan and Billore
Varanasi city, Uttar Pradesh	2014	Mishra <i>et al.</i>
Santiniketan area, West Bengal	2014	Nag and Gupta
Erode city, Tamil Nadu	2014	Parithabhanu <i>et al.</i>
Samastipur, Bihar	2014	Sinha <i>et al.</i>

## **CONCLUSION**

It was a wonderful and learning experience for me while working on this project. This project took me through the various phases of project development and gave me real knowledge about The Ecology and It's Ecosystem. The joy of work and the thrill involved while tackling the various problems and challenge gave me a feel of the competitive world in which we all are present.

I enjoyed each and every bit of work that I had done and put into this project.

## **BIBLIOGRAPHY**

Help from the following websites and books have been taken for the completion of this project.-

- Environmental Studies under CBCS by N.Arumugam and V.Kumaresan.
- [www.wikipedia.org](http://www.wikipedia.org)
- <http://www.cwejournal.org>
- <http://rcscollegemanjhaul.org>

**SEMESTER II**  
**COURSE: AECC2 (Environmental Studies)**

Checked  
23 out of  
30

**Project Title: Vi** **polluted side**



**College Roll No. : PHSA20M612**  
**CU Registration No. : 223-1111-0422-20**  
**CU Roll No : 203223-21-0109**

## Nepal??

**Introduction: Pollution can be defined as the undesirable in natural system. It may also define as the unwanted change in the characteristic of air, water, soil and other environmental factors. Pollution adversely affects the health, survival or other activities of human and other animals. It is the main problem at present at both at local level as well as at a global level. In Nepal, the pollution is growing concern. But there are only limited studies done so far to quantify the level of pollution. Thus the availability of data is very poor. The monitoring activities are virtually insignificant. However, with the movement of industrialization and urbanization the pollution situation has become quite visible in some industrial localities and major urban centers.**

**Pollutants, the component of pollutions, can be either foreign substances/energies or naturally occurring contaminants. Pollutions include soil, liquid or gaseous substances present in greater than natural abundance produced due to human activity, which have detrimental effect on your environment. Pollution can effect: air, water, soil and biodiversity that direct effect the plant and animal life.**

*There are various types of pollution. Some are listed below.*

- **Water Pollution:** It is defined as the contamination of water by human substances which are detrimental to living beings. Industrial water, household garages, non-decomposable materials from school, chemicals from agriculture activities are major cause to pollute water bodies. The effects of water pollution include decreasing the quantity of drinkable water available, lowering water supplies for crop irrigation and impacting fish and wildlife populations that require water of certain purity for survival.
- **Land Pollution:** Soil and land pollution is contamination of the soil that prevents natural growth and balance in the land. Many micro and macro flora and furma are affected by land pollution. Soil concentration can lead to poor growth and reduced crop yields, lose of wildlife.

- **Noise Pollution:** It refers to undesirable levels of noises caused by human activity. It causes mental stress, depression, damage to the ear.

### **Objectives:**

- To identify the major reason, type of pollution visit near area.
- To identify the adverse effect of pollution in the vicinity.
- To study the present situation of environment.
- To study the visible effect of environment.
- To study the direct and indirect causes of pollution.
- To suggest control measures of minimize pollution.

### **Methodology:**

Firstly, we visited around polluted Dande river site and small waterweed in front of the paklihawa campus. Further analysis was done in following two methods.

**A.Primary Method:** The polluted site was properly observed and information gathered up.

**B.Secondary Method:** Different literally books and journals related to pollution were consulted. Internet sites were also cited and desk study was done for obtaining different information about the different place.

**Observation in polluted site:**

Most people around the river are unaware and illiterate. They are unknown about waste management practices. So they don't care about biodegradable and non-biodegradable substances.



**{Pic: Polluted Dande River}**



**During our visit we saw river was dumping location. We observed the following materials or pollutants on the river bank.**

- 1. Wastes from UCMS Hospital*
- 2. Plastic bags*
- 3. Plastic bottles*
- 4. Waste food materials*
- 5. Damaged domestic waves*
- 6. Dead bodies of animals*
- 7. Plant materials*
- 8. Surface run off from agricultural land*
- 9. Fuel materials from vehicles.*



*{Pic:High algal growth at polluted river}*

*The main factors that the result of pollution found*

- a) Irrigation water for cultivating water crops.**
- b) Different animals wallow in the river.**
- c) Swimming in the river.**

- d) Surface run off from agricultural land.**
- e) Cremation of people in the river bank.**
- f) Random fishing and over fishing by using poisons.**
- g) Eutrophication.**
- h) Lack of awareness and activities among local people.**

### *Consequences:*

- **The river is being polluted due to different human activities which are not eco friendly. The heap of pollutants in the river looked as it is dumping site not a river.**
- **It has totally damaged the beauty of river. Very bad smell could be easily felt while walking by the water sources.**
- **The water has become impure and unusable for human and animals.**
- **Water quality seemed to be totally degraded and when it is use for domestic purposes.**
- **It may cause water related illness such as typhoid, cholera etc.**
- **Due to foul smell of river and other pollutions the recreational value of river has decreased.**

## **Remedial Measures:**

**Here are some measures to suggest reducing the problem faced due to Dande river water pollution:**

- A. The major cause of pollution is human behavior. It should be changed.**
- B. Proper selection and management of dumping sites**
- C. Use of bio-degradable substances as compost manures.**
- D. Application of '3-R' principle; Recycle, Reduce, Reuse.**
- E. Management of dustbins by household itself and municipality in servable places.**
- F. Cremation by the side of the river should be prohibited.**
- G. Planting ground cover and stabilizing erosion prone areas.**
- H. Cleaning campaign must be launched from local level.**
- I. Strict implementation of "polluters pay" principle.**
- J. Solid wastes must be reduced and recycle.**
- K. Public awareness against water pollution must be raised.**

- L.** Proper dumping site must be established for non-bio degradable wastes.
- M.** Various NGOs, INGOs should conduct community programme.
- N.** Use of decomposable materials and discard using of non renewable materials.
- O.** Emphasis on using renewable solid materials and proper utilization with reuse must be done.

### **Summary and Conclusion:**

**Water is most important natural resource of environment that supports life on Earth. The visited locality is undergoing rapid pollution. This trend is creating more and more pollution in the environment. Thus, we suggested some recommendations for the solution for the pollution of water resources.**

**SEMESTER II**  
**COURSE: AECC2 (Environmental Studies)**

**Project Title: *Visit to a local polluted side***



**College Roll No. : PHSA20M612**  
**CU Registration No. : 223-1111-0422-20**  
**CU Roll No : 203223-21-0109**

**Introduction:** Pollution can be defined as the undesirable in natural system. It may also define as the unwanted change in the characteristic of air, water, soil and other environmental factors. Pollution adversely affects the health, survival or other activities of human and other animals. It is the main problem at present at both at local level as well as at a global level. In Nepal, the pollution is growing concern. But there are only limited studies done so far to quantify the level of pollution. Thus the availability of data is very poor. The monitoring activities are virtually insignificant. However, with the movement of industrialization and urbanization the pollution situation has become quite visible in some industrial localities and major urban centers.

Pollutants, the component of pollutions, can be either foreign substances/energies or naturally occurring contaminants. Pollutions include soil, liquid or gaseous substances present in greater than natural abundance produced due to human activity, which have detrimental effect on your environment. Pollution can effect: air, water, soil and biodiversity that direct effect the plant and animal life.

*There are various types of pollution. Some are listed below.*

- **Water Pollution:** It is defined as the contamination of water by human substances which are detrimental to living beings. Industrial water, household garages, non-decomposable materials from school, chemicals from agriculture activities are major cause to pollute water bodies. The effects of water pollution include decreasing the quantity of drinkable water available, lowering water supplies for crop irrigation and impacting fish and wildlife populations that require water of certain purity for survival.
- **Land Pollution:** Soil and land pollution is contamination of the soil that prevents natural growth and balance in the land. Many micro and macro flora and fauna are affected by land pollution. Soil concentration can lead to poor growth and reduced crop yields, lose of wildlife.



- **Noise Pollution:** It refers to undesirable levels of noises caused by human activity. It causes mental stress, depression, damage to the ear.

### **Objectives:**

- To identify the major reason, type of pollution visit near area.
- To identify the adverse effect of pollution in the vicinity.
- To study the present situation of environment.
- To study the visible effect of environment.
- To study the direct and indirect causes of pollution.
- To suggest control measures of minimize pollution.

### **Methodology:**

Firstly, we visited around polluted Dande river site and small waterweed in front of the paklihawa campus. Further analysis was done in following two methods.

**A.Primary Method:** The polluted site was properly observed and information gathered up.

**B.Secondary Method:** Different literally books and journals related to pollution were consulted. Internet sites were also cited and desk study was done for obtaining different information about the different place.

**Observation in polluted site:**

Most people around the river are unaware and illiterate. They are unknown about waste management practices. So they don't care about biodegradable and non-biodegradable substances.



**{Pic: Polluted Dande River}**

**During our visit we saw river was dumping location. We observed the following materials or pollutants on the river bank.**

- 1. Wastes from UCMS Hospital*
- 2. Plastic bags*
- 3. Plastic bottles*
- 4. Waste food materials*
- 5. Damaged domestic waves*
- 6. Dead bodies of animals*
- 7. Plant materials*
- 8. Surface run off from agricultural land*
- 9. Fuel materials from vehicles.*



*{Pic:High algal growth at polluted river}*

*The main factors that the result of pollution found*

- a) Irrigation water for cultivating water crops.**
- b) Different animals wallow in the river.**
- c) Swimming in the river.**

- d) Surface run off from agricultural land.**
- e) Cremation of people in the river bank.**
- f) Random fishing and over fishing by using poisons.**
- g) Eutrophication.**
- h) Lack of awareness and activities among local people.**

### *Consequences:*

- **The river is being polluted due to different human activities which are not eco friendly. The heap of pollutants in the river looked as it is dumping site not a river.**
- **It has totally damaged the beauty of river. Very bad smell could be easily felt while walking by the water sources.**
- **The water has become impure and unusable for human and animals.**
- **Water quality seemed to be totally degraded and when it is use for domestic purposes.**
- **It may cause water related illness such as typhoid, cholera etc.**
- **Due to foul smell of river and other pollutions the recreational value of river has decreased.**

## **Remedial Measures:**

**Here are some measures to suggest reducing the problem faced due to Dande river water pollution:**

- A. The major cause of pollution is human behavior. It should be changed.**
- B. Proper selection and management of dumping sites**
- C. Use of bio-degradable substances as compost manures.**
- D. Application of '3-R' principle; Recycle, Reduce, Reuse.**
- E. Management of dustbins by household itself and municipality in servable places.**
- F. Cremation by the side of the river should be prohibited.**
- G. Planting ground cover and stabilizing erosion prone areas.**
- H. Cleaning campaign must be launched from local level.**
- I. Strict implementation of "polluters pay" principle.**
- J. Solid wastes must be reduced and recycle.**
- K. Public awareness against water pollution must be raised.**

- L.** Proper dumping site must be established for non-bio degradable wastes.
- M.** Various NGOs, INGOs should conduct community programme.
- N.** Use of decomposable materials and discard using of non renewable materials.
- O.** Emphasis on using renewable solid materials and proper utilization with reuse must be done.

### **Summary and Conclusion:**

**Water is most important natural resource of environment that supports life on Earth. The visited locality is undergoing rapid pollution. This trend is creating more and more pollution in the environment. Thus, we suggested some recommendations for the solution for the pollution of water resources.**

**SEMESTER 2**

**COURSE: AECC 2 (ENVIRONMENTAL STUDIES)**

**PROJECT TITLE: STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRINCIPLES OF IDENTIFICATION**

**COLLEGE ROLL NO- PHSA20M614**

**CU REGISTRATION NO.- 223-1111-0437-20**

**CU ROLL NO- 203223-21-0116**

**SESSION- 2020-2021**

**Checked  
25 out of  
30**



## **STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRICIPLES OF IDENTIFICATION**

**Aim:** To study of common plants, insects, fish, birds and mammals of a selected site including the feeding and territorial behaviour of animals and birds and role of plants, insects, birds, mammals and fish in the ecosystem.

**Introduction:** Several plants, insects, birds, mammals and fish can be seen around an urban or rural setting where there is some vegetation. Each and every species of animals and plants had a definite role in the ecosystem. It is very interesting to observe the behavioural nature of the animals, their feeding and breeding habit etc.

**Requirements:** A pair of binoculars, field guide to identify plants, insects, birds, fish and mammals.

**Observations:** Plants, insects, birds, fish and mammals are identified and their position in the ecosystem and food-chain were marked and noted.

### **Trees:**



**GULMOHAR TREE**



**BANYAN TREE**

<b>Name of species</b>	<b>Scientific Name</b>	<b>Group</b>	<b>Identifying character</b>	<b>Role in ecosystem</b>	<b>Current Status</b>
Silk cotton tree	Bombax ceiba	Tree	Deciduous tree	providing food, fibre, fuel and medicine	Rare
Gulmohar	Delonix regia	Tree	Yellow branches and Red flower	Prevent soil erosion	Rare
Flame of the forest	Butea monosperma	Tree	Deciduous with red flower	Producer	Rare
Copper pod	Peltophorum ferrugirium	Tree	Small yellow flower	Nitrogen fixing	Rare
Camel's foot	Bauhinia purpurea	Tree	Trunk-less, Medium height while & light yellow flower	Producer and living place of birds	Rare
Indian cork tree	Mullingtonia hortensis	Tree	Deciduous tree with beautiful flower	Producer and living place of many birds and animals	Common
Indian gum tree	Acacia trilotica	Tree	Deciduous , medium height	Producer	Rare
Banyan Tree	Ficus benghalensis	Tree	Deciduous tree with prop root pillar-like branches	Producer	Common
Bo tree	Ficus religiosa	Tree	Deciduous tree	Gives fruits for others	Common
Margossa	Azadarachta indica	Tree	Deciduous tree	Gives fruits for others	Rare
Mango	Mangifera indica	Tree	Evergreen plant	Gives fruits for others	Rare
Mamila tamarind	Pithecolobium dulee	Tree	Deciduous plant	Gives fruits for others	Rare
Black plum	Syzigium cumini	Tree	Deciduous plant	Gives fruits for others	Rare
Clustur fig	Ficus glomerate	Tree	Deciduous plant	Gives fruits for others	Rare

Name of species	Scientific Name	Group	Identifying character	Role in ecosystem	Current Status
Coconut	Cocos nucifera	Tree	Deciduous plant	Gives fruits for others	Rare
Tulasi	Ocimum sanctum	Herb	Weak stem	Producer medical plant	Rare
Aparajeeta	Clitoria ternatea	Herb Climber	Climber stem with tendrils	Producer medical plant	Abundant
Kalmegh	Andrographis paniculata	Shrub	Soft branches stems single leaves	Producer medical plant	Abundant
Nayantara	Catharanthus rosens	Shrub	Soft branches stems single leaves	Producer medical plants	Common

## Insects:



HONEY BEE



MOSQUITO

Common Name	Scientific Name	Type	Relation with human
Housefly	Musca nebula	Harmful insect	Spreads diseases like typhoid and cholera etc.
Honey bee	Apis indica	Useful insect	Produces honey , wax

Common Name	Scientific Name	Type	Relation with human
Lepisma	Lepisma sp.	Harmful insect found in old books	Spreads diseases and destroys cloths, paper etc.
Majra poka	Tryporyza incertulas	Harmful for agricultural, primary consumer	Destroys rice plants
Moths	Bombyx mori	Useful insect primary consumer	Produces silk
Mosquito	Anopheles sp. Culex sp. Ades sp.	Harmful insect	Causes Malaria, etc.
Rice Bug	Leptocorisa acuta	Harmful	Destroys Rice

## Birds:



CORVUS SPLENDOUS



PARROT

Name	Scientific name	Identifying characteristics	Feeding Habit
House sparrow(Passer)	Passer domesticus	Black throat and grey crown	Insects, grain seeds
Crow	Corvas splendidus	Black with greyish colour, sky-blue neck	Feeds on almost all edibles (omnivorous)

<b>Name</b>	<b>Scientific name</b>	<b>Identifying characteristics</b>	<b>Feeding Habit</b>
Parrot	Psittacula krameri	Green with red bill	Fruits/Vegetables
Dove	Streptopelia sp.	Light brown and grey colour, sign of peace	Grains and seeds
Pigeon	Columba livia	Blue grey body, multicolour sheen on neck, dark streaks on wings	Grains, seeds, insects
Cuckoo	Heirococyx varius	Ash-grey coloured brown and white patches on the under side	Grains, insects, larva
Koel	Eudynamys Scolopacesus	Indian nightingale, male has plumage with greenish bill. Female has brown colour with white spots	Grains, insects, larva
Wood pecker	Branchypternus begalensis	Golden-coloured bird with long bill and crown	Takes out insects from the trees
Kingfisher	Alcedo sp.	Large beak, found near water bodies	Feeds on small fishes, tadpoles
Bulbul	Molpaster sp.	Feathery crest, present, brown coloured with black head and crimson patch under the tail	Gains, seeds

## Freshwater fish:



EEL CATFISH (CHANNALLABES APUS)

Name	Scientific name	Identifying characteristics	Roles in ecosystem
Eel catfish	Channallabes apus	Large sized, elongate fishes with a compressed body and tapering tail	Help control the population of frogs and insects
Feathered river garfish	Zenarchopterus dispar	Body very elongate, sub-cylindrical, slender, laterally compressed. Abdomen rounded. Head and snout pointed.	Used in commercial purposes by humans
Killifish	Aphyosemion cinnamomeum	Body moderately elongated and compressed. Head and body with scales. Pre orbital very narrow.	Eats mosquito and other harmful insects

<b>Name</b>	<b>Scientific name</b>	<b>Identifying characteristics</b>	<b>Roles in ecosystem</b>
Top minnows	Gambusia	Body short, cylindrical, compressed. Head and body with scales. Premaxillaries slightly protractile	Eats mosquito
Pipe fishes	Syngnathinae	Pipefishes are very slender, long-bodied fishes that are covered with rings of bony armour.	Controls the abundance of prey species
Snakeheads	Channa Striata	Adults are dark brown in colour with faint black bands visible across its entire body	It is an important food fish in its entire native range, and is of considerable economic importance.
Swamp Eels	Synbranchidae	They are long and slender, they lack pectoral and pelvic fins, and their dorsal and anal fins are vestigial, making them limbless vertebrates	Swamp eels are known as primary predators in their native region
Glass Fishes	Parambassis ranga	It has completely transparent body which reveals its bones and internal organs, hence its name.	It's a filter feeder mainly eating planktons. Its also used as an ornamental fish.

## Mammals:



HOMO SAPIENS



INDIAN ELEPHANT

Name	Scientific name	Identifying characteristics	Feeding Habit
Humans	Homo sapien	Speech, Upright Posture, Extraordinary Brains, Hands	Feeds on almost all edibles (omnivorous)
Kashmir gray langur	Semnopithecus ajax	They are <i>big</i> monkeys, larger than other langur species A long tail that arcs over the back adds to their overall length.	Eat mainly leaves (herbivores)
Rhesus macaque	Macaca mulatta	It is brown or grey in color and has a pink face, which is bereft of fur.	They mainly eat seeds, roots, bark, fruits and cereals
Indian Rhinoceros	Rhinoceros unicornis	It has a thick grey-brown skin with pinkish skin folds and one horn on its snout. Its upper legs and shoulders are covered in wart-like bumps.	They feed through grazing, preferring grasses to taller plants and shrubs
Hippopotamus	Hippopotamus amphibius	Body is barrel shaped, legs short	They are omnivorous



<b>Name</b>	<b>Scientific name</b>	<b>Identifying characteristics</b>	<b>Feeding Habit</b>
Dog	Canis lupus familiaris	They have fluffy fur, floppy ears, curly tails, or spots. Presence of canine teeth.	They are carnivores
Cat	Felis catus	They have fluffy fur, floppy ears, curly tails, or spots. They lack snout and have larger ear to body ratio	They are carnivores
South Asian River Dolphin	Platanista gangetica	At birth the Ganges river dolphin appears to be a dark chocolate-brown color, however over time they begin to take on a grayish brown skin tone	The Ganges river dolphin can be found hunting a variety of freshwater fish and invertebrate such as catfish, clams and prawns.
Indian Elephant	Elephas maximus indicus	Indian elephants have large heads, but only short necks. They have short, but powerful legs that support their entire body-weight, like columns.	They are herbivores

**Comment:** Each animal has a definite role in ecosystem. Plants are producers, insects are primary consumers, birds and other animals are secondary consumers or some tertiary consumers. Presence of these animals keep the natural balance of the ecosystem. They are the members of different trophic levels of food-chain and food-web.

### **Bibliography:**

- The book of Indian birds By Salim Ali
- The book of Indian Animals By Parter S. H.
- The Freshwater fishes of India : A handbook By K. C. Jayaram
- <https://www.animals.net/>
- <https://www.a-z-animals.com/>

### **Acknowledgement:**

I express my deep sense of gratitude to Prof. Jayeeta Chowdhury of Physics Dept. for providing necessary guidance & suggestion for the field-work.

I am thankful to my parents and my classmates of my team for their friendly assistance and cooperation.

**SEMESTER 2**

**COURSE: AECC 2 (ENVIRONMENTAL STUDIES)**

**PROJECT TITLE: STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRINCIPLES OF IDENTIFICATION**

**COLLEGE ROLL NO- PHSA20M614**

**CU REGISTRATION NO.- 223-1111-0437-20**

**CU ROLL NO- 203223-21-0116**

**SESSION- 2020-2021**

## STUDY OF COMMON PLANTS, INSECTS, FISH, BIRDS, MAMMALS AND BASIC PRICIPLES OF IDENTIFICATION

**Aim:** To study of common plants, insects, fish, birds and mammals of a selected site including the feeding and territorial behaviour of animals and birds and role of plants, insects, birds, mammals and fish in the ecosystem.

**Introduction:** Several plants, insects, birds, mammals and fish can be seen around an urban or rural setting where there is some vegetation. Each and every species of animals and plants had a definite role in the ecosystem. It is very interesting to observe the behavioural nature of the animals, their feeding and breeding habit etc.

**Requirements:** A pair of binoculars, field guide to identify plants, insects, birds, fish and mammals.

**Observations:** Plants, insects, birds, fish and mammals are identified and their position in the ecosystem and food-chain were marked and noted.

### Trees:



GULMOHAR TREE



BANYAN TREE

<b>Name of species</b>	<b>Scientific Name</b>	<b>Group</b>	<b>Identifying character</b>	<b>Role in ecosystem</b>	<b>Current Status</b>
Silk cotton tree	Bombax ceiba	Tree	Deciduous tree	providing food, fibre, fuel and medicine	Rare
Gulmohar	Delonix regia	Tree	Yellow branches and Red flower	Prevent soil erosion	Rare
Flame of the forest	Butea monosperma	Tree	Deciduous with red flower	Producer	Rare
Copper pod	Peltophorum ferrugirium	Tree	Small yellow flower	Nitrogen fixing	Rare
Camel's foot	Bauhinia purpurea	Tree	Trunk-less, Medium height while & light yellow flower	Producer and living place of birds	Rare
Indian cork tree	Mullingtonia hortensis	Tree	Deciduous tree with beautiful flower	Producer and living place of many birds and animals	Common
Indian gum tree	Acacia trilotica	Tree	Deciduous , medium height	Producer	Rare
Banyan Tree	Ficus benghalensis	Tree	Deciduous tree with prop root pillar-like branches	Producer	Common
Bo tree	Ficus religiosa	Tree	Deciduous tree	Gives fruits for others	Common
Margossa	Azadarachta indica	Tree	Deciduous tree	Gives fruits for others	Rare
Mango	Mangifera indica	Tree	Evergreen plant	Gives fruits for others	Rare
Mamila tamarind	Pithecolobium dulee	Tree	Deciduous plant	Gives fruits for others	Rare
Black plum	Syzigium cumini	Tree	Deciduous plant	Gives fruits for others	Rare
Clustur fig	Ficus glomerate	Tree	Deciduous plant	Gives fruits for others	Rare

<b>Name of species</b>	<b>Scientific Name</b>	<b>Group</b>	<b>Identifying character</b>	<b>Role in ecosystem</b>	<b>Current Status</b>
Coconut	Cocos nucifera	Tree	Deciduous plant	Gives fruits for others	Rare
Tulasi	Ocimum sanctum	Herb	Weak stem	Producer medical plant	Rare
Aparajeeta	Clitoria ternatea	Herb Climber	Climber stem with tendrils	Producer medical plant	Abundant
Kalmegh	Andrographis paniculata	Shrub	Soft branches stems single leaves	Producer medical plant	Abundant
Nayantara	Catharanthus rosens	Shrub	Soft branches stems single leaves	Producer medical plants	Common

## Insects:



HONEY BEE



MOSQUITO

<b>Common Name</b>	<b>Scientific Name</b>	<b>Type</b>	<b>Relation with human</b>
Housefly	Musca nebula	Harmful insect	Spreads diseases like typhoid and cholera etc.
Honey bee	Apis indica	Useful insect	Produces honey , wax

Common Name	Scientific Name	Type	Relation with human
Lepisma	Lepisma sp.	Harmful insect found in old books	Spreads diseases and destroys cloths, paper etc.
Majra poka	Tryporyza incertulas	Harmful for agricultural, primary consumer	Destroys rice plants
Moths	Bombyx mori	Useful insect primary consumer	Produces silk
Mosquito	Anopheles sp. Culex sp. Ades sp.	Harmful insect	Causes Malaria, etc.
Rice Bug	Leptocorisa acuta	Harmful	Destroys Rice

## Birds:



CORVUS SPLENDOUS



PARROT

Name	Scientific name	Identifying characteristics	Feeding Habit
House sparrow(Passer)	Passer domesticus	Black throat and grey crown	Insects, grain seeds
Crow	Corvas splendidus	Black with greyish colour, sky-blue neck	Feeds on almost all edibles (omnivorous)

<b>Name</b>	<b>Scientific name</b>	<b>Identifying characteristics</b>	<b>Feeding Habit</b>
Parrot	Psittacula krameri	Green with red bill	Fruits/Vegetables
Dove	Streptopelia sp.	Light brown and grey colour, sign of peace	Grains and seeds
Pigeon	Columba livia	Blue grey body, multicolour sheen on neck, dark streaks on wings	Grains, seeds, insects
Cuckoo	Heirococyx varius	Ash-grey coloured brown and white patches on the under side	Grains, insects, larva
Koel	Eudynamys Scolopacesus	Indian nightingale, male has plumage with greenish bill. Female has brown colour with white spots	Grains, insects, larva
Wood pecker	Branchypternus begalensis	Golden-coloured bird with long bill and crown	Takes out insects from the trees
Kingfisher	Alcedo sp.	Large beak, found near water bodies	Feeds on small fishes, tadpoles
Bulbul	Molpaster sp.	Feathery crest, present, brown coloured with black head and crimson patch under the tail	Gains, seeds



## Freshwater fish:



EEL CATFISH (CHANNALLABES APUS)

Name	Scientific name	Identifying characteristics	Roles in ecosystem
Eel catfish	Channallabes apus	Large sized, elongate fishes with a compressed body and tapering tail	Help control the population of frogs and insects
Feathered river garfish	Zenarchopterus dispar	Body very elongate, sub-cylindrical, slender, laterally compressed. Abdomen rounded. Head and snout pointed.	Used in commercial purposes by humans
Killifish	Aphyosemion cinnamomeum	Body moderately elongated and compressed. Head and body with scales. Pre orbital very narrow.	Eats mosquito and other harmful insects

<b>Name</b>	<b>Scientific name</b>	<b>Identifying characteristics</b>	<b>Roles in ecosystem</b>
Top minnows	Gambusia	Body short, cylindrical, compressed. Head and body with scales. Premaxillaries slightly protractile	Eats mosquito
Pipe fishes	Syngnathinae	Pipefishes are very slender, long-bodied fishes that are covered with rings of bony armour.	Controls the abundance of prey species
Snakeheads	Channa Striata	Adults are dark brown in colour with faint black bands visible across its entire body	It is an important food fish in its entire native range, and is of considerable economic importance.
Swamp Eels	Synbranchidae	They are long and slender, they lack pectoral and pelvic fins, and their dorsal and anal fins are vestigial, making them limbless vertebrates	Swamp eels are known as primary predators in their native region
Glass Fishes	Parambassis ranga	It has completely transparent body which reveals its bones and internal organs, hence its name.	It's a filter feeder mainly eating planktons. Its also used as an ornamental fish.

## Mammals:



HOMO SAPIENS



INDIAN ELEPHANT

Name	Scientific name	Identifying characteristics	Feeding Habit
Humans	Homo sapien	Speech, Upright Posture, Extraordinary Brains, Hands	Feeds on almost all edibles (omnivorous)
Kashmir gray langur	Semnopithecus ajax	They are <i>big</i> monkeys, larger than other langur species A long tail that arcs over the back adds to their overall length.	Eat mainly leaves (herbivores)
Rhesus macaque	Macaca mulatta	It is brown or grey in color and has a pink face, which is bereft of fur.	They mainly eat seeds, roots, bark, fruits and cereals
Indian Rhinoceros	Rhinoceros unicornis	It has a thick grey-brown skin with pinkish skin folds and one horn on its snout. Its upper legs and shoulders are covered in wart-like bumps.	They feed through grazing, preferring grasses to taller plants and shrubs
Hippopotamus	Hippopotamus amphibius	Body is barrel shaped, legs short	They are omnivorous

<b>Name</b>	<b>Scientific name</b>	<b>Identifying characteristics</b>	<b>Feeding Habit</b>
Dog	Canis lupus familiaris	They have fluffy fur, floppy ears, curly tails, or spots. Presence of canine teeth.	They are carnivores
Cat	Felis catus	They have fluffy fur, floppy ears, curly tails, or spots. They lack snout and have larger ear to body ratio	They are carnivores
South Asian River Dolphin	Platanista gangetica	At birth the Ganges river dolphin appears to be a dark chocolate-brown color, however over time they begin to take on a grayish brown skin tone	The Ganges river dolphin can be found hunting a variety of freshwater fish and invertebrate such as catfish, clams and prawns.
Indian Elephant	Elephas maximus indicus	Indian elephants have large heads, but only short necks. They have short, but powerful legs that support their entire body-weight, like columns.	They are herbivores

**Comment:** Each animal has a definite role in ecosystem. Plants are producers, insects are primary consumers, birds and other animals are secondary consumers or some tertiary consumers. Presence of these animals keep the natural balance of the ecosystem. They are the members of different trophic levels of food-chain and food-web.

### **Bibliography:**

- The book of Indian birds By Salim Ali
- The book of Indian Animals By Parter S. H.
- The Freshwater fishes of India : A handbook By K. C. Jayaram
- <https://www.animals.net/>
- <https://www.a-z-animals.com/>

### **Acknowledgement:**

I express my deep sense of gratitude to Prof. Jayeeta Chowdhury of Physics Dept. for providing necessary guidance & suggestion for the field-work.

I am thankful to my parents and my classmates of my team for their friendly assistance and cooperation.

# **PROJECT REPORT**

**SEMESTER II**

**COURSE: AECC(Environmental Science)**

**College Roll No-PHSA20M572**

**CU Registration No-223-1111-0454-20**

**CU Roll No-203223-21-0124**

**Project Title- A Documentary Of Mousuni Island**

**Checked  
26 out of  
30**

## **Disclaimer:**

***Its Not Just A Project ! Its a Documentary that tries to succinctly encapsulate one of many virgin and neglected islands, the Mousuni Islands and its inhabitants. Its a documentary of the environmental assets that the island takes pride in and displays boastfully, despite its constant battle with the cataclysmic climatic conditions to survive and provide its inhabitants with the means to live. The island is born and bred in nature whose existence has been started to get questioned and rejected by the nature itself as if it doesn't matter, as if it was a mistake . Its a documentary that barely captures all the combined efforts of the island and its inhabitants battling against their creator to survive. Its a documentary that tries to ostentatiously display how the island takes up cudgels for her offsprings. The documentary brings light to the thousands of neglected souls that battle life and death scenarios every moment of their life to barely pull through. ALL LIVES MATTER!***

## Inside Mousuni Islands: A Saga Of Climate Refugees, Fisher Folks and Survivors.



“It started with the frightening sound of the unbridled gust and the earthy-musty whiff of wetness . I thought, what if this mud hut of ours, with its light roof flies off?Then where would I go with the children? I had a little brother with me, we were so terrified of the water setting foot into our house and the utterly boisterous sound of the storm. He was holding me tight and crying. I held him closely and left the house to climb over the embankment. In front of my eyes, the walls of our house collapsed!”, Aashi Dey.

Aashi Dey lives in the delta region of Mousuni Islands and is among the other thirteen million people who call it home.



We often run behind popular and major tourist approved destinations to fit into the group. But what about the roads untraveled? Not once, not twice, but most of the time in this rat race, we ignore various gems which lie in front of our eyes.

Mousuni Islands is one of such virgin islands where most human feet have yet to leave behind marks. The unexplored islands hidden in Namkhana of West Bengal and adjacent to Sundarban Delta, is the perfect amalgamation of beach, sun and sand, seas and rivers, serene tranquility and its contrary agitated chaos.



“Straddling the Bay of Bengal and the River Ganga, just 60 miles from the City of Joy, Kolkata, lies a special world of virgin beach and fisher folk fables. These low lying Islands are facing rising sea levels that are three times the global average. Several Islands have already disappeared and scientist say that Mousuni could be next.



“It didn’t happen overnight. The island decayed gradually, little by little.”, Geeta Maity. She points her finger and said, “My house was right there among a row of houses. There was a mosque and an embankment in its vicinity. Everything got washed away. When my father-in-law was alive, we used to cultivate this land.”





Farming is and always has been the social and economic backbone of Mousuni Island but flooding, erratic rainfall and in In 2009, this place was badly affected by a devastating tropical cyclone, Aila and disrupted the lives of the locals. Ever since the natural disaster, large patches of agricultural land were destroyed; turning thousands of people lose their livelihood. Every year, during monsoons, raging sea waves engulf huge portions of village land forcing the villagers to leave their home losing lands every year. In absence of enough agricultural land, fishing became the only way of survival. Limited work opportunity forced them to travel far south of the country in search of jobs.





In 2016, a group of young travelers went on a trail to this unexplored place. Transportation to this island was not simple at that time. This beautiful place was not properly connected with the main city, didn't have electricity or even the basic resources. Despite all these difficulties, the group was determined to explore the virgin beach to learn some new and different experience directly from Mother Nature. They also thought of sharing these raw experiences with this whole world, and planned to create something which can be a gateway for the travellers and ardent nature lovers. This is how Izifiso Backpackers' Camp started in November 2017 in Mousuni Island.

Mousuni Island is very close to Jambu Island and Sagar Island. Bokkhali and Henry Island are the beaches you can cover while visiting Mousuni Island. They are the sole organization that only try and give best traveling expertise to their visiting guests. They have their own in-house camp in-charge to help us all the time. Electricity is there and every one mud hut has full

electricity. Running water with four shared toilets for the visiting guests. They have their own Community dining place to take a seat and have food together along with . Camp is simply one meters away from Beach.

Walking through Sea Beach and Mud walk within Mangrove area is a mystical experience. Interacting with local fisherman and watching them to fish with pulling nets has its own charms. Village roaming and watching sunset sitting is inexplicably prepossessing.



Electricity is still the luxury there as it just started to come within the island at the end of 2017.

You need to live in a tent as it's the only accommodation available there and most importantly if you go there as tourist you will be the only tourist to stay overnight there or the group which will go. Tent is placed well within pile of trees like babla, jahu, neem and various others which will give you some sort of jungle feeling. You can indulge in beach camping at night and enjoy chicken grill at night with your pals. Honestly, reading a

novel while relaxing on a hammock with the soft music of nature quadruples the enticing experience effortlessly .

Its disappointing and inconsolable how its residents of are being forced to migrate as the small island is slowly being submerged by the sea. Now environment experts warn that the neighbouring islands of Ganga Sagar and Mousuni are facing a similar fate.

“How many times have you rebuilt your house?” Sujit Mondal does not answer at first; he just gazes at the deceptive calm of the river he has to cross by boat to reach his home. The 44-year-old resident of the sinking island of the Sundarbans archipelago has clearly been asked this question more times than he can count. Finally he answers: “At least four”.

Every year, with houses and acres of land being swallowed by a hungry sea, the topography of the island alters.





Six months, two cyclones, one island.

Cyclone Amphan made landfall on May 20, 2020 at latitude 21.65 degrees north, longitude 88.3 degrees east. Cyclone Bulbul made landfall on November 9, 2019 at latitude 21.55 degrees north, longitude 88.5 degrees east. Mousuni is a small island in West Bengal, India, at latitude 21.66 degrees north, longitude 88.30 degrees east

Traditionally, they farmed rice and vegetables in one of the world's most fertile deltas. They made considerable money growing betel leaves (paan). They bred freshwater fish in ponds. Those who did not own land worked as farm laborers. The women would search for shrimp fry in the brackish water, which they sold to aquaculture farms.



The first big shock came on May 25, 2009, when Cyclone Aila made landfall at latitude 22.00 degrees north, longitude 88.00 degrees east.

Like Cyclone Aila, the wind caused by Amphan and Bulbul blew away roofs, flattened huts, felled trees and electricity poles. The waves topped six-metre-high embankments and flooded farms and ponds with saline water, killing plants and freshwater fish.





Since then, the land has been unable to support all its people. At least one man from just about every household in Mousuni has had to find work elsewhere in India – as laborers in factories, construction sites or farms; as security guards, gardeners, rickshaw pullers, restaurant cooks and waiters and managers.

The remittances Mousuni's emigrants sent not only supported their parents, wives and children. In some cases, they enabled a change from mud to brick walls for the home, from thatch to a tin or even asbestos roof.

With the promise of these remittances, many residents who lost their roofs or walls to Cyclone Bulbul last November borrowed to rebuild.



Stronger cyclones are the most dramatic impact of climate change in Mousuni, but not the only one. In recent decades, the sea level has risen continuously.

According to studies done by the oceanography department in Jadavpur University, Kolkata, Mousuni has lost about one-sixth of its 28-square-kilometre land area to the rising sea in the past 50 years, while the population has increased by two-and-a-half times.



“The rate of relative sea level rise is about 8 to 12 millimetres per year, as measured at Sagar island adjacent to Mousuni, which is three to four times over the global average,” said Sugata Hazra of the oceanography department. “This is mainly due to significant rise of the sea surface temperature since the end-1990s.”

When out at sea, Cyclone Amphan became a super cyclone because the surface temperature of the Bay of Bengal was at a record high. The speed reduced a bit as it neared land, with a maximum surface wind speed of 185 kilometres per hour. Bulbul and Aila both had maximum surface wind speed of 155 kmph.

“Disaster-prone areas like Mousuni are almost like punchbags,” said Sanjay Vashist, director of Climate Action Network, South Asia. “They keep taking punches and often don’t get the chance to recover.”

“Though the state government is doing what it can, we need national and international support not only to reconstruct the Sundarbans but also to minimise damage in case of future disasters,” said Javed Ahmed Khan, West Bengal’s minister in charge of disaster management.

“Despite facing severe and repeated climate impacts over the last many years, the vulnerability of people living in Mousuni and elsewhere in the Sundarbans has not yet been recognised. We need to push for more support for the affected people through the international mechanism,” said Harjeet Singh, global climate lead of Action Aid.

## **Acknowledgement**

I would like to express my thanks of gratitude to Prof. Jayeeta Chowdhury of Physics Dept. who gave me the necessary guidance & suggestion for the field work, which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to them.

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

# **PROJECT REPORT**

**SEMESTER II**

**COURSE: AECC(Environmental Science)**

**College Roll No-PHSA20M572**

**CU Registration No-223-1111-0454-20**

**CU Roll No-203223-21-0124**

**Project Title- A Documentary Of Mousuni Island**

## **Disclaimer:**

***Its Not Just A Project ! Its a Documentary that tries to succinctly encapsulate one of many virgin and neglected islands, the Mousuni Islands and its inhabitants. Its a documentary of the environmental assets that the island takes pride in and displays boastfully, despite its constant battle with the cataclysmic climatic conditions to survive and provide its inhabitants with the means to live. The island is born and bred in nature whose existence has been started to get questioned and rejected by the nature itself as if it doesn't matter, as if it was a mistake . Its a documentary that barely captures all the combined efforts of the island and its inhabitants battling against their creator to survive. Its a documentary that tries to ostentatiously display how the island takes up cudgels for her offsprings. The documentary brings light to the thousands of neglected souls that battle life and death scenarios every moment of their life to barely pull through. ALL LIVES MATTER!***

## Inside Mousuni Islands: A Saga Of Climate Refugees, Fisher Folks and Survivors.



“It started with the frightening sound of the unbridled gust and the earthy-musty whiff of wetness . I thought, what if this mud hut of ours, with its light roof flies off?Then where would I go with the children? I had a little brother with me, we were so terrified of the water setting foot into our house and the utterly boisterous sound of the storm. He was holding me tight and crying. I held him closely and left the house to climb over the embankment. In front of my eyes, the walls of our house collapsed!”, Aashi Dey.

Aashi Dey lives in the delta region of Mousuni Islands and is among the other thirteen million people who call it home.

We often run behind popular and major tourist approved destinations to fit into the group. But what about the roads untraveled? Not once, not twice, but most of the time in this rat race, we ignore various gems which lie in front of our eyes.

Mousuni Islands is one of such virgin islands where most human feet have yet to leave behind marks. The unexplored islands hidden in Namkhana of West Bengal and adjacent to Sundarban Delta, is the perfect amalgamation of beach, sun and sand, seas and rivers, serene tranquility and its contrary agitated chaos.



“Straddling the Bay of Bengal and the River Ganga, just 60 miles from the City of Joy, Kolkata, lies a special world of virgin beach and fisher folk fables. These low lying Islands are facing rising sea levels that are three times the global average. Several Islands have already disappeared and scientist say that Mousuni could be next.



“It didn’t happen overnight. The island decayed gradually, little by little.”, Geeta Maity. She points her finger and said, “My house was right there among a row of houses. There was a mosque and an embankment in its vicinity. Everything got washed away. When my father-in-law was alive, we used to cultivate this land.”







Farming is and always has been the social and economic backbone of Mousuni Island but flooding, erratic rainfall and in In 2009, this place was badly affected by a devastating tropical cyclone, Aila and disrupted the lives of the locals. Ever since the natural disaster, large patches of agricultural land were destroyed; turning thousands of people lose their livelihood. Every year, during monsoons, raging sea waves engulf huge portions of village land forcing the villagers to leave their home losing lands every year. In absence of enough agricultural land, fishing became the only way of survival. Limited work opportunity forced them to travel far south of the country in search of jobs.





In 2016, a group of young travelers went on a trail to this unexplored place. Transportation to this island was not simple at that time. This beautiful place was not properly connected with the main city, didn't have electricity or even the basic resources. Despite all these difficulties, the group was determined to explore the virgin beach to learn some new and different experience directly from Mother Nature. They also thought of sharing these raw experiences with this whole world, and planned to create something which can be a gateway for the travellers and ardent nature lovers. This is how Izifiso Backpackers' Camp started in November 2017 in Mousuni Island.

Mousuni Island is very close to Jambu Island and Sagar Island. Bokkhali and Henry Island are the beaches you can cover while visiting Mousuni Island. They are the sole organization that only try and give best traveling expertise to their visiting guests. They have their own in-house camp in-charge to help us all the time. Electricity is there and every one mud hut has full

electricity. Running water with four shared toilets for the visiting guests. They have their own Community dining place to take a seat and have food together along with . Camp is simply one meters away from Beach.

Walking through Sea Beach and Mud walk within Mangrove area is a mystical experience. Interacting with local fisherman and watching them to fish with pulling nets has its own charms. Village roaming and watching sunset sitting is inexplicably prepossessing.



Electricity is still the luxury there as it just started to come within the island at the end of 2017.

You need to live in a tent as it's the only accommodation available there and most importantly if you go there as tourist you will be the only tourist to stay overnight there or the group which will go. Tent is placed well within pile of trees like babla, jahu, neem and various others which will give you some sort of jungle feeling. You can indulge in beach camping at night and enjoy chicken grill at night with your pals. Honestly, reading a

novel while relaxing on a hammock with the soft music of nature quadruples the enticing experience effortlessly .

Its disappointing and inconsolable how its residents of are being forced to migrate as the small island is slowly being submerged by the sea. Now environment experts warn that the neighbouring islands of Ganga Sagar and Mousuni are facing a similar fate.

“How many times have you rebuilt your house?” Sujit Mondal does not answer at first; he just gazes at the deceptive calm of the river he has to cross by boat to reach his home. The 44-year-old resident of the sinking island of the Sundarbans archipelago has clearly been asked this question more times than he can count. Finally he answers: “At least four”.

Every year, with houses and acres of land being swallowed by a hungry sea, the topography of the island alters.





Six months, two cyclones, one island.

Cyclone Amphan made landfall on May 20, 2020 at latitude 21.65 degrees north, longitude 88.3 degrees east. Cyclone Bulbul made landfall on November 9, 2019 at latitude 21.55 degrees north, longitude 88.5 degrees east. Mousuni is a small island in West Bengal, India, at latitude 21.66 degrees north, longitude 88.30 degrees east

Traditionally, they farmed rice and vegetables in one of the world's most fertile deltas. They made considerable money growing betel leaves (paan). They bred freshwater fish in ponds. Those who did not own land worked as farm laborers. The women would search for shrimp fry in the brackish water, which they sold to aquaculture farms.



The first big shock came on May 25, 2009, when Cyclone Aila made landfall at latitude 22.00 degrees north, longitude 88.00 degrees east.

Like Cyclone Aila, the wind caused by Amphan and Bulbul blew away roofs, flattened huts, felled trees and electricity poles. The waves topped six-metre-high embankments and flooded farms and ponds with saline water, killing plants and freshwater fish.



Since then, the land has been unable to support all its people. At least one man from just about every household in Mousuni has had to find work elsewhere in India – as laborers in factories, construction sites or farms; as security guards, gardeners, rickshaw pullers, restaurant cooks and waiters and managers.

The remittances Mousuni's emigrants sent not only supported their parents, wives and children. In some cases, they enabled a change from mud to brick walls for the home, from thatch to a tin or even asbestos roof.

With the promise of these remittances, many residents who lost their roofs or walls to Cyclone Bulbul last November borrowed to rebuild.



Stronger cyclones are the most dramatic impact of climate change in Mousuni, but not the only one. In recent decades, the sea level has risen continuously.

According to studies done by the oceanography department in Jadavpur University, Kolkata, Mousuni has lost about one-sixth of its 28-square-kilometre land area to the rising sea in the past 50 years, while the population has increased by two-and-a-half times.



“The rate of relative sea level rise is about 8 to 12 millimetres per year, as measured at Sagar island adjacent to Mousuni, which is three to four times over the global average,” said Sugata Hazra of the oceanography department. “This is mainly due to significant rise of the sea surface temperature since the end-1990s.”

When out at sea, Cyclone Amphan became a super cyclone because the surface temperature of the Bay of Bengal was at a record high. The speed reduced a bit as it neared land, with a maximum surface wind speed of 185 kilometres per hour. Bulbul and Aila both had maximum surface wind speed of 155 kmph.



“Disaster-prone areas like Mousuni are almost like punchbags,” said Sanjay Vashist, director of Climate Action Network, South Asia. “They keep taking punches and often don’t get the chance to recover.”

“Though the state government is doing what it can, we need national and international support not only to reconstruct the Sundarbans but also to minimise damage in case of future disasters,” said Javed Ahmed Khan, West Bengal’s minister in charge of disaster management.

“Despite facing severe and repeated climate impacts over the last many years, the vulnerability of people living in Mousuni and elsewhere in the Sundarbans has not yet been recognised. We need to push for more support for the affected people through the international mechanism,” said Harjeet Singh, global climate lead of Action Aid.

## **Acknowledgement**

I would like to express my thanks of gratitude to Prof. Jayeeta Chowdhury of Physics Dept. who gave me the necessary guidance & suggestion for the field work, which also helped me in doing a lot of Research and I came to know about so many new things I am really thankful to them.

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

# UNIVERSITY OF CALCUTTA

## AECC-2 PROJECT

Name of the Candidate: Aditya Ghosh

Name of the Department: Physics

Registration number: 223-1111-0474-20

Departmental Roll Number: PHSA20M583

University Roll Number: 203223-21-0134

Name of the Title of the chosen Theme:

**POND ECOSYSTEM**

---

Checked  
25 out of  
30

# INTRODUCTION

---

A pond ecosystem as a whole represents fresh water ecosystem. Ponds are areas filled with water, either natural or manmade that is smaller than a lake. Ponds can be created by a variety of natural processes. They are generally shallow water bodies of standing water. Ponds are self-sufficient and self-regulating systems. Aquatic ecosystems ranges from hydrothermal vents at the bottom of the ocean, to marshes, to freshwater swamps, to high altitude lakes. About 75% of the earth's surface is water both in frozen and liquid form. These ecosystems cover a tremendous range of physical and chemical conditions, yet the same kind of biological creatures are commonly found in all of them- aquatic organisms.



Most of the earth is covered with aquatic ecosystem. Activities of organisms, mostly microscopic, in the oceans, exerts major control over the composition of the atmosphere. They also play major roles in primary production and respiration and the associated process of nutrient cycling worldwide.

# STUDY OBJECTIVES

---

Here are some of the objectives of this project based on pond ecosystem.

- To understand how ecosystems might be affected by naturally occurring or human induced disturbances such as weather and water pollution.
- To become skilled and experienced at some of the basic biological and ecological research techniques.
- To understand basic pond ecology in urban cities like Kolkata and be able to identify living organisms in this ecosystem.
- To obtain a basic level of understanding of the interaction between biotic and abiotic components of a pond ecosystem.

# STUDY AREA

---

The pond that is under study in this project, has no such specific name although it is one of the biggest pond of the locality and is just next to my home. The pond is controlled by the local Nabaday Club authority which is responsible for its maintenance.

In terms of dimensions it does not fall under any well defined geometrical shape. Still, by satellite images the rough length of the pond is 95m with a breadth of 54m. It covers a land area of around 3400m<sup>2</sup>. Roughly it is situated at 22° 28 '28" N latitude and 88° 22'09" E longitude. Upon enquiry it was found that more than 65 years ago it was a small lake. But due to urbanization , it was little by little converted into land from the sides. But by the legal efforts of the local people the pond was saved from further getting converted to land. Estimates say that it lost around 10m length from all the sides.

# METHODOLOGY

---

- The length and breadth of the pond was physically measured on the spot ( by motion detecting applications) and later verified by Google Maps with an error of around  $\pm 5m$ .
- The geographical coordinates of the location was obtained by GPS.
- The spot had to be visited 4 times at different times of the day in order to develop a clear understanding of the ecosystem.



Satellite image of the pond under study.

# LITERATURE SURVEY

---

Components of the pond Ecosystem: There are 2 main components of the pond ecosystem, namely,

- ABIOTIC COMPONENT
- BIOTIC COMPONENT

## ABIOTIC COMPONENT :

Non-living components of the pond ecosystem comprises light, water, soil, temperature, Carbon Dioxide (CO<sub>2</sub>), Oxygen (O<sub>2</sub>), minerals and organic compounds. Basically they are the non living factors that can have an impact on the ecosystem.

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of pond include water quality, temperature, light, soil, and seasonal change.

Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond.

The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts.

pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging.

The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive.

Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature.

The change of seasons has an impact on the pond. Spring and Fall are the seasons that keep the ecosystem healthy and the risk of negative effects on the organisms that inhabit the environment remains very low. This is because the temperature and climate are not extreme enough to have a great impact on the oxygen and nutrient level and they can be evenly distributed between the different water levels. In the winter time, because of the low temperatures, oxygen from the water can disappear from in the water if it is too cold. Also, plants above the water will freeze and die. In the Summer, the temperature of the water can become too warm and again hold less oxygen for the aquatic organisms. Too much sunlight can impact the pond because the algae is growing too fast therefore crowding space for the fish.



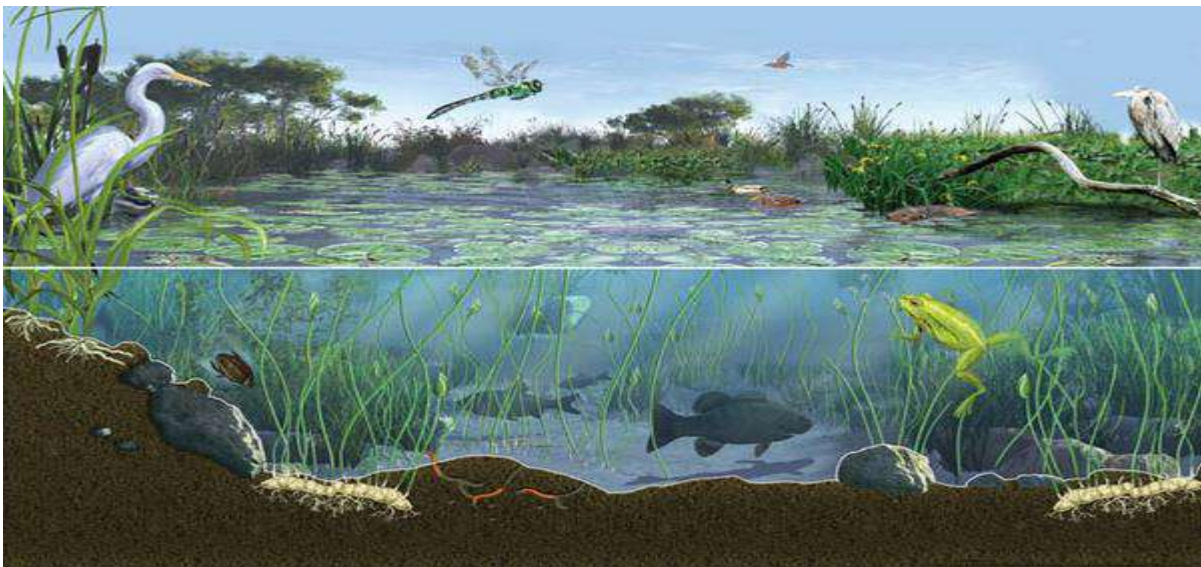
## BIOTIC COMPONENT:

**Producers:** Green plants are the producers of pond ecosystem. They synthesize organic compounds from simple inorganic substances such as water, CO<sub>2</sub> and minerals in presence of sunlight , for example *Eichhornia*, *Spirogyra*, *Anabaena*, *Volvox*, etc.

**Consumers:** Animals are the consumers that utilise the food produced by the green plants these include small insects (*Cyclops*, *Daphnia* ) and fishes. Zooplanktons such as *Paramecium* are herbivores. They are primary consumers. They feed on phytoplanktons. The primary consumers like crustaceans are eaten by small fishes and they are called tertiary consumers

**Decomposers:** Bacteria and fungi are the decomposer of the pond ecosystem .They decompose the excreta of animals and bodies of dead plants and animals and release simple inorganic and organic substances into the environment. They are also known as saprotrophs or reducers .

The simpler substances released by the decomposer are reused by the producers. Thus there is a cyclic exchange of materials between the biotic and abiotic components of the pond ecosystem.





## **ENERGY FLOW (Unidirectional flow of Energy in the Ecosystem)**

Energy flow in an ecosystem is the movement of energy from external environment through successive trophic levels and back to the external environment. It is one of the most fundamental processes and is common to all ecosystems. No ecosystem and not a single biotic component of the ecosystem can survive without energy. The continuous flow of energy between different biotic components is the key function of ecosystem and is responsible for the continuance of life.



Sunlight is the ultimate source of energy for all ecosystems. The Solar energy enter the living world through the photosynthesis carried out by producers. Of total solar incident energy that falls on the earth , only 50% is the Photosynthetically Active Radiation( PAR). This constitutes the visible solar spectrum. Only about 1 to 5% of the total incident solar energy or to 10% of the PAR is captured by producers of the ecosystem and utilised in the synthesis of organic matter. The rest is either absorbed by atmospheric gases as heat, used for evaporation of water or scattered and reflected by the clouds.

The entire Living Word is a sustained by 2- 10% of the PAR captured by the plans. All organisms are dependent for the energy supply on producers. These organisms are grouped according to their sources of energy into different trophic levels .A trophic level is represented by organisms which get their energy from a common source. The different trophic levels in an ecosystem include producers herbivores (primary

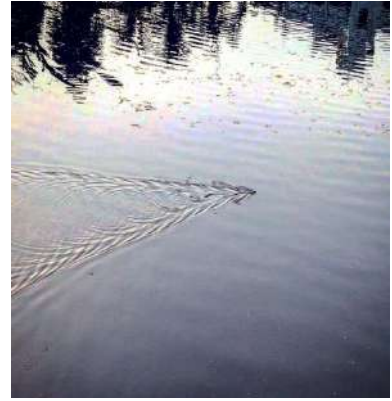
consumers), primary carnivore (secondary consumers) , secondary carnivores(tertiary consumers) , detritivores ( decomposers).



Birds



Trees



Snake

## STUDY FINDINGS

---

The water in a pond must remain clean if it is to provide a healthy environment for the organisms (animals and plants) living in it. The natural waste from the living and dead organisms is 'recycled' by special tiny organisms called bacteria. Plenty of oxygen is needed for the bacteria to 'break down' the waste. The pond can take care of its own waste – it's people who cause pollution!

Perhaps the most serious threat to the pond is chemical pollution as a result of idol immersion. The festive season starts from September and continues upto November. Hundreds of idols are immersed every year although it is banned. Often dead bodies of fishes are seen few days after Durga Puja.



Nowadays people dump their everyday wastes around the places surrounding the pond which releases bad odour in the entire locality especially in the monsoons. These practices are carried out late during the night or before dawn to avoid being caught.

CONTROL:

- The rules already made must be strictly followed for the cleanliness of the pond.
- Depositing waste materials around the pond must be made punishable by law.
- Idol immersion must be totally stopped.
- Clean water must be pumped into the pond atleast twice a year.
- Remove sediments where the pond has been receiving polluted sediments for some time, it may be necessary to remove those sediments completely to see any noticeable improvement in the quality of the pond.



# CONCLUSION

---

Everyone in the world depends on Earth's ecosystems and the service they provide, such as food, water, disaster management, climate regulation, spiritual fulfillment, and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process- in fact, many have been harmed. Moreover, the full cost associated with these gains are only now becoming apparent. So it is better that care for ecosystem should be taken as one of the major responsibility of every individual for sustainable living of future generation as well.



# UNIVERSITY OF CALCUTTA

## AECC-2 PROJECT

Name of the Candidate: Aditya Ghosh

Name of the Department: Physics

Registration number: 223-1111-0474-20

Departmental Roll Number: PHSA20M583

University Roll Number: 203223-21-0134

Name of the Title of the chosen Theme:

**POND ECOSYSTEM**

---

# INTRODUCTION

---

A pond ecosystem as a whole represents fresh water ecosystem. Ponds are areas filled with water, either natural or manmade that is smaller than a lake. Ponds can be created by a variety of natural processes. They are generally shallow water bodies of standing water. Ponds are self-sufficient and self-regulating systems. Aquatic ecosystems ranges from hydrothermal vents at the bottom of the ocean, to marshes, to freshwater swamps, to high altitude lakes. About 75% of the earth's surface is water both in frozen and liquid form. These ecosystems cover a tremendous range of physical and chemical conditions, yet the same kind of biological creatures are commonly found in all of them- aquatic organisms.



Most of the earth is covered with aquatic ecosystem. Activities of organisms, mostly microscopic, in the oceans, exerts major control over the composition of the atmosphere. They also play major roles in primary production and respiration and the associated process of nutrient cycling worldwide.

# STUDY OBJECTIVES

---

Here are some of the objectives of this project based on pond ecosystem.

- To understand how ecosystems might be affected by naturally occurring or human induced disturbances such as weather and water pollution.
- To become skilled and experienced at some of the basic biological and ecological research techniques.
- To understand basic pond ecology in urban cities like Kolkata and be able to identify living organisms in this ecosystem.
- To obtain a basic level of understanding of the interaction between biotic and abiotic components of a pond ecosystem.

# STUDY AREA

---

The pond that is under study in this project, has no such specific name although it is one of the biggest pond of the locality and is just next to my home. The pond is controlled by the local Nabaday Club authority which is responsible for its maintenance.

In terms of dimensions it does not fall under any well defined geometrical shape. Still, by satellite images the rough length of the pond is 95m with a breadth of 54m. It covers a land area of around 3400m<sup>2</sup>. Roughly it is situated at 22° 28 '28" N latitude and 88° 22'09" E longitude. Upon enquiry it was found that more than 65 years ago it was a small lake. But due to urbanization , it was little by little converted into land from the sides. But by the legal efforts of the local people the pond was saved from further getting converted to land. Estimates say that it lost around 10m length from all the sides.

# METHODOLOGY

---

- The length and breadth of the pond was physically measured on the spot ( by motion detecting applications) and later verified by Google Maps with an error of around  $\pm 5m$ .
- The geographical coordinates of the location was obtained by GPS.
- The spot had to be visited 4 times at different times of the day in order to develop a clear understanding of the ecosystem.



Satellite image of the pond under study.



# LITERATURE SURVEY

---

Components of the pond Ecosystem: There are 2 main components of the pond ecosystem, namely,

- ABIOTIC COMPONENT
- BIOTIC COMPONENT

## ABIOTIC COMPONENT :

Non-living components of the pond ecosystem comprises light, water, soil, temperature, Carbon Dioxide (  $\text{CO}_2$  ), Oxygen (  $\text{O}_2$  ), minerals and organic compounds. Basically they are the non living factors that can have an impact on the ecosystem.

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of pond include water quality, temperature, light, soil, and seasonal change.

Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond.

The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts.

pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging.

The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive.

Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature.

The change of seasons has an impact on the pond. Spring and Fall are the seasons that keep the ecosystem healthy and the risk of negative effects on the organisms that inhabit the environment remains very low. This is because the temperature and climate are not extreme enough to have a great impact on the oxygen and nutrient level and they can be evenly distributed between the different water levels. In the winter time, because of the low temperatures, oxygen from the water can disappear from in the water if it is too cold. Also, plants above the water will freeze and die. In the Summer, the temperature of the water can become too warm and again hold less oxygen for the aquatic organisms. Too much sunlight can impact the pond because the algae is growing too fast therefore crowding space for the fish.



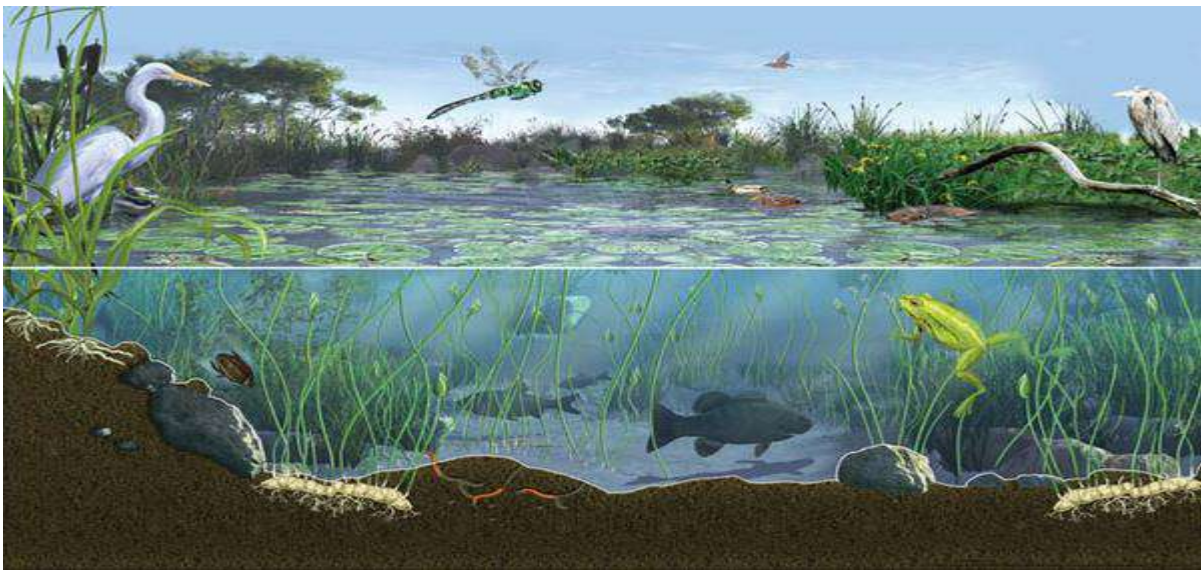
## BIOTIC COMPONENT:

**Producers:** Green plants are the producers of pond ecosystem. They synthesize organic compounds from simple inorganic substances such as water, CO<sub>2</sub> and minerals in presence of sunlight , for example *Eichhornia*, *Spirogyra*, *Anabaena*, *Volvox*, etc.

**Consumers:** Animals are the consumers that utilise the food produced by the green plants these include small insects (*Cyclops*, *Daphnia* ) and fishes. Zooplanktons such as *Paramecium* are herbivores. They are primary consumers. They feed on phytoplanktons. The primary consumers like crustaceans are eaten by small fishes and they are called tertiary consumers

**Decomposers:** Bacteria and fungi are the decomposer of the pond ecosystem .They decompose the excreta of animals and bodies of dead plants and animals and release simple inorganic and organic substances into the environment. They are also known as saprotrophs or reducers .

The simpler substances released by the decomposer are reused by the producers. Thus there is a cyclic exchange of materials between the biotic and abiotic components of the pond ecosystem.



## **ENERGY FLOW (Unidirectional flow of Energy in the Ecosystem)**

Energy flow in an ecosystem is the movement of energy from external environment through successive trophic levels and back to the external environment. It is one of the most fundamental processes and is common to all ecosystems. No ecosystem and not a single biotic component of the ecosystem can survive without energy. The continuous flow of energy between different biotic components is the key function of ecosystem and is responsible for the continuance of life.



Sunlight is the ultimate source of energy for all ecosystems. The Solar energy enter the living world through the photosynthesis carried out by producers. Of total solar incident energy that falls on the earth , only 50% is the Photosynthetically Active Radiation( PAR). This constitutes the visible solar spectrum. Only about 1 to 5% of the total incident solar energy or to 10% of the PAR is captured by producers of the ecosystem and utilised in the synthesis of organic matter. The rest is either absorbed by atmospheric gases as heat, used for evaporation of water or scattered and reflected by the clouds.

The entire Living Word is a sustained by 2- 10% of the PAR captured by the plans. All organisms are dependent for the energy supply on producers. These organisms are grouped according to their sources of energy into different trophic levels .A trophic level is represented by organisms which get their energy from a common source. The different trophic levels in an ecosystem include producers herbivores (primary

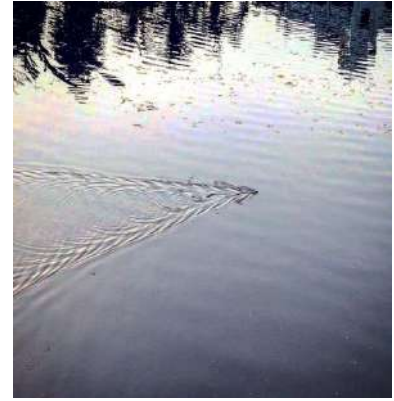
consumers), primary carnivore (secondary consumers) , secondary carnivores(tertiary consumers) , detritivores ( decomposers).



Birds



Trees



Snake

## STUDY FINDINGS

---

The water in a pond must remain clean if it is to provide a healthy environment for the organisms (animals and plants) living in it. The natural waste from the living and dead organisms is 'recycled' by special tiny organisms called bacteria. Plenty of oxygen is needed for the bacteria to 'break down' the waste. The pond can take care of its own waste – it's people who cause pollution!

Perhaps the most serious threat to the pond is chemical pollution as a result of idol immersion. The festive season starts from September and continues upto November. Hundreds of idols are immersed every year although it is banned. Often dead bodies of fishes are seen few days after Durga Puja.



Nowadays people dump their everyday wastes around the places surrounding the pond which releases bad odour in the entire locality especially in the monsoons. These practices are carried out late during the night or before dawn to avoid being caught.

CONTROL:

- The rules already made must be strictly followed for the cleanliness of the pond.
- Depositing waste materials around the pond must be made punishable by law.
- Idol immersion must be totally stopped.
- Clean water must be pumped into the pond atleast twice a year.
- Remove sediments where the pond has been receiving polluted sediments for some time, it may be necessary to remove those sediments completely to see any noticeable improvement in the quality of the pond.



# CONCLUSION

---

Everyone in the world depends on Earth's ecosystems and the service they provide, such as food, water, disaster management, climate regulation, spiritual fulfillment, and aesthetic enjoyment. Over the past 50 years, humans have changed these ecosystems more rapidly and extensively than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel. This transformation of the planet has contributed to substantial net gains in human well-being and economic development. But not all regions and groups of people have benefited from this process- in fact, many have been harmed. Moreover, the full cost associated with these gains are only now becoming apparent. So it is better that care for ecosystem should be taken as one of the major responsibility of every individual for sustainable living of future generation as well.



PROJECT REPORT

SEMESTER II

COURSE : AECC 2(ENVIRONMENTAL STUDIES)

PROJECT TITLE : STUDY OF COMMON  
PLANTS,INSECTS,FISH,BIRDS,MAMMALS AND BASIC PRICIPLES OF  
IDENTIFICATION

Checked  
24 out of  
30

COLLEGE ROLL NO. : PHS&20M586

CU REGISTRATION NO. : 223-1112-0315-20

CU ROLL NO. : 203223-21-0160

2020-2021



## i. INTRODUCTION :

**Biodiversity** is the biological variety and variability of life on Earth. Biodiversity is a measure of variation at the genetic, species, and ecosystem level. The word Biodiversity was first used by the great scientist "Walter G. Rosen" in 1986.

A **Biodiversity Hotspot** is a region with a high level of endemic species that have experienced great habitat loss. The term hotspots was introduced in 1988 by "Norman Myers". While hotspots are spread all over the world, the majority areas and most are located in the tropics.

Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future as a primary result of deforestation.

**Plants** are critical to other life on this planet because they form the basis of all food webs by Photosynthesis. 'Plants' are divided into several kind of kingdoms such as Protista, Fungi and Plantae. **Insects** are a class in the phylum Arthropoda. They are the largest group of animal on earth and also the first animals capable of light.

**Fish** are a class in phylum Chordata. They are aquatic, Craniate, gill-bearing animals that lack with digits. **Birds** are a group of warm-blooded vertebrates constituting the class Aves. They are ready visitors that visit frequently from place to place even from continent to another continent. **Mammals** (from Latin *mamma*, 'breast') are a group of Vertebrates constituting the class Mammalia. We all belongs to this class. They all are link together by Food-Chain.

In this project we are observing some common plants, insects fish, birds and mammals around us and their basic principle of identification.

## ii. AREA OF STUDY:

The area is Shikarpur, Cooch Behar of West Bengal in India.

## iii. METHOD OF STUDY:

Making this I use internet collect information about plants, insects, fish, birds, mammals.

**DATE:** 20/6/2021

**TIME:** 12.00 p.m.

## iv. OBSERVATION:

A. PLANTS

B. INSECTS

C. FISH

D. BIRDS

E. MAMMALS

## A.PLANTS

### 1) ALOE VERA

**Scientific Name:** *Aloe vera*

➤ **Source:**

Thick fleshy leaves(Pulp,dried,juice) are used drug.



➤ **Family & Distribution:** Liliaceae , it is native of West Indies or

Mediterranean region .It grows wild in hot dry valleys of Western Himalayas and Southern,Northern part of India.Sangola is the one of the drought region it is mainly distributed in every places in rural area some of the important places like Waki,Mahud,Chindepir,Rajuri,Sangola, Jawala and Gherdi.It is xerophytic plant.

➤ **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 contains glucose , galactose,mannose and galacturonic acid with protein.The plant contain aloesone and aloesin .

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

## **B.INSECTS**

### **1) INDIAN MEAL MOTH**

The Indian meal moth was given its name after an insect scientist found it feeding on corn meal . They typically live from two to six months .

- **Size :** 5/8"
- **Shape:** Elongated,Oval
- **Color:** Copper reddish
- **Legs:** 6
- **Wings:** Yes
- **Antenna:**Yes
- **Common Name:**Indian meal moth
- **Kingdom:** Animalia
- **Phylum:** Arthropoda
- **Class:** Insecta
- **Order :** Lepidoptera
- **Family:** Pyralidae
- **Species:** Plodia interpunctella



➤ **Diet:** Indian meal moths feed on dried fruits ,grains,seeds,nuts

,chocolate,candies ,bird seed,dog food,powdered milk ,dried red peppers and candy.

➤ **Habitat:** Attracted to the light ,these bugs are found in bright places where food is stored like restaurants and grocery stores .

➤ **Impact:** Moths infest foods and can contaminate food products by leaving skin and waste behind .

➤ **Prevention :** 1) Store food in sealed containers.

2)Discard infested foods in outdoor trash bins.

3) Clean infested cupboards thoroughly with a vacuum and Soap and water.

## **C.FISH**

**1) CATLA:** Catla, also known as the major South Asian carp, is an economically important South Asian freshwater fish in the carp family Cyprinidae. It is native to rivers and lakes in northern India, Bangladesh, Myanmar, Nepal, and Pakistan, but has also been introduced elsewhere in South Asia and is commonly farmed.



**Kingdom:** Animalia

**Phylum:** Chordata

**Class:** Actinopterygii

**Order:** Cypriniformes

**Family:** Cyprinidae

**Subfamily:** Labeoninae

**Genus:** Labeo

**Species:** L. catla

➤ **Diet:** Catla fish are surface and midwater feeder. The young are feed on both zooplankton and phytoplankton, but the mature fish are generally feed on zooplankton. For commercial fish farming, they can be feed on both natural and supplementary feeds.

➤ **Habitat:** The fish is mainly found in the rives and lakes in northern India, Bangladesh, Nepal, Pakistan and Myanmar. The Catla fish is a freshwater species, and it is found rarely in brakish water. Some common habitats of this fish species are baors, beels, canals, ditch, floodplains, haors, lake, ponds and lakes.

## **D. BIRDS**

### **1) ORIENTAL MAGPIE-ROBIN**

**Common English Name:** Oriental magpie-robin

**Bengali Name:** Doyel

**Scientific Name:** *Copsychus Saularis*



➤ **Distribution:**

parts of plain

➤ **Characters :**

Quiet and calm a bird chirps during dawn or dusk

➤ **Vegetation Spectrum:**

Tremaorientalis, Bamusa sp., Mangifera indica, Tinosporacordifolia,

Ficus sp., pothos sp.,

Phyllanthusreticulatus, Adinacordifolia, Mangferaindica,

Casuarinaequisetifolia , Ravanalamadagascariensis, Plumeriarubra, Tabernemontadivericata,  
etc.

## **E. MAMMALS**

**1)GOAT:** The domestic goat or simply goat is a subspecies of *C. aegagrus* domesticated from the wild goat of Southwest Asia and Eastern Europe. The goat is a member of the animal family Bovidae and the subfamily Caprinae, meaning it is closely related to the sheep. There are over 300 distinct breeds of goat.



•**Lifespan:** 15 – 18 years

•**Scientific name:** *Capra aegagrus hircus*

•**Gestation period:** 150 days

•**Family:** Bovidae

•**Kingdom:** Animalia

➤ **Diet:** Goats are fond of leguminous fodders. They do not relish fodders like sorghum and maize silage or straw. They reluctantly eat hay prepared from forest grasses, if cut in early stages, but very much relish hay prepared from leguminous crops.

➤ **Origins:** Found in the Saanen Valley of Switzerland and spreadthroughout Europe.

➤ **Height:** 41-58 cm (average)

➤ **Weight:** 20 -140 kg (average)

## **V.CONCLUTION :**

The flora and fauna of our region is very significant. Here are just a few examples. From this list I can get a partial idea of the biodiversity of our region. Plants have been used in India since time immemorial and hunting has been practiced since the beginning of civilization. At present the demand and circulation of Ayurvedic treatment is very much increasing. Besides, biodiversity is being destroyed under the pressure of population and civilization. In addition, due to the unscientific use of plants, many plants are endangered today. They need to be saved. They cultivate rare and important plants in their own homes. Can be easily saved. Even by making the common people aware, it is possible to save the animals . without killing them. The number of animals in the region is increasing by counting. The number of plants is decreasing every day due to rapid urbanization. It is important to save the animals that have been found in very small numbers in our study without delay. Balancing biodiversity is crucial for a healthy environment. Our duty is to make citizens aware of the need to conserve biodiversity.

**Vi. ACKNOWLEDGMENTS** : I would like to thank my teacher Dr. Jayeeta Chowdhury,for selecting the project and for supervising and giving necessary instructions at all times.



PROJECT REPORT

SEMESTER II

COURSE : AECC 2(ENVIRONMENTAL STUDIES)

PROJECT TITLE : STUDY OF COMMON  
PLANTS,INSECTS,FISH,BIRDS,MAMMALS AND BASIC PRICIPLES OF  
IDENTIFICATION

COLLEGE ROLL NO. : PHS&20M586

CU REGISTRATION NO. : 223-1112-0315-20

CU ROLL NO. : 203223-21-0160

2020-2021



## i. INTRODUCTION :

**Biodiversity** is the biological variety and variability of life on Earth. Biodiversity is a measure of variation at the genetic, species, and ecosystem level. The word Biodiversity was first used by the great scientist "Walter G. Rosen" in 1986.

A **Biodiversity Hotspot** is a region with a high level of endemic species that have experienced great habitat loss. The term hotspots was introduced in 1988 by "Norman Myers". While hotspots are spread all over the world, the majority areas and most are located in the tropics.

Biodiversity generally tends to cluster in hotspots, and has been increasing through time, but will be likely to slow in the future as a primary result of deforestation.

**Plants** are critical to other life on this planet because they form the basis of all food webs by Photosynthesis. 'Plants' are divided into several kind of kingdoms such as Protista, Fungi and Plantae. **Insects** are a class in the phylum Arthropoda. They are the largest group of animal on earth and also the first animals capable of light.

**Fish** are a class in phylum Chordata. They are aquatic, Craniate, gill-bearing animals that lack with digits. **Birds** are a group of warm-blooded vertebrates constituting the class Aves. They are ready visitors that visit frequently from place to place even from continent to another continent. **Mammals** (from Latin *mamma*, 'breast') are a group of Vertebrates constituting the class Mammalia. We all belongs to this class. They all are link together by Food-Chain.

In this project we are observing some common plants, insects fish, birds and mammals around us and their basic principle of identification.

## ii. AREA OF STUDY:

The area is Shikarpur, Cooch Behar of West Bengal in India.

## iii. METHOD OF STUDY:

Making this I use internet collect information about plants, insects, fish, birds, mammals.

**DATE:** 20/6/2021

**TIME:** 12.00 p.m.

## iv. OBSERVATION:

A. PLANTS

B. INSECTS

C. FISH

D. BIRDS

E. MAMMALS

## A.PLANTS

### 1) ALOE VERA

**Scientific Name:** *Aloe vera*

➤ **Source:**

Thick fleshy leaves(Pulp,dried,juice) are used drug.



➤ **Family & Distribution:** Liliaceae , it is native of West Indies or

Mediterranean region .It grows wild in hot dry valleys of Western Himalayas and Southern,Northern part of India.Sangola is the one of the drought region it is mainly distributed in every places in rural area some of the important places like Waki,Mahud,Chindepir,Rajuri,Sangola, Jawala and Gherdi.It is xerophytic plant.

➤ **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 contains glucose , galactose,mannose and galacturonic acid with protein.The plant contain aloesone and aloesin .

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

## **B.INSECTS**

### **1) INDIAN MEAL MOTH**

The Indian meal moth was given its name after an insect scientist found it feeding on corn meal . They typically live from two to six months .

- **Size :** 5/8"
- **Shape:** Elongated,Oval
- **Color:** Copper reddish
- **Legs:** 6
- **Wings:** Yes
- **Antenna:**Yes
- **Common Name:**Indian meal moth
- **Kingdom:** Animalia
- **Phylum:** Arthropoda
- **Class:** Insecta
- **Order :** Lepidoptera
- **Family:** Pyralidae
- **Species:** Plodia interpunctella



➤ **Diet:** Indian meal moths feed on dried fruits ,grains,seeds,nuts

,chocolate,candies ,bird seed,dog food,powdered milk ,dried red peppers and candy.

➤ **Habitat:** Attracted to the light ,these bugs are found in bright places where food is stored like restaurants and grocery stores .

➤ **Impact:** Moths infest foods and can contaminate food products by leaving skin and waste behind .

➤ **Prevention :** 1) Store food in sealed containers.

2)Discard infested foods in outdoor trash bins.

3) Clean infested cupboards thoroughly with a vacuum and Soap and water.

## **C.FISH**

**1) CATLA:** Catla, also known as the major South Asian carp, is an economically important South Asian freshwater fish in the carp family Cyprinidae. It is native to rivers and lakes in northern India, Bangladesh, Myanmar, Nepal, and Pakistan, but has also been introduced elsewhere in South Asia and is commonly farmed.



**Kingdom:** Animalia

**Phylum:** Chordata

**Class:** Actinopterygii

**Order:** Cypriniformes

**Family:** Cyprinidae

**Subfamily:** Labeoninae

**Genus:** Labeo

**Species:** L. catla

➤ **Diet:** Catla fish are surface and midwater feeder. The young are feed on both zooplankton and phytoplankton, but the mature fish are generally feed on zooplankton. For commercial fish farming, they can be feed on both natural and supplementary feeds.

➤ **Habitat:** The fish is mainly found in the rives and lakes in northern India, Bangladesh, Nepal, Pakistan and Myanmar. The Catla fish is a freshwater species, and it is found rarely in brakish water. Some common habitats of this fish species are baors, beels, canals, ditch, floodplains, haors, lake, ponds and lakes.

## **D. BIRDS**

### **1) ORIENTAL MAGPIE-ROBIN**

**Common English Name:** Oriental magpie-robin

**Bengali Name:** Doyel

**Scientific Name:** *Copsychus Saularis*



➤ **Distribution:**

parts of plain

➤ **Characters :**

Quiet and calm a bird chirps during dawn or dusk

➤ **Vegetation Spectrum:**

Tremaorientalis, Bamusa sp., Mangifera indica, Tinosporacordifolia,

Ficus sp., pothos sp.,

Phyllanthusreticulatus, Adinacordifolia, Mangferaindica,

Casuarinaequisetifolia , Ravanalamadagascariensis, Plumeriarubra, Tabernemontadivericata,  
etc.

## **E. MAMMALS**

**1)GOAT:** The domestic goat or simply goat is a subspecies of *C. aegagrus* domesticated from the wild goat of Southwest Asia and Eastern Europe. The goat is a member of the animal family Bovidae and the subfamily Caprinae, meaning it is closely related to the sheep. There are over 300 distinct breeds of goat.



•**Lifespan:** 15 – 18 years

•**Scientific name:** *Capra aegagrus hircus*

•**Gestation period:** 150 days

•**Family:** Bovidae

•**Kingdom:** Animalia

➤ **Diet:** Goats are fond of leguminous fodders. They do not relish fodders like sorghum and maize silage or straw. They reluctantly eat hay prepared from forest grasses, if cut in early stages, but very much relish hay prepared from leguminous crops.

➤ **Origins:** Found in the Saanen Valley of Switzerland and spreadthroughout Europe.

➤ **Height:** 41-58 cm (average)

➤ **Weight:** 20 -140 kg (average)

## **V.CONCLUTION :**

The flora and fauna of our region is very significant. Here are just a few examples. From this list I can get a partial idea of the biodiversity of our region. Plants have been used in India since time immemorial and hunting has been practiced since the beginning of civilization. At present the demand and circulation of Ayurvedic treatment is very much increasing. Besides, biodiversity is being destroyed under the pressure of population and civilization. In addition, due to the unscientific use of plants, many plants are endangered today. They need to be saved. They cultivate rare and important plants in their own homes. Can be easily saved. Even by making the common people aware, it is possible to save the animals . without killing them. The number of animals in the region is increasing by counting. The number of plants is decreasing every day due to rapid urbanization. It is important to save the animals that have been found in very small numbers in our study without delay. Balancing biodiversity is crucial for a healthy environment. Our duty is to make citizens aware of the need to conserve biodiversity.

**Vi. ACKNOWLEDGMENTS** : I would like to thank my teacher Dr. Jayeeta Chowdhury,for selecting the project and for supervising and giving necessary instructions at all times.

Checked  
24 out of  
30

# PROJECT REPORT

## SEMESTER II

COURSE: AECC2(Environmental Studies)

PROJECT TITLE: STUDY OF POND ECOSYSTEM

COLLEGE ROLL NO: PHSA20M591

CU REGISTRATION NO: 223-1112-0331-20

CU ROLL NO: 203223-21-0164



# INDEX

<u>TROPIC</u>	<u>PAGE NO</u>
Introduction	1
Types Of Pond Ecosystem	1
Meaning Of Pond Ecosystem	1-2
Characteristics Of Pond Ecosystem	2
Pond Zone Identification	2-3
Components Of Pond Ecosystem:	
A. Biotic Component	4-5
B. Abiotic Component	6
Importance Of Pond Ecosystem	6
Conclusion	7
Acknowledgement	7

## INTRODUCTION:

A pond is either a natural or an artificial body of water that is enclosed. Ponds can occur naturally in the world or they can be human made (such as a garden pond). An ecosystem is the technical term for a community of organisms. For such a community to form an ecosystem, it needs to be a distinct system where the organisms live and interact. Pond Ecosystem is differed from other water ecosystems. Unlike the river ecosystem, which is categorized under the Lotic systems, pond ecosystem falls under the Lentic ecosystem for the reason that the water remains stagnant in ponds for a relatively longer period time. A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 – 15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there.

## TYPES OF POND ECOSYSTEM:

Ponds can come in many different forms, and they all have their own differentiating characteristics. Below, you will find a discussion of some of the key types of pond ecosystem.

**1. Salt Ponds:** Salt ponds contain brackish (salty) water and can occur close to the sea side where waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools. It is also possible to find salt ponds inland, thanks to the presence of brackish streams created through streams flowing through salty rocks.

**2. Garden Ponds:** These artificially created ponds can contain ornamental plant and animal species that come from all over the world.

**3. Freshwater Pools:** Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground. They can be home to fish, birds, amphibians, crustaceans and many other kinds of wildlife.

**4. Vernal Pools:** Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they appear and at other times of the year will be relatively deserted – one example for instance is a seasonal oasis in the desert. These types of pond ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of year.

**5. Underground Ponds.** Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens and so on.

## MEANING OF POND ECOSYSTEM:

A pond ecosystem is a system of organisms that live together in a pond. A pond ecosystem can be defined in three ways:

1. A closed community of organisms in a body of water.
2. An enclosed body of water that houses numerous different creatures.

3. A biological system that includes water and plant and animal life interacting with each other.

So, to summarize, a pond ecosystem is:

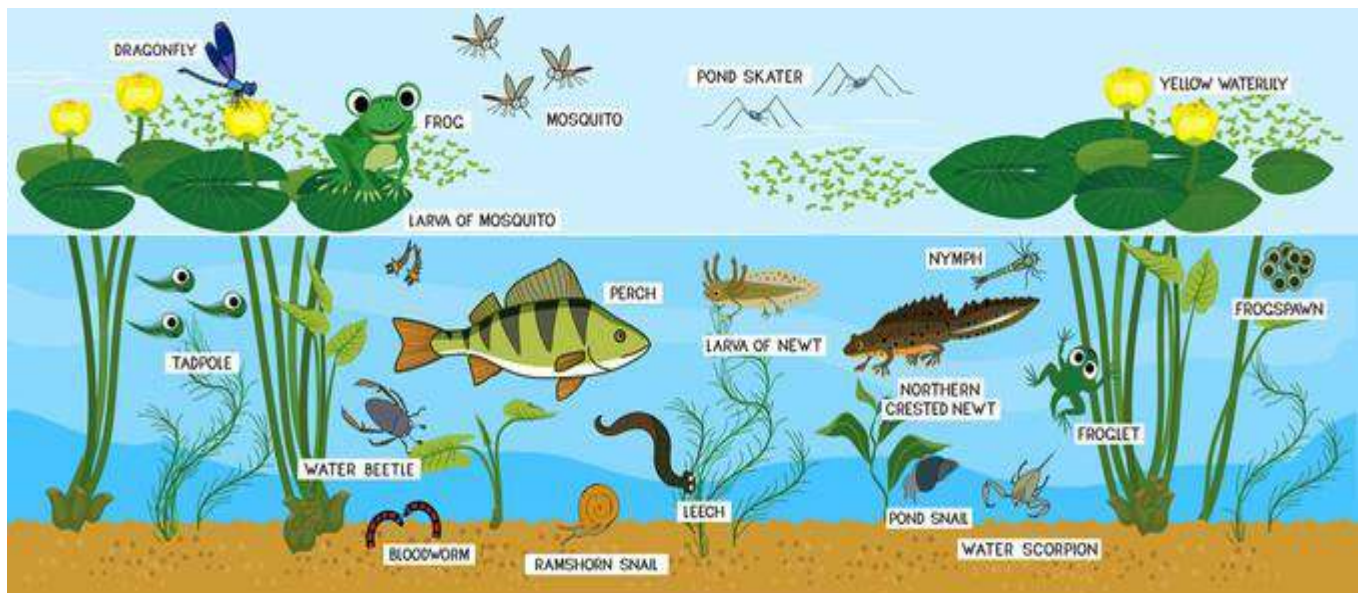
- A community of organisms living together...
- Within a body of water that can be either...
- Artificially enclosed or....
- Naturally enclosed.
- A distinct community with its own ecology.

### CHARACTERISTICS OF POND ECOSYSTEM:

There are several things that mark pond ecosystems out from other types of ecosystems. Below, you will find a list of some of the main features of these ecosystems.

- 1. Still waters:** pond ecosystems are lentic ecosystems – they involve stagnant or standing water.
- 2. Surrounded by banks:** by definition, pond ecosystems are surrounded by either artificial or natural banks.
- 3. Wet:** these ecosystems are wet and humid ones.
- 4. Different levels:** distinct communities of creatures will live at different levels of a pond. Crustaceans and fish may live at the lower level, for example, whilst birds and blooming plants may live towards the surface.
- 5. Variable in size:** some pond ecosystems can be very small (such as a rockpool) whilst others can be almost as large as a lake.

### POND ECOSYSTEM



shutterstock.com · 1941903688

### POND ZONE IDENTIFICATION:

On the basis of water depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

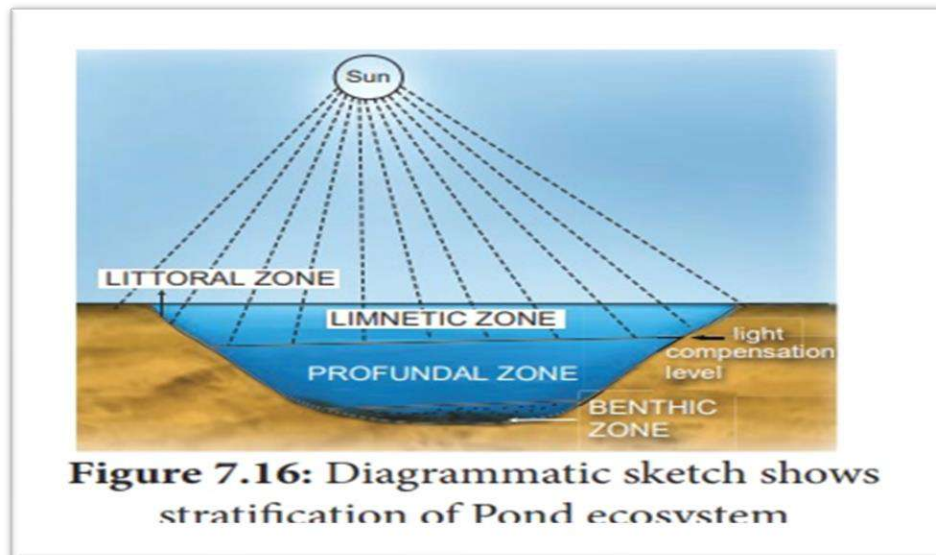
- I. Littoral
- II. limnetic

### III. Pro-fundal

### IV. Benthic.

**Littoral Zone** – The Littoral Zone is the shore area of the lake or pond. The littoral zone consists of the area from the dry land sloping to the open water and can be very narrow or very wide. Oligotrophic or young ponds have narrow littoral zones due to their steep sides and eutrophic or old ponds have wide littoral zones due to their gently sloping shoreline and sides. The littoral zone is shallow and gets a lot of nutrients from runoff and non-point source pollution. Therefore, it typically has an abundance of aquatic plant and algae growth. Some other common inhabitants of the littoral zone are cattails, reeds, crawfish, snails, insects, zooplankton, and small fish.

**II. Limnetic-Zone-** The Limnetic Zone is generally classified as the open water area of the lake or pond. This is a much larger section of water in oligotrophic or younger ponds and lakes than it is in eutrophic or older bodies of water. Within the limnetic zone are two separate sections. The upper portion of the limnetic zone near the surface of the water is the Euphotic Zone or Epilimnion (warm water region). This is the portion of water that receives sunlight. The zone ends where the sunlight fails to penetrate the water. The euphotic zone is where algae and other aquatic plants thrive (along with the littoral zone). This is the typical area of dense fish populations because oxygen levels are typically higher due to contact with the air.



**Figure 7.16: Diagrammatic sketch shows stratification of Pond ecosystem**

**III. Pro-fundal Zone-** It is the deep-water parts where there is no effective light penetration. The associated organisms are mussels, crab, worms etc. The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them.

**IV. Benthic Zone-** This is the bottom of the pond or lake and consists of organic sediments and soil. The benthic zone is the pond or lakes digestive system. This is where bacteria decompose organic matter from dead algae, aquatic plants, and fish and animal waste. The more organic matter in the pond, the more decomposition taking place. Decomposition can take place either aerobically (in the presence of oxygen) or anaerobically (without oxygen). It is much better to have aerobic decomposition because it is a faster process and the by products are easier to handle. The benthic zone increases as the pond or lake ages.

### COMPONENTS OF POND ECOSYSTEM:

Ponds get their energy from the sun. As with other ecosystems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide and water to organic

compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

Two main components of pond ecosystems are as follows-

I. Biotic component

II. Abiotic component

### **BIOTIC COMPONENT:**

#### **1. Producers:**

- **Phytoplankton**, literally “wandering plants,” are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants—they are protists!



- **Periphytic algae** are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.

- **Submerged plants** grow completely under water

- **Floating plants** include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.



- **Emergent plants** are rooted in shallow water but their stems and leaves are above water most of the time.

- **Shore plants** grow in wet soil at the edge of the pond.

## 2. Consumers:

- **Zooplankton** are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.

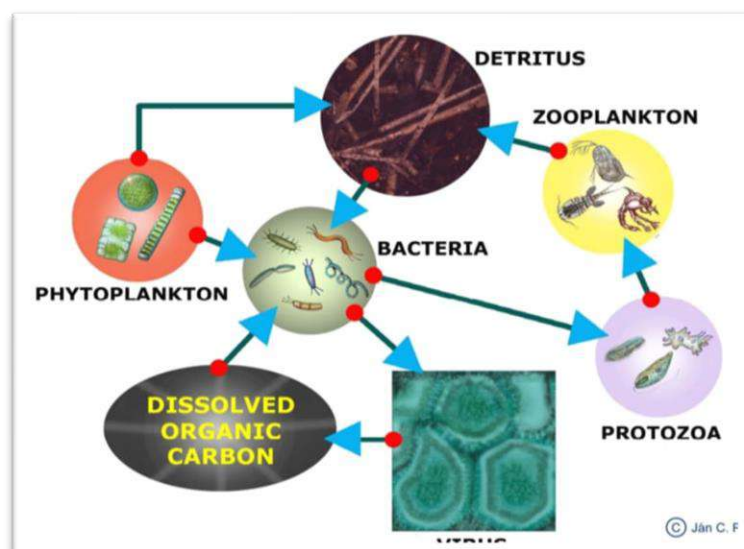
- **Invertebrates** include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

- **Vertebrates** are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles



## 3. Decomposers:

Animal waste and dead and decaying plants and animals form detritus on the bottom of the pond. Decomposers, also known as detritivores, are bacteria and other organisms that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide



### **ABIOTIC COMPONENT:**

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive. Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature. The change of seasons has an impact on the pond. Spring and Fall are the seasons that keep the ecosystem healthy and the risk of negative effects on the organisms that inhabit the environment very low.

### **IMPORTANCE OF POND ECOSYSTEM:**

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

#### **1. Biodiversity:**

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

#### **2. Ubiquity:**

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

#### **3. Abundance:**

Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

#### **4. Source of Hydration:**

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

#### **5. Beauty:**

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond, we can feel inspired, calm and in touch with nature.

## A BIG POND IN MY VILLAGE



### 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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions. Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems.

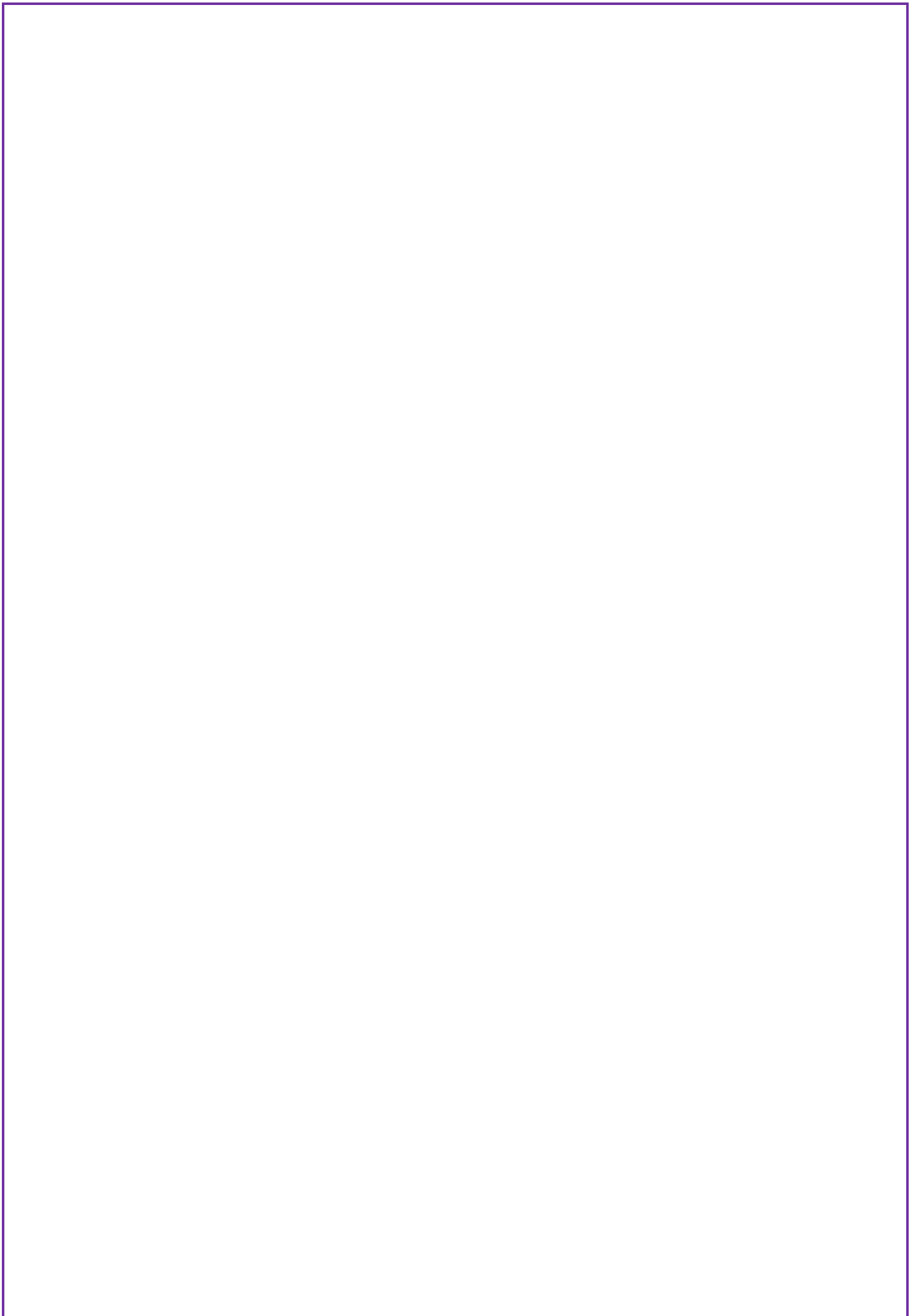
### ACKNOWLEDGEMENT:

I am highly indebted to all the professor of Environmental Science Department of our SCOTTISH CHURCH COLLEGE for their guidance and support. I am highly obliged to Dr JAYEETA CHOWDHURY, HOD of Physics, SCOTTISH CHURCH COLLEGE for her constant guidance and supervision. I would also like to express my gratitude towards batch mates for their help.

**Date: July 4,2021**

**Manik Barman**





# PROJECT REPORT

## SEMESTER II

COURSE: AECC2(Environmental Studies)

PROJECT TITLE: STUDY OF POND ECOSYSTEM

COLLEGE ROLL NO: PHSA20M591

CU REGISTRATION NO: 223-1112-0331-20

CU ROLL NO: 203223-21-0164

# INDEX

<u>TROPIC</u>	<u>PAGE NO</u>
Introduction	1
Types Of Pond Ecosystem	1
Meaning Of Pond Ecosystem	1-2
Characteristics Of Pond Ecosystem	2
Pond Zone Identification	2-3
Components Of Pond Ecosystem:	
A. Biotic Component	4-5
B. Abiotic Component	6
Importance Of Pond Ecosystem	6
Conclusion	7
Acknowledgement	7

## INTRODUCTION:

A pond is either a natural or an artificial body of water that is enclosed. Ponds can occur naturally in the world or they can be human made (such as a garden pond). An ecosystem is the technical term for a community of organisms. For such a community to form an ecosystem, it needs to be a distinct system where the organisms live and interact. Pond Ecosystem is differed from other water ecosystems. Unlike the river ecosystem, which is categorized under the Lotic systems, pond ecosystem falls under the Lentic ecosystem for the reason that the water remains stagnant in ponds for a relatively longer period time. A pond ecosystem refers to the freshwater ecosystem where there are communities of organisms that are dependent on each other and with the prevailing water environment for their nutrients and survival. Usually, ponds are shallow (hardly 12 – 15 feet) water bodies in which sunlight can reach to its bottom, permitting the growth of the plants that grow there.

## TYPES OF POND ECOSYSTEM:

Ponds can come in many different forms, and they all have their own differentiating characteristics. Below, you will find a discussion of some of the key types of pond ecosystem.

**1. Salt Ponds:** Salt ponds contain brackish (salty) water and can occur close to the sea side where waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools. It is also possible to find salt ponds inland, thanks to the presence of brackish streams created through streams flowing through salty rocks.

**2. Garden Ponds:** These artificially created ponds can contain ornamental plant and animal species that come from all over the world.

**3. Freshwater Pools:** Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground. They can be home to fish, birds, amphibians, crustaceans and many other kinds of wildlife.

**4. Vernal Pools:** Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they appear and at other times of the year will be relatively deserted – one example for instance is a seasonal oasis in the desert. These types of pond ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of year.

**5. Underground Ponds.** Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens and so on.

## MEANING OF POND ECOSYSTEM:

A pond ecosystem is a system of organisms that live together in a pond. A pond ecosystem can be defined in three ways:

1. A closed community of organisms in a body of water.
2. An enclosed body of water that houses numerous different creatures.

3. A biological system that includes water and plant and animal life interacting with each other.

So, to summarize, a pond ecosystem is:

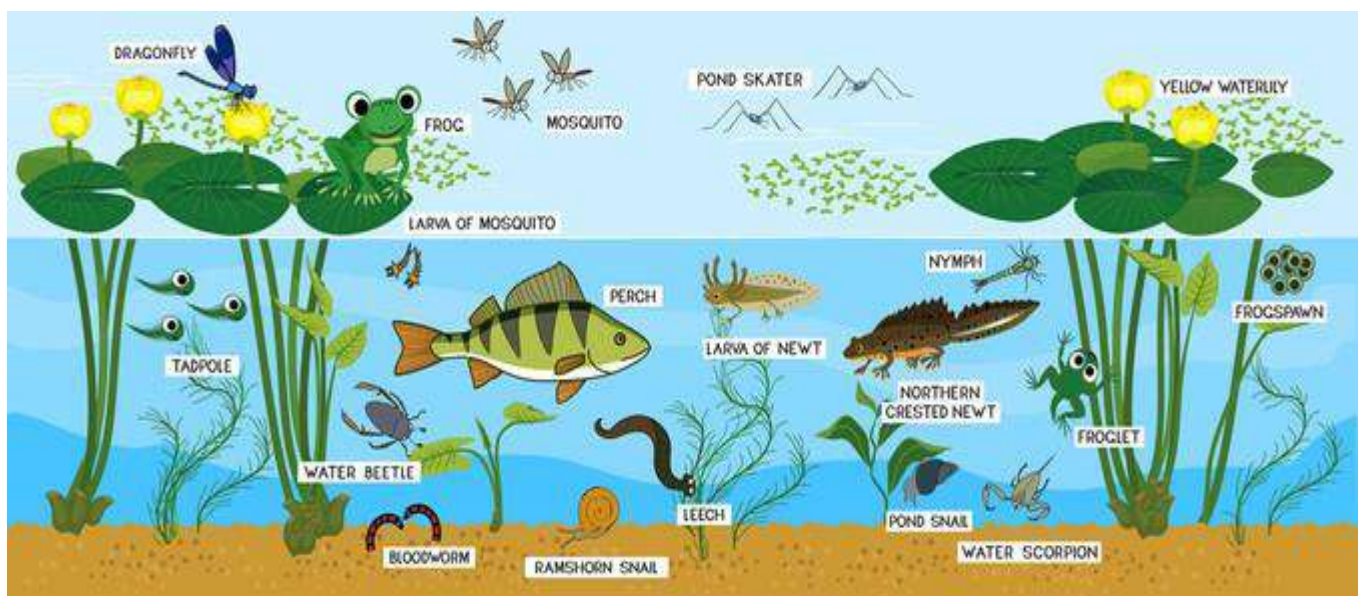
- A community of organisms living together...
- Within a body of water that can be either...
- Artificially enclosed or....
- Naturally enclosed.
- A distinct community with its own ecology.

### CHARACTERISTICS OF POND ECOSYSTEM:

There are several things that mark pond ecosystems out from other types of ecosystems. Below, you will find a list of some of the main features of these ecosystems.

- 1. Still waters:** pond ecosystems are lentic ecosystems – they involve stagnant or standing water.
- 2. Surrounded by banks:** by definition, pond ecosystems are surrounded by either artificial or natural banks.
- 3. Wet:** these ecosystems are wet and humid ones.
- 4. Different levels:** distinct communities of creatures will live at different levels of a pond. Crustaceans and fish may live at the lower level, for example, whilst birds and blooming plants may live towards the surface.
- 5. Variable in size:** some pond ecosystems can be very small (such as a rockpool) whilst others can be almost as large as a lake.

### POND ECOSYSTEM



shutterstock.com · 1941903688

### POND ZONE IDENTIFICATION:

On the basis of water depth and types of vegetation and animals there may be three zones in a lake or pond. The different zones are as follows:

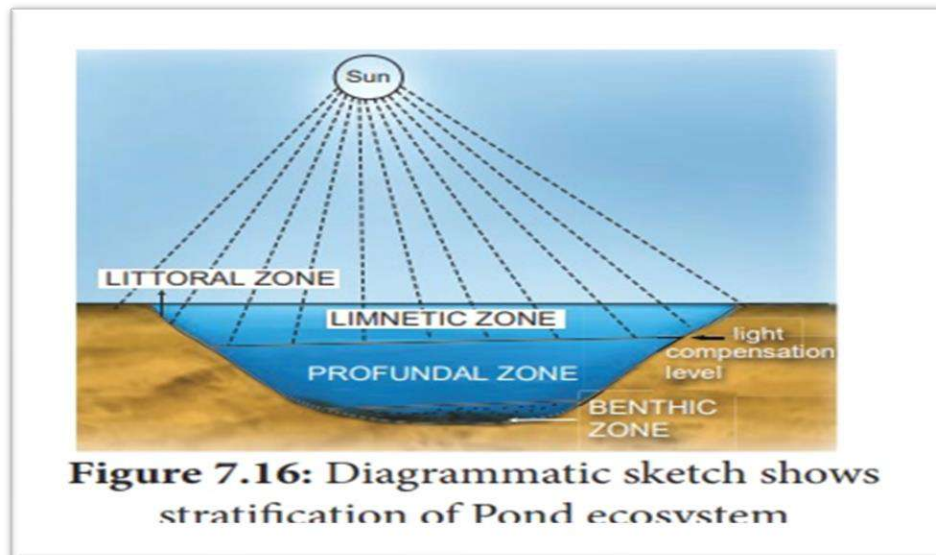
- I. Littoral
- II. limnetic

### III. Pro-fundal

### IV. Benthic.

**Littoral Zone** – The Littoral Zone is the shore area of the lake or pond. The littoral zone consists of the area from the dry land sloping to the open water and can be very narrow or very wide. Oligotrophic or young ponds have narrow littoral zones due to their steep sides and eutrophic or old ponds have wide littoral zones due to their gently sloping shoreline and sides. The littoral zone is shallow and gets a lot of nutrients from runoff and non-point source pollution. Therefore, it typically has an abundance of aquatic plant and algae growth. Some other common inhabitants of the littoral zone are cattails, reeds, crawfish, snails, insects, zooplankton, and small fish.

**II. Limnetic-Zone-** The Limnetic Zone is generally classified as the open water area of the lake or pond. This is a much larger section of water in oligotrophic or younger ponds and lakes than it is in eutrophic or older bodies of water. Within the limnetic zone are two separate sections. The upper portion of the limnetic zone near the surface of the water is the Euphotic Zone or Epilimnion (warm water region). This is the portion of water that receives sunlight. The zone ends where the sunlight fails to penetrate the water. The euphotic zone is where algae and other aquatic plants thrive (along with the littoral zone). This is the typical area of dense fish populations because oxygen levels are typically higher due to contact with the air.



**III. Pro-fundal Zone-** It is the deep-water parts where there is no effective light penetration. The associated organisms are mussels, crab, worms etc. The organisms inhabiting this freshwater ecosystem include algae, fungi, microorganisms, plants and fish. These organisms can be further classified as producers, consumers and decomposers, based on their mode of obtaining nutrition. The energy in an ecosystem flows from the producers to the consumers. Decomposers, on the other hand, get nutrients from the dead organisms by decomposing them.

**IV. Benthic Zone-** This is the bottom of the pond or lake and consists of organic sediments and soil. The benthic zone is the pond or lakes digestive system. This is where bacteria decompose organic matter from dead algae, aquatic plants, and fish and animal waste. The more organic matter in the pond, the more decomposition taking place. Decomposition can take place either aerobically (in the presence of oxygen) or anaerobically (without oxygen). It is much better to have aerobic decomposition because it is a faster process and the by products are easier to handle. The benthic zone increases as the pond or lake ages.

### COMPONENTS OF POND ECOSYSTEM:

Ponds get their energy from the sun. As with other ecosystems, plants are the primary producers. The chlorophyll in aquatic plants captures energy from the sun to convert carbon dioxide and water to organic

compounds and oxygen through the process of photosynthesis. Nitrogen and phosphorus are important nutrients for plants. The addition of these substances may increase primary productivity. However, too many nutrients can cause algal blooms, leading to eutrophication.

Two main components of pond ecosystems are as follows-

I. Biotic component

II. Abiotic component

### **BIOTIC COMPONENT:**

#### **1. Producers:**

• **Phytoplankton**, literally “wandering plants,” are microscopic algae that float in the open water and give it a green appearance. They carry out photosynthesis using carbon dioxide that is dissolved in the water and release oxygen that is used by the bacteria and animals in the pond. Phytoplankton are not actually plants—they are protists!



• **Periphytic algae** are microscopic algae that attach themselves to substrates and give the rocks and sticks a greenish brown slimy appearance. They also carry out photosynthesis and produce oxygen, often near the bottom of the pond where it can be used by decomposers.

• **Submerged plants** grow completely under water

• **Floating plants** include plants that float on the surface and plants that are rooted on the bottom of the pond but have leaves and/or stems that float.



- **Emergent plants** are rooted in shallow water but their stems and leaves are above water most of the time.

- **Shore plants** grow in wet soil at the edge of the pond.

## 2. Consumers:

- **Zooplankton** are microscopic animals that eat phytoplankton or smaller zooplankton. Some are single-celled animals, tiny crustaceans, or tiny immature stages of larger animals. Zooplankton float about in the open water portions of the pond and are important food for some animals.

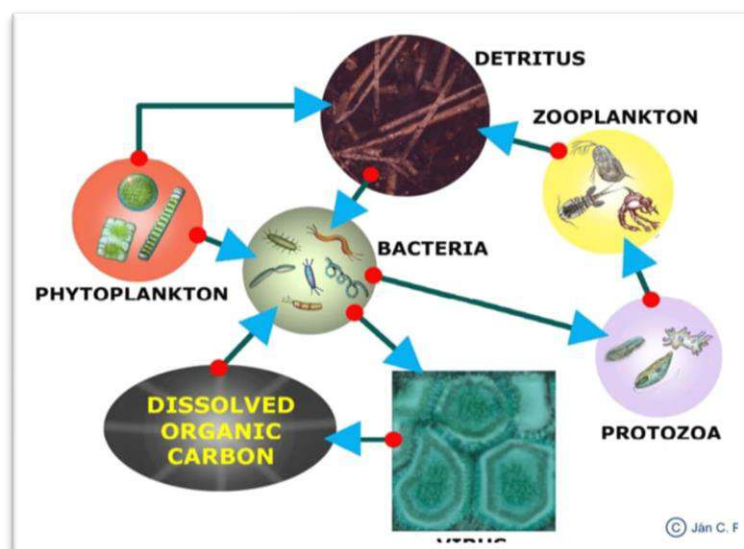
- **Invertebrates** include all animals without backbones. Macroinvertebrates are big enough to be seen with the naked eye. Some of them are only found in clean water.

- **Vertebrates** are animals with backbones. In a pond these might include fish, frogs, salamanders, and turtles



## 3. Decomposers:

Animal waste and dead and decaying plants and animals form detritus on the bottom of the pond. Decomposers, also known as detritivores, are bacteria and other organisms that break down detritus into material that can be used by primary producers, thus returning the detritus to the ecosystem. As this material decomposes it can serve as a food resource for microbes and invertebrates. During decay microbes living on detritus can pull nutrients from the overlying water thus acting to improve water quality. In the process of breaking down detritus, decomposers produce water and carbon dioxide





### **ABIOTIC COMPONENT:**

Abiotic factors are non-living factors that can have an impact on the ecosystem. The main factors of ponds include water quality, temperature, light, soil, and seasonal change. Water is an important abiotic factor. The quality of water is crucial for living organisms in the pond. The temperature could impact the ecosystem if they are at the extremes. Water that is too hot will not have as much oxygen for the fish and they will in return become weak and prone to parasites and diseases. Too low of a water temperature also puts the aquatic ecosystem under stress and the fish can die off in large amounts. pH is also taken into consideration because too low or too high of acidity in the water can clog a fish's gills and reproduction will be more challenging. The lay of the land and the soil is of importance as well. The soil needs to contain enough moisture to keep the surrounding plants alive. If the soil or ground is dry, it is less likely to sustain a live or growing plant in comparison to moist, fertile soil that will help the plant stay alive. Light is also an abiotic factor in this ecosystem. The plants need light for photosynthesis so they can produce oxygen not only above the water but below as well to sustain healthy oxygen levels for aquatic organisms. Fish also need light in the form of heat from the sun to keep the water at a regular temperature. The change of seasons has an impact on the pond. Spring and Fall are the seasons that keep the ecosystem healthy and the risk of negative effects on the organisms that inhabit the environment very low.

### **IMPORTANCE OF POND ECOSYSTEM:**

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them. Below, you will find some significant reasons why this is the case.

#### **1. Biodiversity:**

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

#### **2. Ubiquity:**

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

#### **3. Abundance:**

Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

#### **4. Source of Hydration:**

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

#### **5. Beauty:**

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond, we can feel inspired, calm and in touch with nature.

## A BIG POND IN MY VILLAGE



### **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. This includes pond ecosystems which, as we have seen, can come in many different shapes and forms and can perform many different functions. Unfortunately, the world's pond ecosystems are being threatened by many factors. These include the drainage of wetlands for industrial purposes, pollution, urban sprawl and global warming which is changing the face of the planet and its weather systems. So, it is up to us right now to do all that we can to look after these beautiful and significant ecosystems.

### **ACKNOWLEDGEMENT:**

I am highly indebted to all the professor of Environmental Science Department of our SCOTTISH CHURCH COLLEGE for their guidance and support. I am highly obliged to Dr JAYEETA CHOWDHURY, HOD of Physics, SCOTTISH CHURCH COLLEGE for her constant guidance and supervision. I would also like to express my gratitude towards batch mates for their help.

**Date: July 4,2021**

**Manik Barman**



# PROJECT REPORT

Checked  
25 out of  
30

Semester II

Course: AECC II (Environmental Studies)

**STUDY OF COMMON BIRDS, INSECTS, MAMMALS, FISH, PLANTS,  
AND BASIC PRINCIPLES OF IDENTIFICATION.**

College Roll No.- PHSA20M597

CU Registration No.- 223-1112-0360-20

CU Roll No.- 203223-21-0165

## Contents:

1. Acknowledgement
2. Introduction
3. Observations
  - Plants
  - Fish
  - Insects
  - Birds
  - Mammals
4. Conclusion

## Acknowledgement

I am very grateful to the Environmental Sciences professors whose guidance and teaching helped me a great deal during the making of this project report. I would also like to express my gratitude to Dr. Jayeeta Chowdhury, the head of department of physics at Scottish Church College for her guidance and supervision. Lastly, I would like to thank my class mates who helped a great deal to make this report.

Date: 4<sup>th</sup> July, 2021

Aritrajit Raha.

## INTRODUCTION:

I. PLANTS: Plants are essential to all other life on planet Earth. They form the basis of almost every food chain and food web. Most plants are autotrophic, creating their own food by the use of sunlight, water and carbon dioxide via a process known as 'photosynthesis'. Some of the earliest plant fossils have been aged at around 3.8 billion years old, thus proving that plants have been around for longer than most other organisms. The idea of 'plant' which was once used to describe anything green and not an animal has now been divided into kingdoms; mainly being Protista, Fungi and Plantae.

II. INSECTS: Insects are a class under the Phylum Arthropoda. They are small invertebrates with a hard protective exoskeleton. Insects are the largest group of animals known to man with a staggering approximate 900 thousand species that have been identified. New species of insects are continually being discovered and scientists estimate the number of undiscovered insect species to be from 2 million to around 30 million. Insects are six-legged creatures and most possess wings. They are the first creatures to have attained the ability to fly. Insects are found all over the world, and in most percentage in tropical regions.

III. FISH: Fish are aquatic, craniate, gill-bearing animals that lack limbs with digits. The earliest organisms that can be classified as fish were soft-bodied chordates that first appeared during the beginning of the Palaeozoic era. Although they lacked a true spine, they possessed notochords which allowed them to be more agile than their invertebrate counterparts. Many fish of the Palaeozoic developed external armour that protected them from predators. The first fish with jaws appeared around 444 million years ago after which many such as sharks became formidable marine predators. Most fish are cold-blooded. With 34,300 described species, fish exhibit greater species diversity than any other group of vertebrates.

IV. BIRDS: Birds are a group of warm-blooded vertebrates constituting the class Aves, characterised by feathers, toothless beaked jaws, the laying of

hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton. Birds live worldwide and range in size from the 5.5 cm (2.2 in) bee hummingbird to the 2.8 m (9 ft 2 in) ostrich. There are about ten thousand living species of birds. The digestive and respiratory systems of birds are also uniquely adapted for flight. Some bird species of aquatic environments have further evolved for swimming. Birds are descendants of the primitive avialans which first appeared about 160 million years ago.

V. MAMMALS: Mammals are a group of vertebrate animals constituting the class Mammalia. Mammals are characterized by mammary glands present in females that produce milk for young ones. Mammals give birth by a process known as 'parturition', i.e. the foetus is developed inside the womb of the mother and is delivered fully developed. These characteristics distinguish mammals from most other creatures that lay eggs. Mammals first appeared around 323 million years ago. The most abundant mammals on Earth are human beings (*Homo sapiens*) and the largest known mammals are marine mammals, Blue whales (*Balaenoptera musculus*).



## OBSERVATIONS:

### 1. PLANTS

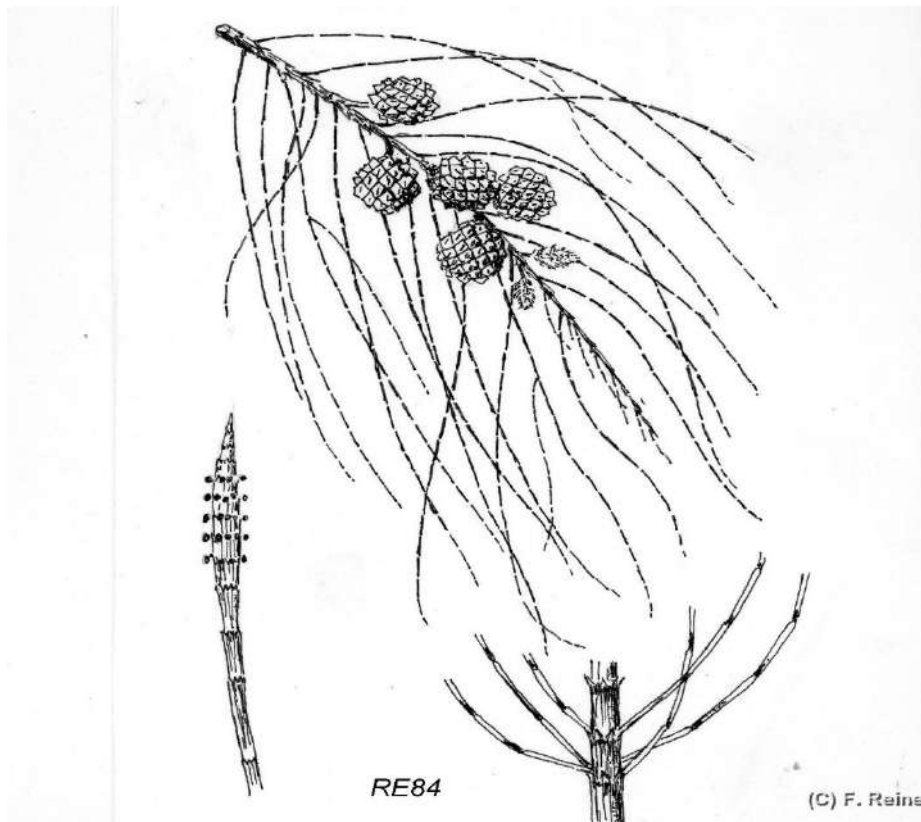
- **Sal Tree.**

- Vernacular Name: Sal, Sarai
- Scientific Name: *Shorea Robusta*
- Distribution: This tree is native to the Indian subcontinent, ranging south of the Himalaya, from Myanmar in the east to Nepal, India and Bangladesh. In India, it extends from Assam, Bengal, Odisha and Jharkhand west to the Shivalik Hills in Haryana, east of the Yamuna. The range also extends through the Eastern Ghats and to the eastern Vindhya and Satpura ranges of central India. It is often the dominant tree in the forests where it occurs.
- Characteristics: Sal is moderate to slow growing, and can attain heights of 30 to 35 m and a trunk diameter of up to 2-2.5 m. The leaves are 10–25 cm long and 5–15 cm broad. In wetter areas, Sal is evergreen; in drier areas, it is dry-season deciduous, shedding most of the leaves in between February to April, leafing out again in April and May.



- **Casuarina Tree.**

- i. Vernacular Name: Jungli Jhao, Bilati Jhao.
- ii. Scientific Name: *Casuarina Equisetifolia*.
- iii. Distribution: The casuarinas tree has been cultivated all through the South India to retrieve the sandy seashore. In the North Kannada and particularly along the Coromandel Coast, it grows extensively for fuel. It can make a good, solid hedge if one plants it closely and keeps it low. People in the coastal districts and inland regions often use this tree as a roadside or garden tree as it is an enormously decorative and useful tree. In fact gardeners cultivate it as a hot-house plant to meet the decorative purposes only.
- iv. Characteristics: The Casuarina Tree is a large fast growing evergreen tree that has small cones and big, straight stem. This tree is a quick-growing one and attains a height of about 40 m and has a diameter of about 60 cm. The tree is short lived and its natural span of life seldom exceeds 50 years. The casuarina tree is a hardy tree and the sandy-soil of the sea-coast areas is most suitable for the tree. It grows well in both Southwest and North East monsoons.



## 2. FISH

- **Rohu.**

- Vernacular Name: Rui
- Scientific Name: *Labeo Rohita*
- Distribution: The rohu occurs in rivers throughout much of northern and central and eastern India, Pakistan, Vietnam, Bangladesh, Nepal and Myanmar, and has been introduced into some of the rivers of Peninsular India and Sri Lanka.
- Characteristics: The rohu is a large, silver-colored fish of typical cyprinid shape, with a conspicuously arched head. Adults can reach a maximum weight of 45 kg (99 lb) and maximum length of 2 m (6.6 ft), but average around  $\frac{1}{2}$  m (1.6 ft).

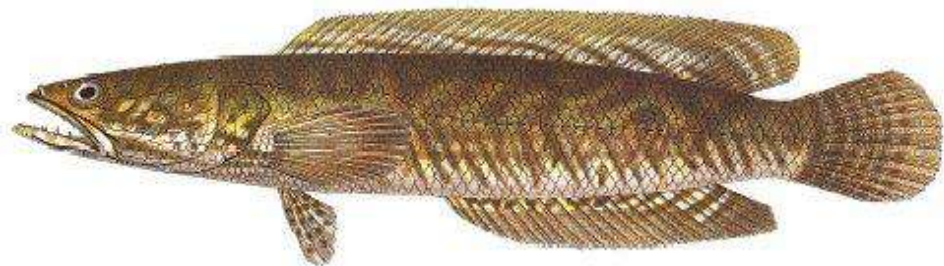


- **Mudfish**

- Vernacular Name: Shol
- Scientific Name: *Channa Striata*
- Distribution: It has a widespread range covering southern China, Pakistan, most of India, southern Nepal, Bangladesh, Sri Lanka, and most

of Southeast Asia. It has more recently been introduced to the outermost parts of Indonesia, the Philippines, and Mauritius. The only currently confirmed Hawaiian establishment of *C. striata* is on a commercial fish farm.

- iv. Characteristics: It is an important food fish in its entire native range, and is of considerable economic importance. Adults are dark brown in colour with faint black bands visible across its entire body. Males and females both help to construct a nest out of water vegetation during breeding time. Eggs are guarded by both parents. Fry are reddish orange and are guarded by both parents until they turn greenish brown at around 5–6 cm. It is common in freshwater plains, where it migrates from rivers and lakes into flooded fields, returning to the permanent water bodies in the dry season, where it survives by burrowing in the mud. It preys on frogs, water bugs, and smaller fish, and it will attack anything moving when breeding.



### 3. INSECTS

- **Tree Cricket**

- i. Vernacular Name: Tree Cricket
- ii. Scientific Name: *Oecanthinae*
- iii. Distribution: They live in trees and shrubs, for which they are well camouflaged. These crickets are nocturnal and can be found on every continent except Antarctica. In Europe, tree crickets have been expanding northwards and had reached the island of Jersey in the Channel Islands by 2010. In August 2015, the first population was found in mainland

England at Dungeness in Kent, where hundreds of males were present.

- iv. Characteristics: Tree crickets as well as most other crickets have two pairs of wings. The fore wings are located closer to the head and are hard and leathery in appearance. The hind wings are located aft of the fore wings and are the wings it uses for flight. When the cricket is not in flight the fore wings fold back to cover the hind wings. The bodies of tree crickets are long and skinny with a coloration that matches their habitat. They have large powerful legs used for jumping. Their heads contain two antennae which can sense both touch and odor and compound eyes which are inherent in all Orthoptera.



- **Stick Insects**

- i. Common Name: Stick Insects
- ii. Scientific Name: *Phasmatodea*
- iii. Distribution: Phasmatodea can be found all over the world except for the Antarctic and Patagonia. They are most numerous in the tropics and subtropics. The greatest diversity is found in Southeast Asia and South America, followed by Australia, Central America, and the southern United States. Over 300 species are known from the island of Borneo, making it the richest place in the world for Phasmatodea.

- iv. Characteristics: Phasmids can be relatively large, ranging from 1.5 centimetres (0.6 in) to over 63 centimetres (25 in) in length. Females of the genus *Phryganistria* are the world's longest insects, measuring up to 64 centimetres (25 in) in total length in the case of an undescribed species, including the outstretched legs. The heaviest species of phasmid is likely to be *Heteropteryx dilatata*, the females of which may weigh as much as 65 g (2.3 oz).



#### 4. BIRDS

- **Indian Peafowl:**

- i. Vernacular Name: Peacock
- ii. Scientific Name: *Pavo Cristatus*
- iii. Distribution: The Indian peafowl is a resident breeder across the Indian subcontinent and inhabits the drier lowland areas of Sri Lanka. In the Indian subcontinent, it is found mainly below an elevation of 1,800 m (1.1 mi) and in rare cases seen at about 2,000 m (1.2 mi). It is found in moist and dry-deciduous forests, but can adapt to live in cultivated regions and around human habitations and is

usually found where water is available. In many parts of northern India, they are protected by religious practices and will forage around villages and towns for scraps. Some have suggested that the peacock was introduced into Europe by Alexander the Great, while others say the bird had reached Athens by 450 BCE and may have been introduced even earlier. It has since been introduced in many other parts of the world and has become feral in some areas.

- iv. Characteristics: Peacocks are a larger sized bird with a length from bill to tail of 100 to 115 cm (39 to 45 in) and to the end of a fully grown train as much as 195 to 225 cm (77 to 89 in) and weigh 4–6 kg (8.8–13.2 lb). The females, or peahens, are smaller at around 95 cm (37 in) in length and weigh 2.75–4 kg (6.1–8.8 lb). Indian peafowl are among the largest and heaviest representatives of the Phasianidae.



- **Indian Spot-Billed Duck**

- i. Common Name: Indian Spot Billed Duck
- ii. Scientific Name: *Anas poecilorhyncha*
- iii. Distribution: This duck is a resident throughout Pakistan and India in freshwater wetlands. They

tend to avoid very large patches of open water and prefer medium-sized wetlands with vegetation cover. Some individuals may however migrate as a bird ringed at Bharatpur in Rajasthan on 5 December 1969 was recovered near Novosibirsk in August 1970. It is quite gregarious outside the breeding season and forms small flocks. The northernmost populations have expanded their range northwards by more than 500 km since the early 20th century, possibly in reaction to global warming.

- iv. Characteristics: This duck is around the same size as a mallard and has a scaly patterned body with a green speculum bordered by white. At rest the white stripe stands out and the long neck and the bill with yellow tip and orange red spots at the base are distinctive in the nominate subspecies. The red spots at the base of the bills are absent in *haringtoni*. It measures 55–63 cm (22–25 in) in length and 83–95 cm (33–37 in) across the wings, with a body mass of 790–1,500 g (1.74–3.31 lb). These are mainly grey ducks with a paler head and neck and a black bill tipped bright yellow. The wings are whitish with black flight feathers below, and from above show a white-bordered green. The male has a red spot on the base of the bill, which is absent or inconspicuous in the smaller but otherwise similar female. The male does not have an eclipse plumage. The legs and feet are bright orange to coral red. Juveniles are browner and duller than adults.





## 5. MAMMALS

- **Asiatic Lion**

- i. Vernacular Name: Lion
- ii. Scientific Name: *Panthera leo leo*
- iii. Distribution: In Saurashtra's Gir Forest, an area of 1,412.1 km<sup>2</sup> (545.2 sq mi) was declared as a sanctuary for Asiatic lion conservation in 1965. This sanctuary and the surrounding areas are the only habitats supporting the Asiatic lion. After 1965, a national park was established covering an area of 258.71 km<sup>2</sup> (99.89 sq mi) where human activity is not allowed. In the surrounding sanctuary only Maldharis have the right to take their livestock for grazing. Lions inhabit remnant forest habitats in the two hill systems of Gir and Girnar that comprise Gujarat's largest tracts of tropical and subtropical dry broadleaf forests, thorny forest and savanna, and provide valuable habitat for a diverse flora and fauna.
- iv. Characteristics: The Asiatic lion's fur ranges in colour from ruddy-tawny, heavily speckled with black, to sandy or buffish grey, sometimes with a silvery sheen in certain lighting. Males have only moderate mane growth at the top of the head, so that their ears are always visible. The mane is scanty on the cheeks and throat, where it is only 10 cm (3.9 in) long. About half of Asiatic lions' skulls from the Gir forest have divided infraorbital foramina, whereas African lions have only one foramen on either side. The sagittal crest is more strongly developed, and the post-orbital area is shorter than in African lions. Skull length in adult males ranges from 330 to 340 mm (13 to 13 in), and in females, from 292 to 302 mm (11.5 to 11.9 in). It differs from the African lion by a larger tail tuft and less inflated auditory bullae. The most striking morphological character of the Asiatic lion is a longitudinal fold of skin running along its belly.



- **Sloth Bear**

- i. Common Name: Sloth Bear
- ii. Scientific Name: *Melursus ursinus*
- iii. Distribution: The sloth bear's global range includes India, the Terai of Nepal, temperate climatic zones of Bhutan and Sri Lanka. It occurs in a wide range of habitats including moist and dry tropical forests, savannahs, scrublands and grasslands below 1,500 m (4,900 ft) on the Indian subcontinent, and below 300 m (980 ft) in Sri Lanka's dry forests. It is regionally extinct in Bangladesh.
- iv. Characteristics: Sloth bears adults are a medium-sized species though weight can range variously from 55 to 105 kg (121 to 231 lb) in typically-sized females and from 80 to 145 kg (176 to 320 lb) in typically-sized males. Exceptionally large specimens of females can scale up to 124 kg (273 lb) and males up to 192 kg (423 lb). The average weight of sloth bears from the nominate subspecies in Nepal was 95 kg (209 lb) in females and 114 kg (251 lb) in males. Nominate bears in India were found to weigh average 93.2 kg (205 lb) in males and 83.3 kg (184 lb) in female per one study. Specimens from Sri Lanka (*M. u. inornatus*) may weigh up to 68.2 kg (150 lb) in

females and 104.5 kg (230 lb) in males. However six Sri Lankan male sloth bears averaged only 74.8 kg (165 lb) and 57.5 kg (127 lb) was the average for four females, so Sri Lankan bears could be up to at least 30% lighter in body mass than nominate race bears and with apparent far more pronounced size sexual dimorphism. They are 60–92 cm (2 ft 0 in–3 ft 0 in) high at the shoulder, and have a body length of 1.4–1.9 m (4 ft 7 in–6 ft 3 in). Besides being smaller than males, females reportedly typically have more fur between their shoulders.



## Conclusion

For this project I have chosen common plants, birds, insects, and fish found in West Bengal and common mammals found all over India. Thus this project presents an account of some common plants, birds, insects, fishes and mammals and their identification and characteristics.

# **PROJECT REPORT**

Semester II

Course: AECC II (Environmental Studies)

## **STUDY OF COMMON BIRDS, INSECTS, MAMMALS, FISH, PLANTS, AND BASIC PRINCIPLES OF IDENTIFICATION.**

College Roll No.- PHSA20M597

CU Registration No.- 223-1112-0360-20

CU Roll No.- 203223-21-0165

## Contents:

1. Acknowledgement
2. Introduction
3. Observations
  - Plants
  - Fish
  - Insects
  - Birds
  - Mammals
4. Conclusion

## Acknowledgement

I am very grateful to the Environmental Sciences professors whose guidance and teaching helped me a great deal during the making of this project report. I would also like to express my gratitude to Dr. Jayeeta Chowdhury, the head of department of physics at Scottish Church College for her guidance and supervision. Lastly, I would like to thank my class mates who helped a great deal to make this report.

Date: 4<sup>th</sup> July, 2021

Aritrajit Raha.

## INTRODUCTION:

I. PLANTS: Plants are essential to all other life on planet Earth. They form the basis of almost every food chain and food web. Most plants are autotrophic, creating their own food by the use of sunlight, water and carbon dioxide via a process known as 'photosynthesis'. Some of the earliest plant fossils have been aged at around 3.8 billion years old, thus proving that plants have been around for longer than most other organisms. The idea of 'plant' which was once used to describe anything green and not an animal has now been divided into kingdoms; mainly being Protista, Fungi and Plantae.

II. INSECTS: Insects are a class under the Phylum Arthropoda. They are small invertebrates with a hard protective exoskeleton. Insects are the largest group of animals known to man with a staggering approximate 900 thousand species that have been identified. New species of insects are continually being discovered and scientists estimate the number of undiscovered insect species to be from 2 million to around 30 million. Insects are six-legged creatures and most possess wings. They are the first creatures to have attained the ability to fly. Insects are found all over the world, and in most percentage in tropical regions.

III. FISH: Fish are aquatic, craniate, gill-bearing animals that lack limbs with digits. The earliest organisms that can be classified as fish were soft-bodied chordates that first appeared during the beginning of the Palaeozoic era. Although they lacked a true spine, they possessed notochords which allowed them to be more agile than their invertebrate counterparts. Many fish of the Palaeozoic developed external armour that protected them from predators. The first fish with jaws appeared around 444 million years ago after which many such as sharks became formidable marine predators. Most fish are cold-blooded. With 34,300 described species, fish exhibit greater species diversity than any other group of vertebrates.

IV. BIRDS: Birds are a group of warm-blooded vertebrates constituting the class Aves, characterised by feathers, toothless beaked jaws, the laying of



hard-shelled eggs, a high metabolic rate, a four-chambered heart, and a strong yet lightweight skeleton. Birds live worldwide and range in size from the 5.5 cm (2.2 in) bee hummingbird to the 2.8 m (9 ft 2 in) ostrich. There are about ten thousand living species of birds. The digestive and respiratory systems of birds are also uniquely adapted for flight. Some bird species of aquatic environments have further evolved for swimming. Birds are descendants of the primitive avialans which first appeared about 160 million years ago.

V. MAMMALS: Mammals are a group of vertebrate animals constituting the class Mammalia. Mammals are characterized by mammary glands present in females that produce milk for young ones. Mammals give birth by a process known as 'parturition', i.e. the foetus is developed inside the womb of the mother and is delivered fully developed. These characteristics distinguish mammals from most other creatures that lay eggs. Mammals first appeared around 323 million years ago. The most abundant mammals on Earth are human beings (*Homo sapiens*) and the largest known mammals are marine mammals, Blue whales (*Balaenoptera musculus*).

## OBSERVATIONS:

### 1. PLANTS

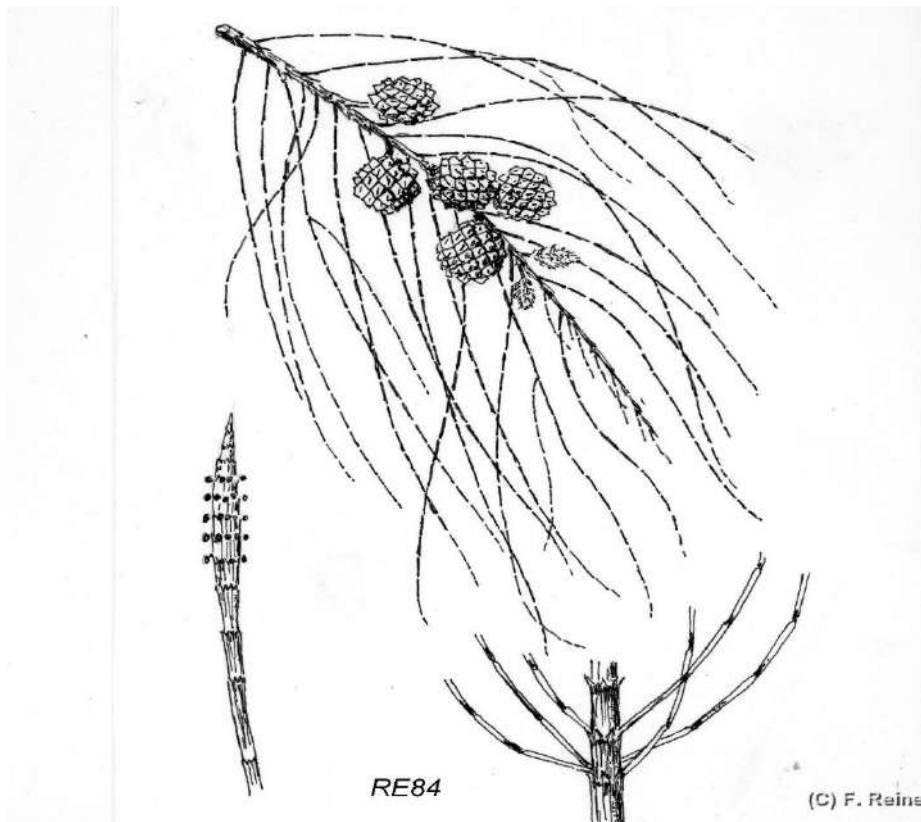
- **Sal Tree.**

- Vernacular Name: Sal, Sarai
- Scientific Name: *Shorea Robusta*
- Distribution: This tree is native to the Indian subcontinent, ranging south of the Himalaya, from Myanmar in the east to Nepal, India and Bangladesh. In India, it extends from Assam, Bengal, Odisha and Jharkhand west to the Shivalik Hills in Haryana, east of the Yamuna. The range also extends through the Eastern Ghats and to the eastern Vindhya and Satpura ranges of central India. It is often the dominant tree in the forests where it occurs.
- Characteristics: Sal is moderate to slow growing, and can attain heights of 30 to 35 m and a trunk diameter of up to 2-2.5 m. The leaves are 10–25 cm long and 5–15 cm broad. In wetter areas, Sal is evergreen; in drier areas, it is dry-season deciduous, shedding most of the leaves in between February to April, leafing out again in April and May.



- **Casuarina Tree.**

- i. Vernacular Name: Jungli Jhao, Bilati Jhao.
- ii. Scientific Name: *Casuarina Equisetifolia*.
- iii. Distribution: The casuarinas tree has been cultivated all through the South India to retrieve the sandy seashore. In the North Kannada and particularly along the Coromandel Coast, it grows extensively for fuel. It can make a good, solid hedge if one plants it closely and keeps it low. People in the coastal districts and inland regions often use this tree as a roadside or garden tree as it is an enormously decorative and useful tree. In fact gardeners cultivate it as a hot-house plant to meet the decorative purposes only.
- iv. Characteristics: The Casuarina Tree is a large fast growing evergreen tree that has small cones and big, straight stem. This tree is a quick-growing one and attains a height of about 40 m and has a diameter of about 60 cm. The tree is short lived and its natural span of life seldom exceeds 50 years. The casuarina tree is a hardy tree and the sandy-soil of the sea-coast areas is most suitable for the tree. It grows well in both Southwest and North East monsoons.



## 2. FISH

- **Rohu.**

- Vernacular Name: Rui
- Scientific Name: *Labeo Rohita*
- Distribution: The rohu occurs in rivers throughout much of northern and central and eastern India, Pakistan, Vietnam, Bangladesh, Nepal and Myanmar, and has been introduced into some of the rivers of Peninsular India and Sri Lanka.
- Characteristics: The rohu is a large, silver-colored fish of typical cyprinid shape, with a conspicuously arched head. Adults can reach a maximum weight of 45 kg (99 lb) and maximum length of 2 m (6.6 ft), but average around  $\frac{1}{2}$  m (1.6 ft).

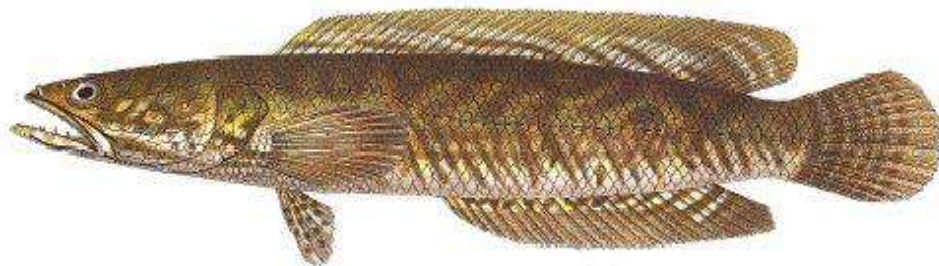


- **Mudfish**

- Vernacular Name: Shol
- Scientific Name: *Channa Striata*
- Distribution: It has a widespread range covering southern China, Pakistan, most of India, southern Nepal, Bangladesh, Sri Lanka, and most

of Southeast Asia. It has more recently been introduced to the outermost parts of Indonesia, the Philippines, and Mauritius. The only currently confirmed Hawaiian establishment of *C. striata* is on a commercial fish farm.

- iv. Characteristics: It is an important food fish in its entire native range, and is of considerable economic importance. Adults are dark brown in colour with faint black bands visible across its entire body. Males and females both help to construct a nest out of water vegetation during breeding time. Eggs are guarded by both parents. Fry are reddish orange and are guarded by both parents until they turn greenish brown at around 5–6 cm. It is common in freshwater plains, where it migrates from rivers and lakes into flooded fields, returning to the permanent water bodies in the dry season, where it survives by burrowing in the mud. It preys on frogs, water bugs, and smaller fish, and it will attack anything moving when breeding.



### 3. INSECTS

- **Tree Cricket**

- i. Vernacular Name: Tree Cricket
- ii. Scientific Name: *Oecanthinae*
- iii. Distribution: They live in trees and shrubs, for which they are well camouflaged. These crickets are nocturnal and can be found on every continent except Antarctica. In Europe, tree crickets have been expanding northwards and had reached the island of Jersey in the Channel Islands by 2010. In August 2015, the first population was found in mainland

England at Dungeness in Kent, where hundreds of males were present.

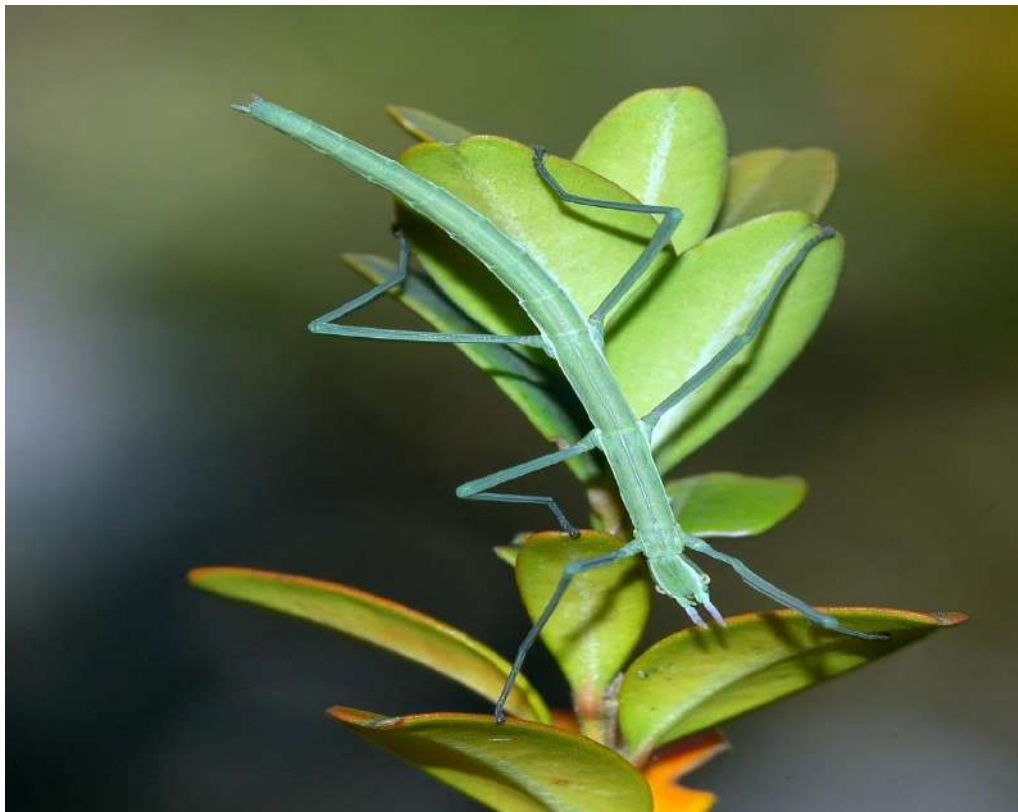
- iv. **Characteristics:** Tree crickets as well as most other crickets have two pairs of wings. The fore wings are located closer to the head and are hard and leathery in appearance. The hind wings are located aft of the fore wings and are the wings it uses for flight. When the cricket is not in flight the fore wings fold back to cover the hind wings. The bodies of tree crickets are long and skinny with a coloration that matches their habitat. They have large powerful legs used for jumping. Their heads contain two antennae which can sense both touch and odor and compound eyes which are inherent in all Orthoptera.



- **Stick Insects**

- i. **Common Name:** Stick Insects
- ii. **Scientific Name:** *Phasmatodea*
- iii. **Distribution:** Phasmatodea can be found all over the world except for the Antarctic and Patagonia. They are most numerous in the tropics and subtropics. The greatest diversity is found in Southeast Asia and South America, followed by Australia, Central America, and the southern United States. Over 300 species are known from the island of Borneo, making it the richest place in the world for Phasmatodea.

- iv. Characteristics: Phasmids can be relatively large, ranging from 1.5 centimetres (0.6 in) to over 63 centimetres (25 in) in length. Females of the genus *Phryganistria* are the world's longest insects, measuring up to 64 centimetres (25 in) in total length in the case of an undescribed species, including the outstretched legs. The heaviest species of phasmid is likely to be *Heteropteryx dilatata*, the females of which may weigh as much as 65 g (2.3 oz).



#### 4. BIRDS

- **Indian Peafowl:**

- i. Vernacular Name: Peacock
- ii. Scientific Name: *Pavo Cristatus*
- iii. Distribution: The Indian peafowl is a resident breeder across the Indian subcontinent and inhabits the drier lowland areas of Sri Lanka. In the Indian subcontinent, it is found mainly below an elevation of 1,800 m (1.1 mi) and in rare cases seen at about 2,000 m (1.2 mi). It is found in moist and dry-deciduous forests, but can adapt to live in cultivated regions and around human habitations and is

usually found where water is available. In many parts of northern India, they are protected by religious practices and will forage around villages and towns for scraps. Some have suggested that the peacock was introduced into Europe by Alexander the Great, while others say the bird had reached Athens by 450 BCE and may have been introduced even earlier. It has since been introduced in many other parts of the world and has become feral in some areas.

- iv. Characteristics: Peacocks are a larger sized bird with a length from bill to tail of 100 to 115 cm (39 to 45 in) and to the end of a fully grown train as much as 195 to 225 cm (77 to 89 in) and weigh 4–6 kg (8.8–13.2 lb). The females, or peahens, are smaller at around 95 cm (37 in) in length and weigh 2.75–4 kg (6.1–8.8 lb). Indian peafowl are among the largest and heaviest representatives of the Phasianidae.



- **Indian Spot-Billed Duck**

- i. Common Name: Indian Spot Billed Duck
- ii. Scientific Name: *Anas poecilorhyncha*
- iii. Distribution: This duck is a resident throughout Pakistan and India in freshwater wetlands. They



tend to avoid very large patches of open water and prefer medium-sized wetlands with vegetation cover. Some individuals may however migrate as a bird ringed at Bharatpur in Rajasthan on 5 December 1969 was recovered near Novosibirsk in August 1970. It is quite gregarious outside the breeding season and forms small flocks. The northernmost populations have expanded their range northwards by more than 500 km since the early 20th century, possibly in reaction to global warming.

- iv. Characteristics: This duck is around the same size as a mallard and has a scaly patterned body with a green speculum bordered by white. At rest the white stripe stands out and the long neck and the bill with yellow tip and orange red spots at the base are distinctive in the nominate subspecies. The red spots at the base of the bills are absent in *haringtoni*. It measures 55–63 cm (22–25 in) in length and 83–95 cm (33–37 in) across the wings, with a body mass of 790–1,500 g (1.74–3.31 lb). These are mainly grey ducks with a paler head and neck and a black bill tipped bright yellow. The wings are whitish with black flight feathers below, and from above show a white-bordered green. The male has a red spot on the base of the bill, which is absent or inconspicuous in the smaller but otherwise similar female. The male does not have an eclipse plumage. The legs and feet are bright orange to coral red. Juveniles are browner and duller than adults.



## 5. MAMMALS

- **Asiatic Lion**

- i. Vernacular Name: Lion
- ii. Scientific Name: *Panthera leo leo*
- iii. Distribution: In Saurashtra's Gir Forest, an area of 1,412.1 km<sup>2</sup> (545.2 sq mi) was declared as a sanctuary for Asiatic lion conservation in 1965. This sanctuary and the surrounding areas are the only habitats supporting the Asiatic lion. After 1965, a national park was established covering an area of 258.71 km<sup>2</sup> (99.89 sq mi) where human activity is not allowed. In the surrounding sanctuary only Maldharis have the right to take their livestock for grazing. Lions inhabit remnant forest habitats in the two hill systems of Gir and Girnar that comprise Gujarat's largest tracts of tropical and subtropical dry broadleaf forests, thorny forest and savanna, and provide valuable habitat for a diverse flora and fauna.
- iv. Characteristics: The Asiatic lion's fur ranges in colour from ruddy-tawny, heavily speckled with black, to sandy or buffish grey, sometimes with a silvery sheen in certain lighting. Males have only moderate mane growth at the top of the head, so that their ears are always visible. The mane is scanty on the cheeks and throat, where it is only 10 cm (3.9 in) long. About half of Asiatic lions' skulls from the Gir forest have divided infraorbital foramina, whereas African lions have only one foramen on either side. The sagittal crest is more strongly developed, and the post-orbital area is shorter than in African lions. Skull length in adult males ranges from 330 to 340 mm (13 to 13 in), and in females, from 292 to 302 mm (11.5 to 11.9 in). It differs from the African lion by a larger tail tuft and less inflated auditory bullae. The most striking morphological character of the Asiatic lion is a longitudinal fold of skin running along its belly.



- **Sloth Bear**

- i. Common Name: Sloth Bear
- ii. Scientific Name: *Melursus ursinus*
- iii. Distribution: The sloth bear's global range includes India, the Terai of Nepal, temperate climatic zones of Bhutan and Sri Lanka. It occurs in a wide range of habitats including moist and dry tropical forests, savannahs, scrublands and grasslands below 1,500 m (4,900 ft) on the Indian subcontinent, and below 300 m (980 ft) in Sri Lanka's dry forests. It is regionally extinct in Bangladesh.
- iv. Characteristics: Sloth bears adults are a medium-sized species though weight can range variously from 55 to 105 kg (121 to 231 lb) in typically-sized females and from 80 to 145 kg (176 to 320 lb) in typically-sized males. Exceptionally large specimens of females can scale up to 124 kg (273 lb) and males up to 192 kg (423 lb). The average weight of sloth bears from the nominate subspecies in Nepal was 95 kg (209 lb) in females and 114 kg (251 lb) in males. Nominate bears in India were found to weigh average 93.2 kg (205 lb) in males and 83.3 kg (184 lb) in female per one study. Specimens from Sri Lanka (*M. u. inornatus*) may weigh up to 68.2 kg (150 lb) in

females and 104.5 kg (230 lb) in males. However six Sri Lankan male sloth bears averaged only 74.8 kg (165 lb) and 57.5 kg (127 lb) was the average for four females, so Sri Lankan bears could be up to at least 30% lighter in body mass than nominate race bears and with apparent far more pronounced size sexual dimorphism. They are 60–92 cm (2 ft 0 in–3 ft 0 in) high at the shoulder, and have a body length of 1.4–1.9 m (4 ft 7 in–6 ft 3 in). Besides being smaller than males, females reportedly typically have more fur between their shoulders.



## Conclusion

For this project I have chosen common plants, birds, insects, and fish found in West Bengal and common mammals found all over India. Thus this project presents an account of some common plants, birds, insects, fishes and mammals and their identification and characteristics.

# **PROJECT REPORT**

**SEMESTER 2**

**COURSE:AECC2(Environmental Science)**

**Project Title:** Visit to a local polluted site

**College Roll No:**PHSA20M603

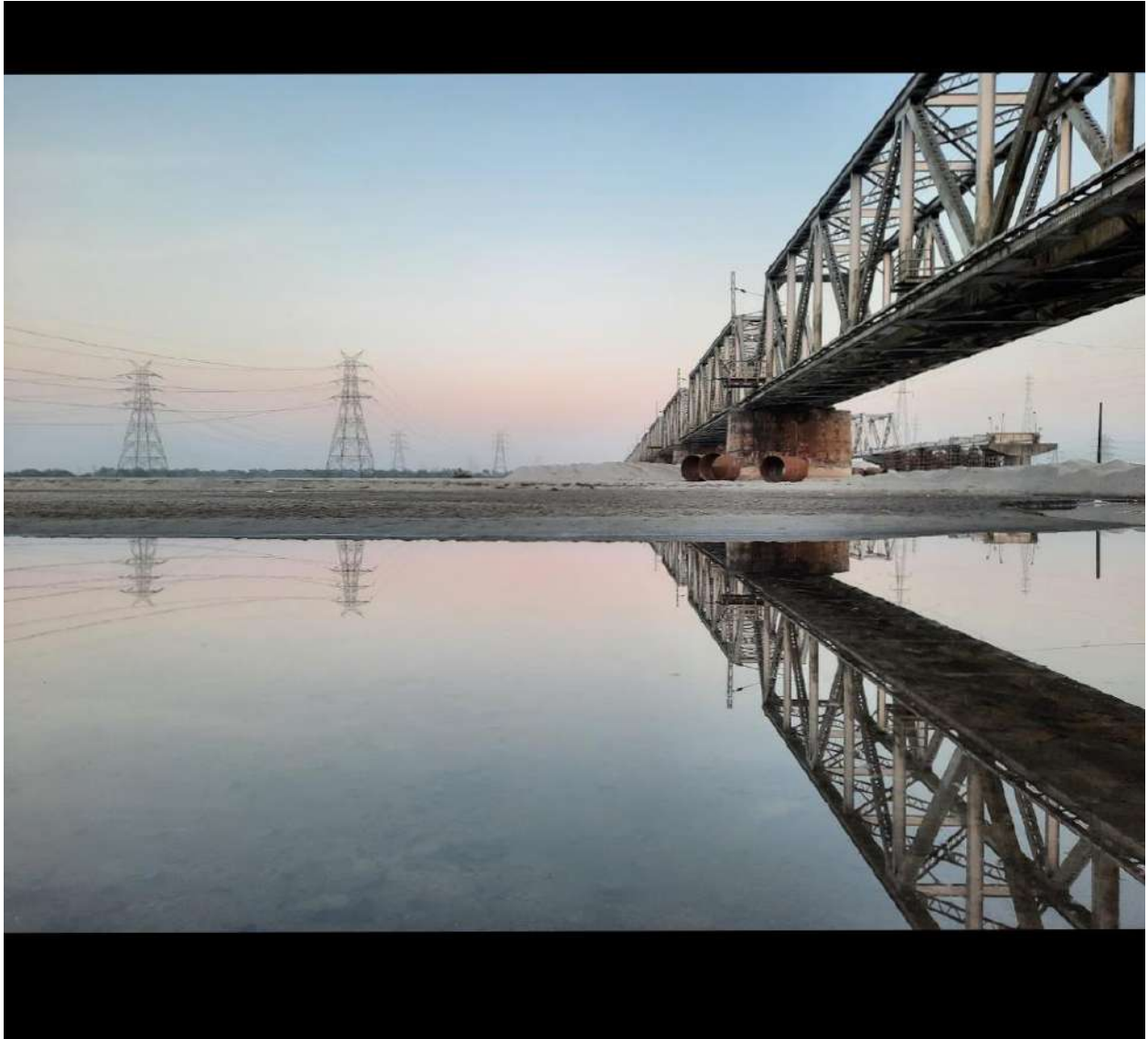
**CU Roll No:**203223-21-0167

**CU Reg No:**223-1112-0390-20

**Checked  
23 out of  
30**

# Visit to a local polluted site

## The Teesta river

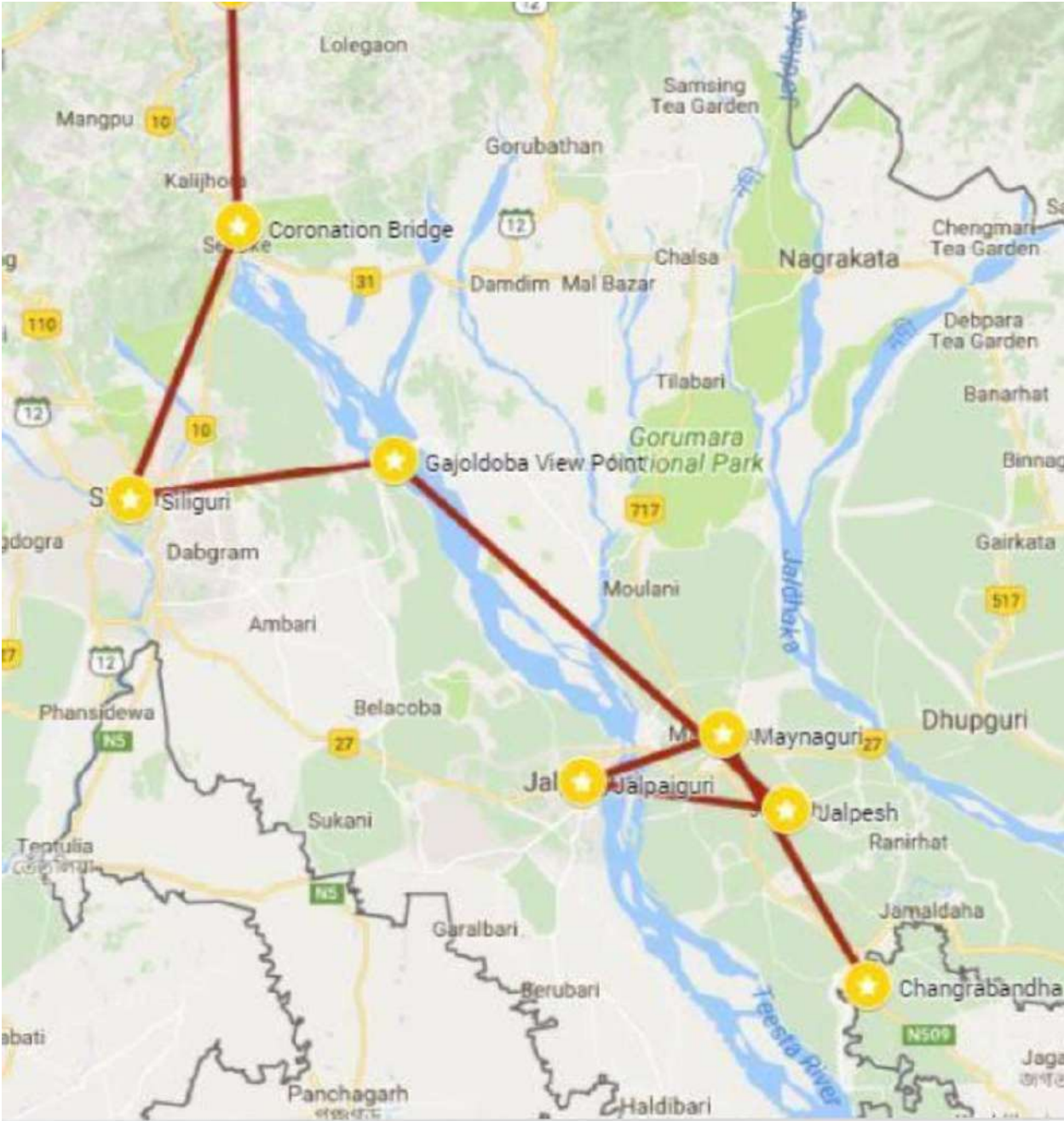


## The Teesta river:

**Teesta River** is a 315 km (196 mi) long river that rises in the eastern [Himalayas](#), flows through the [Indian states](#) of [Sikkim](#) and [West Bengal](#) through [Bangladesh](#) and enters the [Bay of Bengal](#).<sup>[1]</sup> It drains an area of 12,370 km<sup>2</sup> (4,780 sq mi).<sup>[2]</sup> In [India](#), it flows through [North Sikkim](#), [East Sikkim](#), [Kalimpong district](#), [Darjeeling District](#), [Jalpaiguri District](#), [Cooch Behar districts](#) and the cities of [Rangpo](#), [Jalpaiguri](#) and [Mekhliganj](#). It joins the [Jamuna River](#) at [Fulchhari](#) in Bangladesh.



# Location map of Teesta river



## **The principal sources of pollution of Teesta river**

- **Industrial waste**
- **Sewage and waste water**
- **Mining activities**
- **Chemical fertilizers and pesticides**
- **Global warming**
- **Burning of fossil fuels**

## **Teesta river pollution effect:**

### **Effect on wild life:**

Thousands of fish , found floating on the surface of Teesta river.

### **Effect on human being:**

Polluted water affect on human health directly or indirectly Water pollution causes to many diseases such as cholera, hepatitis, severe diarrhea and also many kinds of skin diseases.

### **Effect on marine life:**

Organic matter and nutrients causes an increase in aerobic algae and depletes oxygen from the **water** column. This causes the suffocation of fish and other **aquatic organisms**. Sulfate particles from acid rain can cause harm the health of **marine life** in the rivers and lakes it contaminates, and can result in mortality.

## **Preventions:**

- Action\_plan\_Teesta has been taken by West Bengal Pollution Control Board.

## **There are some steps to follow to help prevent water pollution from getting worse:**

- Conserve soil.
- Dispose of toxic chemicals properly.
- Avoid plastic when possible.
- Use of organic fertilizers and pesticides.
- Sewage treatment.
- Industrial and agricultural waste water treatment.
- Conserve as much water as possible.

## **Conclusion:**

The problems associated with water pollution have the capabilities to disrupt life on our planet to a great extent. Government has passed laws to try to combat against water pollution thus acknowledging

the fact that water pollution is indeed, a serious issue and Teesta is not out of danger from pollution.

Government alone cannot solve this problem. It is ultimately up to us to be involved, be responsible

What it comes to the problems we face with water pollution.



# **PROJECT REPORT**

## **SEMESTER 2**

**COURSE:AECC2(Environmental Science)**

**Project Title:** Visit to a local polluted site

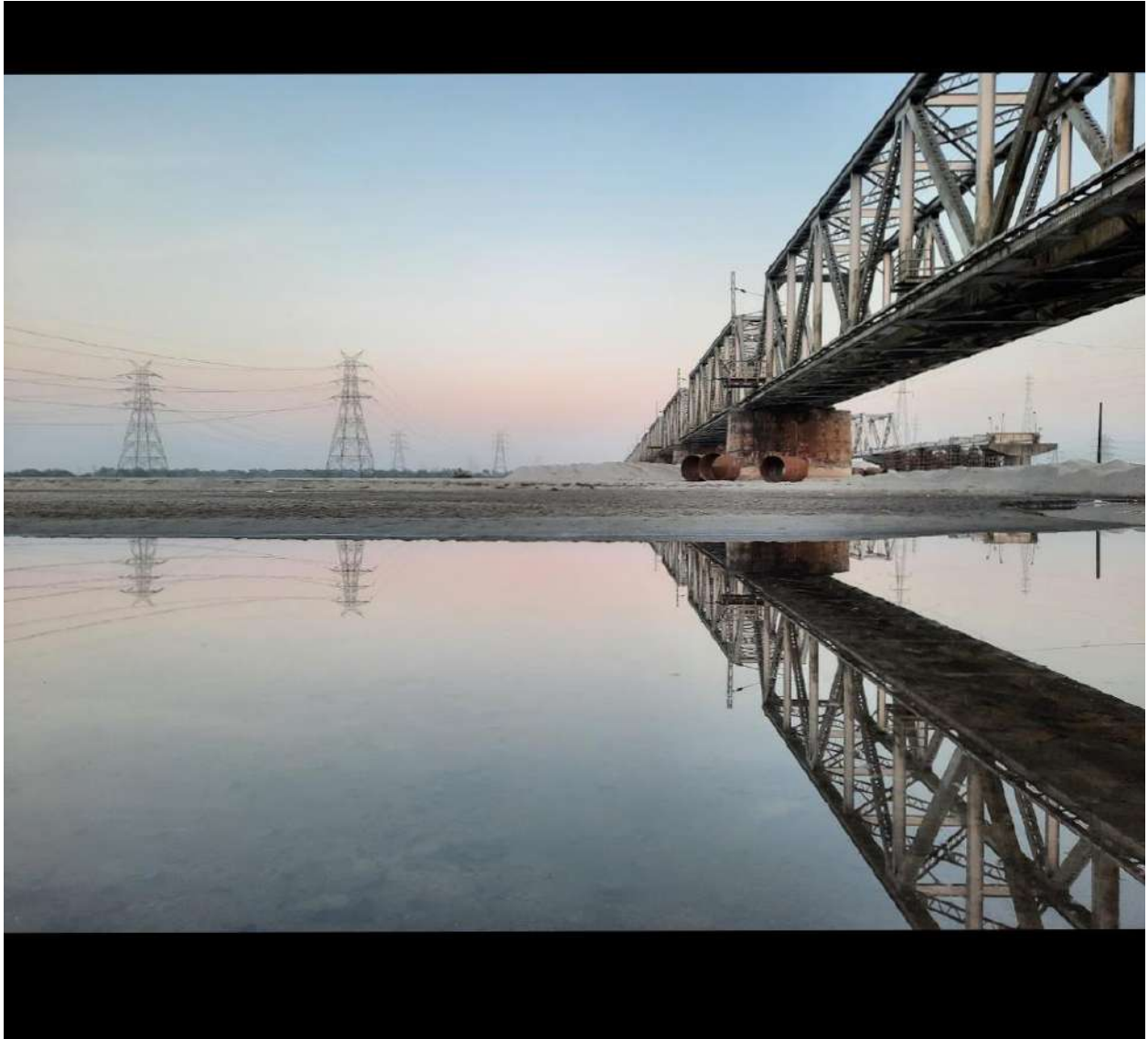
**College Roll No:**PHSA20M603

**CU Roll No:**203223-21-0167

**CU Reg No:**223-1112-0390-20

# Visit to a local polluted site

## The Teesta river





## The Teesta river:

**Teesta River** is a 315 km (196 mi) long river that rises in the eastern [Himalayas](#), flows through the [Indian states](#) of [Sikkim](#) and [West Bengal](#) through [Bangladesh](#) and enters the [Bay of Bengal](#).<sup>[1]</sup> It drains an area of 12,370 km<sup>2</sup> (4,780 sq mi).<sup>[2]</sup> In [India](#), it flows through [North Sikkim](#), [East Sikkim](#), [Kalimpong district](#), [Darjeeling District](#), [Jalpaiguri District](#), [Cooch Behar districts](#) and the cities of [Rangpo](#), [Jalpaiguri](#) and [Mekhliganj](#). It joins the [Jamuna River](#) at [Fulchhari](#) in Bangladesh.



## **The principal sources of pollution of Teesta river**

- **Industrial waste**
- **Sewage and waste water**
- **Mining activities**
- **Chemical fertilizers and pesticides**
- **Global warming**
- **Burning of fossil fuels**

## **Teesta river pollution effect:**

### **Effect on wild life:**

Thousands of fish , found floating on the surface of Teesta river.

### **Effect on human being:**

Polluted water affect on human health directly or indirectly Water pollution causes to many diseases such as cholera, hepatitis, severe diarrhea and also many kinds of skin diseases.

### **Effect on marine life:**

Organic matter and nutrients causes an increase in aerobic algae and depletes oxygen from the **water** column. This causes the suffocation of fish and other **aquatic organisms**. Sulfate particles from acid rain can cause harm the health of **marine life** in the rivers and lakes it contaminates, and can result in mortality.

## **Preventions:**

- Action\_plan\_Teesta has been taken by West Bengal Pollution Control Board.

## **There are some steps to follow to help prevent water pollution from getting worse:**

- Conserve soil.
- Dispose of toxic chemicals properly.
- Avoid plastic when possible.
- Use of organic fertilizers and pesticides.
- Sewage treatment.
- Industrial and agricultural waste water treatment.
- Conserve as much water as possible.

## **Conclusion:**

The problems associated with water pollution have the capabilities to disrupt life on our planet to a great extent. Government has passed laws to try to combat against water pollution thus acknowledging

the fact that water pollution is indeed, a serious issue and Teesta is not out of danger from pollution.

Government alone cannot solve this problem. It is ultimately up to us to be involved, be responsible

What it comes to the problems we face with water pollution.

