

Subject / Important Note :

Page No. :

Date :

Expt. No. :

RAMKRISHNA MISSION

RESIDENTIAL COLLEGE

SRIJAN PARIA

CSUG/194/19

ENVS PROJECT

TOPIC : AIR POLLUTION



R.N.256412
GOLDEN
EAGLE

Ordinary

Remarks : Date : Teacher's Signature

Subject / Important Note :

Page No. : 01

Date :

Expt. No. :

INDEX

PAGIA

1) ACKNOWLEDGEMENT	02
2) INTRODUCTION	03
3) WHAT IS POLLUTION	03
4) CAUSES BEHIND AIR POLLUTION	03
5) GENERAL TRIVIA	04
6) IMPACT OF AIR POLLUTION IN INDIA	05
7) GOVERNMENT INITIATIVES	06
8) CONCLUTION	08



R.N.256412
GOLDEN EAGLE

Ordinary

Remarks : Date : Teacher's Signature

Answe

① Acknowledgement:- This project has given me the golden opportunity for learning and self development through collaborative activity. I consider my self fortunate to have worked under Tatsmar Dada whose encouraging words and monitoring, individual care and motivating approach have widened the horizon of my knowledge and stimulated me to work in joy. I am really grateful to him.

I am also indebted to Ramkrishna Mission Residential College Authority for providing me a blissful ambience.

Last but not the least, I am grateful to all my friends, brother and many well-wishers who helped me numerous ways in concluding the project successfully.



Srijan Paria

Signature of the Students

● Introduction :-

Today, air pollution has emerged as a global public health problem and is deemed as a major environmental health hazard by agencies such as the World Health Organization (WHO) and governments around the world. An increase in concentration of pollutants - both gaseous and solid - is among the largest health risk in the world and according to the latest data released by WHO, indoor and outdoor ~~and~~ air pollution were responsible for 3.7 million deaths of people aged under 60 in 2012.

● What is Air Pollution:-

Air pollution refers to the release of pollutants into the air that are detrimental to human health and the planet as a whole.

● Causes Behind Air Pollution:-

"Most air pollution comes from energy use and production", says Walke, director of the Clean Air Project, part of the Climate and Clean Energy Programme at NDRC.

● Major Causes of Air Pollution in India:-

As of January 2015, coal-powered thermal power plants account for 60.72% of India's total power generation, according to data



available from Central Electricity Authority (CEA)

Growing numbers of cars in Indian cities

-Private & commercial vehicles account for 66.28% of the total com consumption of diesel. Low standards for vehicle emissions and fuel have resulted in increased level of Nitrogen Oxides & Sulphur.

As per Census 2011, 87% of rural households and 26% of urban households depends on biomass for cooking. Burning of Biomass is a leading causes of indoor air pollution and is responsible for respiratory and pulmonary health issues in approximately 400 million Indians.

The proportion of rural households using kerosene as a primary source of energy for lighting is almost 30%. Kerosene lanterns used in rural areas are a primary source of emission of black carbon soot and cause significant health impact, particularly in the case of women and children.

General Trivia:-

1. A recent study by Yale and Columbia University ranked India 126th out of 132 countries surveyed on environmental performance and worst for air pollution; Bar below all BRICS nations i.e Brazil, Russia, China and South Africa.



R.N.256412
GOLDEN EAGLE

Ordinary

2. According to a WHO report from 2014,

Delhi had the dirtiest atmosphere of 1,600 cities around the world. 13 Indian cities feature in the 20 cities. Delhi having a PM_{2.5} level of 153, six times higher than the WHO safe limit of 25.

3. Clean Air India Movement a nationwide campaign to spread awareness about air pollution - has started from Gurgaon. The campaign will be taken to many cities across the country, including Delhi, Mumbai, Bengaluru and Kolkata.

Impact of Air Pollution in India:-

Air pollution, both indoor (household) and outdoor, has had a significant impact on the health of citizens as well as the economy.

1. Air pollution is among the leading causes of death in India: The Global Burden of Diseases Report has ranked outdoor air pollution impacts as the fifth leading causes of death in India and indoor air pollution as the third leading cause.

2. Negative impacts on agricultural productivity. A recent research study "Recent climate and air pollution impacts on Indian agriculture" by scientists at the University of California.



3. Cost of air pollution amounts to 3% of the GDP. A World Bank report titled "Diagnostics Assessment of Select Environmental challenges in India" highlighted that the annual cost of air pollution, specifically pollution from particulate matter (burning of Bossil Bulbs) amounts to 3% of the GDP of the country; outdoor air pollution according to 1.7% and indoor air pollution 1.3%.

Summary of Key Government Initiatives & Policy Measures to tackle the issue:-

Amid growing concerns pertaining to rising air pollution, government of India has taken various initiatives as well as introduced policies to address the issue. In order to prevent and control air pollution, The Parliament of India enacted the Air (Prevention and Control of Pollution) Act, 1981 on 29th March 1981. The Central Pollution Control Board (CPCB), a statutory organization under the Ministry of Environment & Forests MoEF has been entrusted with the responsibility of ensuring ambient air quality and has been conferred and assigned the power and functions to achieve the stipulated objective.

i) Steps to curb vehicular emission:-

Adopting emission norms and fuel regulation standards.



Subject / Important Note :

Page No. : 0807

Date :

Expt. No. :

Promotion of cleaner technologies and alternate source of energy to run vehicles.

National Urban Transport Policy:

Encouraging greater uses of public transport

II) Reduction of the dependence on biomass burning in rural households.

Biomass - Fuel wood, agricultural residue and animal waste - is among the most prevalent sources of energy in India, with almost 87% of rural households and 26% of urban households depend on biomass for cooking. The government of India has focused on the importance of clean and efficient cook stoves in order to reduces emissions as well as the health hazards associated with inhalation of these emissions

III) Renewable Energy:- the new era of focus to reduces dependency on coal:-

India is extremely rich in renewable energy (RE) source, such as wind, solar and small hydro, however, green energy accounts for only 12.14% of India's total installed power capacity.

Solar Power; to become a crucial component of India's power portfolio. Move from carbon subsidization to carbon taxation

IV) National 'Air Quality Index' to enable common man to understand Air Quality.



Subject / Important Note :

Page No. : 08

Date :

Expt. No. :

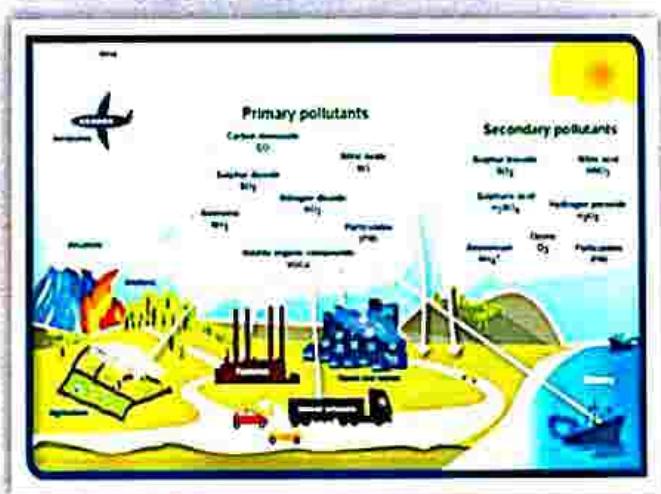
Conclusion :- Air Pollution is complicated issue and negatively impacts the health of citizens as well as the economy of the country. The Government of India and the state government have recognized the adverse effect of air pollution and there is increased seriousness about addressing the air quality issue among all the stakeholders. Furthermore, recent efforts such as the launch of National Air Quality Index point to the need for enhancing public awareness on the quality of air they are breathing. A shift towards renewable energy is part of the plan to reduce dependency on fossil fuels, as well as provide clean energy to households. It is more important that a comprehensive, integrated and longterm plan action, involving coordination between different ministries and departments, is drawn to address the issue, reduce air pollution and ensure that citizens breathe clean air.



R.N.256412
GOLDEN EAGLE

Ordinary

Remarks : Date : Teacher's Signature



RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NITROGEN CYCLE

& ITS IMPORTANCE FOR LIVING BEINGS

NAME : Srinjoy Ghosh

COLLEGE ROLL NO : PHUG/078/19

DEPARTMENT : PHYSICS

YEAR : 2020

SIGNATURE : Srinjoy Ghosh

NITROGEN CYCLE

AND ITS IMPORTANCE FOR
LIVING BEINGS

INTRODUCTION

Nitrogen is present in the environment in a wide variety of chemical forms including organic nitrogen, ammonium (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-), nitrous oxide (N_2O), nitric oxide (NO) or inorganic nitrogen gas (N_2). Organic nitrogen may be in the form of a living organism, humus or in the intermediate products of organic matter decomposition. The processes of the nitrogen cycle transform nitrogen from one form to another. This transformation can be carried out through both biological and physical processes. Important processes in the nitrogen cycle include fixation, ammonification, nitrification and denitrification. The majority of Earth's atmosphere is nitrogen (78%), making it the largest pool of nitrogen. However, atmospheric nitrogen has limited availability for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems. The nitrogen cycle is of particular interest to ecologists because nitrogen availability can affect the rate of key ecosystem processes, including primary production and decomposition. Human activities such as fossil fuel combustion, use of artificial nitrogen fertilizers & the release of nitrogen in wastewater, have dramatically altered the global nitrogen cycle.

DEFINITION.

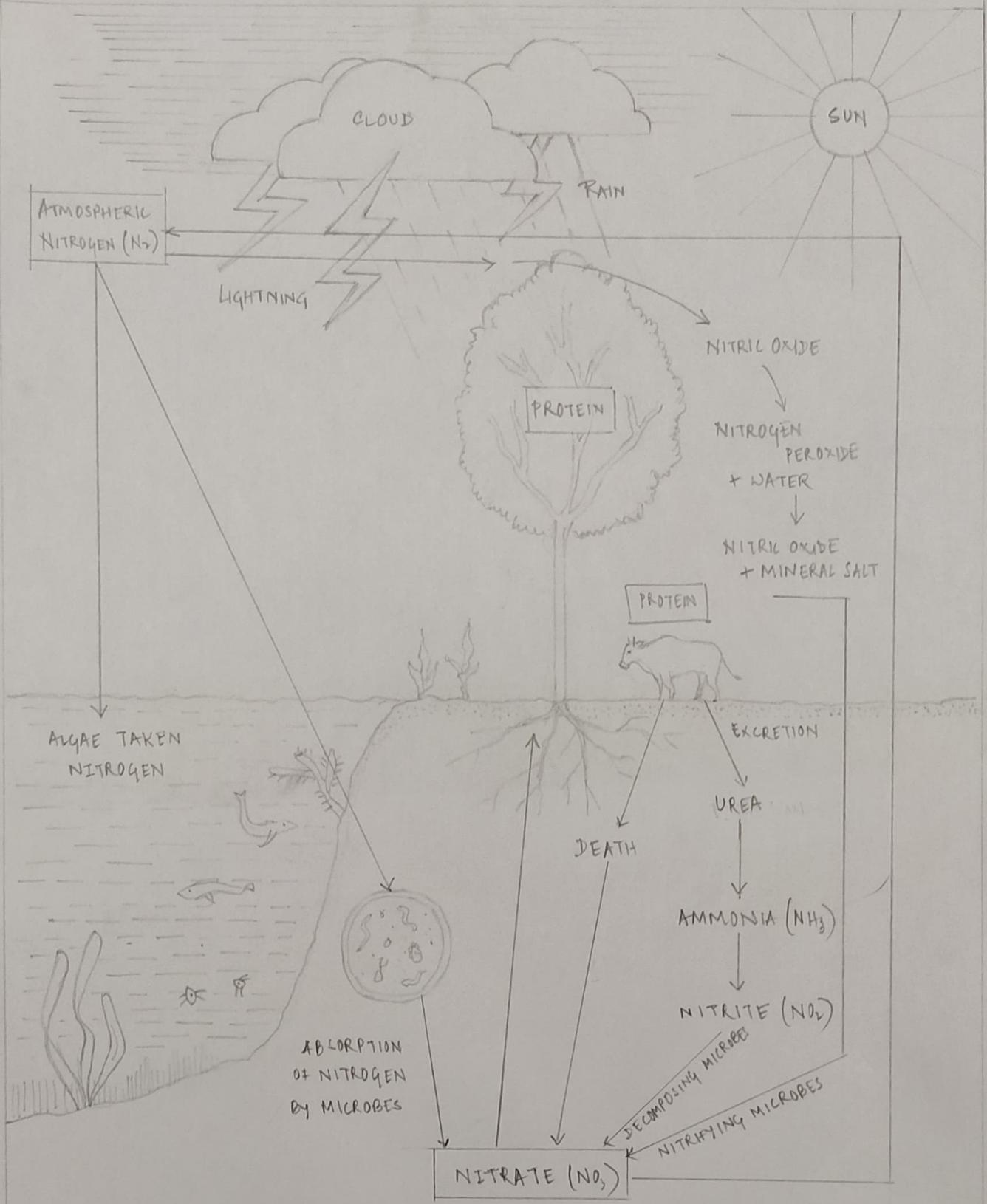
The biogeochemical cycle by which nitrogen is converted into multiple chemical forms as it circulates among atmosphere, terrestrial, and marine ecosystems, is called the nitrogen cycle.

NITROGEN CYCLE

Nitrogen is one of the most essential elements, necessary for the nutrition of organisms as it is the source of proteins and nucleic acids, and in that sense is essential for life. It is the main component of organic substances like DNA, RNA, amino acids, chlorophyll etc. present in the protoplasm. The tremendous amount of free nitrogen in the atmosphere, however, cannot be utilized directly by most organisms, with the exception of a few nitrogen fixing bacteria like Azotobacter, Clostridium, Derxia etc. & blue-green algae like Nostoc, Anabaena, Oscillatoria etc. Rhizobium living in root nodules of leguminous plants can also fix nitrogen symbiotically. These bacteria & algae convert gaseous nitrogen into organic compounds and finally to nitrates soluble in water. Nitrates are utilized by plants for the synthesis of amino acid and protein, as they cannot assimilate nitrogen directly from air. In nature, the nitrogen cycle is divided into three principal phases:

- i Nitrogen fixation
- ii Nitrification.
- iii Denitrification.

In the following sections, we will look into each step in detail.



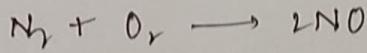
NITROGEN CYCLE

I NITROGEN FIXATION.

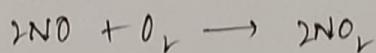
Atmospheric nitrogen must be processed, or 'fixed', to be used by plants. Some fixation occurs in lightning strikes, but most fixation is done by symbiotic or free-living bacteria. These bacteria have the enzyme 'nitrogenase', that combines gaseous nitrogen with hydrogen to produce ammonia, which is then further converted by the bacteria to make their own organic compounds. Most biological nitrogen fixation occurs by the activity of molybdenum nitrogenase, which is a complex two component enzyme having multiple metal containing prosthetic groups. Today, about 30% of the total fixed nitrogen is manufactured in ammonia chemical farms.

A. Natural Fixation.

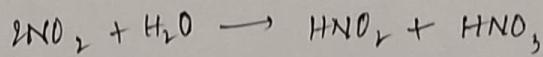
During lightning flashes, the atmospheric nitrogen combines with oxygen to produce nitric oxide (NO)



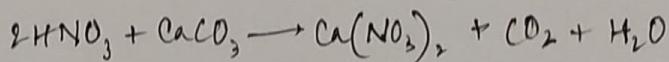
This is again oxidised by O_2 to produce nitrogen dioxide (NO_2)



NO_2 on reaction with rain water or vapour, produces nitrous acid (HNO_2) and nitric acid (HNO_3), which comes down to the soil.



These two acids which react with different metallic salts (potassium, calcium etc) produce nitrate compounds and increase the amount of nitrogen in the soil.



B. Biological Nitrogen Fixation.

The process by which microbes of the soil fix the atmospheric nitrogen through a process of nitrogen fixation and convert them into ammonia, is called biological nitrogen fixation. It takes place in two ways:

1. By free living bacteria:

Some free-living heterotrophic bacteria like Azotobacter, Clostridium (anaerobic), Chromatium, Pseudomonas etc, and blue-green algae (auto-trophic) like Nostoc, Anabaena etc, can fix the molecular nitrogen from air and combine it with hydrogen to form ammonia. This NH_3 , in the form of NH_4^+ ions, is absorbed by root hairs of higher plants.

2. By symbiotic bacteria:

Symbiotic nitrogen fixation is mainly carried out by the activities of Rhizobium species. These rod-shaped gram-negative bacteria, unable to fix atmospheric nitrogen themselves, can do this in combination with cells either from the root of leguminous plants like pea, bean, alfa-alfa or the non-leguminous angiospermic plants like Casuarina, Myrica, Alans etc. These bacteria invade the roots and stimulate the formation of root nodules. The leg-haemoglobin is present in the leguminous plants which are able to fix the atmospheric nitrogen and by oxidation and reduction process nitrogen is converted to ammonia (NH_3).

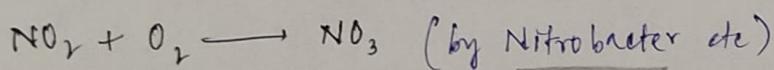
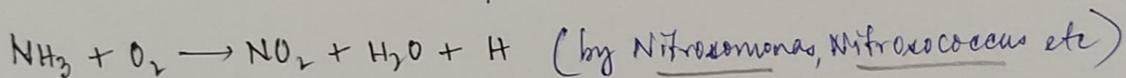
Assimilation.

Plants take nitrogen from the soil, by absorption through their roots in the form of either nitrate ions or ammonium ions. All nitrogen obtained by animals can be traced back to the eating of plants at some stage of the food chain. Plants can absorb nitrate or ammonium ions from soil via root hairs. If nitrate is absorbed, it is first converted to nitrite ions and then ammonium ions for incorporation.

into amino acids, nucleic acids, and chlorophyll. In plants, that have a symbiotic relationship with Rhizobium, some nitrogen is assimilated in form of ammonium ions directly from the nodules. While many animals, fungi, and other heterotrophic organisms obtain nitrogen by ingestion of amino acids, nucleotides and other small organic molecules, other heterotrophs (including many bacteria) are able to utilize inorganic compounds, such as ammonium as sole nitrogen sources. Utilization of various nitrogen sources is carefully regulated in all organisms.

ii NITRIFICATION.

The conversion of ammonia to nitrate is performed primarily by soil-living bacteria & other nitrifying bacteria. In the primary stage of nitrification, the oxidation of ammonium ion (NH_4^+) is performed by bacteria such as the Nitrosomonas species, which convert ammonia to nitrites (NO_2^-). Other bacterial species, such as the Nitrobacter, are responsible for the oxidation of the nitrites into nitrates (NO_3^-). It is important for the ammonia to be converted to nitrates because accumulated nitrites are toxic to plant life.



Majority of the land plants get their principal source of nitrogen from the nitrate present in the soil. Sundew, Drosera, pitcher plant like insectivorous plants collect the nitrogen from the body of insects after trapping them inside the plant body. After the death of these plants, the nitrogen again is mixed with the soil.

iii) DENITRIFICATION.

Denitrification is the process in which ammonia and oxides of nitrogen are reverted back to nitrogen by different forms of denitrifying bacteria, namely *Thiobacillus denitrificans*, *Pseudomonas*, *Bacillus cereus* etc. The gaseous nitrogen is released to the atmosphere and cycle continues. In this process, nitrates are reduced back into the largely inert nitrogen gas (N_2), completing the nitrogen cycle. This process is performed by bacterial species such as *Pseudomonas* and *Clostridium* in anaerobic conditions. They use the nitrate as an electron acceptor in the place of oxygen during respiration. These facultatively anaerobic bacteria can also live in aerobic conditions.

IMPORTANCE OF NITROGEN CYCLE.

- 1 In nature, the balanced component or equilibrium of nitrogen is maintained through nitrogen cycle.
- 2 Nitrogen helps in new cell formation in living body which comes through the nitrogen cycle at a great length of time.
- 3 It is an essential component of the cell as proteins are made up of amino acids, whose integral component is nitrogen. Hence, life cannot exist without nitrogen.
- 4 Nitrogen helps plants to synthesize chlorophyll from the nitrogen compounds.
- 5 In the process of ammonification, the bacteria helps in decomposing the animal and plant matter, which indirectly helps to clean up the environment.
- 6 Nitrates and nitrites are released into the soil, which helps in enriching the soil with necessary nutrients required for cultivation.
- 7 Nitrogen is an integral component of the cell and it forms many crucial compounds and important biomolecules.

CONCLUSION.

Nitrogen is arguably the most important nutrient in regulating primary production and species diversity in both aquatic and terrestrial ecosystems. However the abundant nitrogen in the atmosphere is unusable by plants & animals unless it is converted to usable nitrogen compounds. These microbially driven processes help to transform nitrogen & thus play a crucial role in the fate of nitrogen in the earth ecosystems. However, with increase in human population and interference in the natural flow of things, the global nitrogen cycle is being altered or disbalanced. Application of nitrogen fertilizers in large amounts, chemicals containing nitrogen used in plants seep into the water and cause severe eutrophication. Fossil fuel combustion, use of artificial nitrogen fertilizers and release of nitrogen in wastewater have dramatically altered the global nitrogen cycle.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

POND ECOSYSTEM AND FOOD CHAINS

NAME : SUBHADEEP MONI

COLLEGE ROLL NO : CHUG /154 /19

DEPARTMENT : CHEMISTRY (HONS)

YEAR : 2020

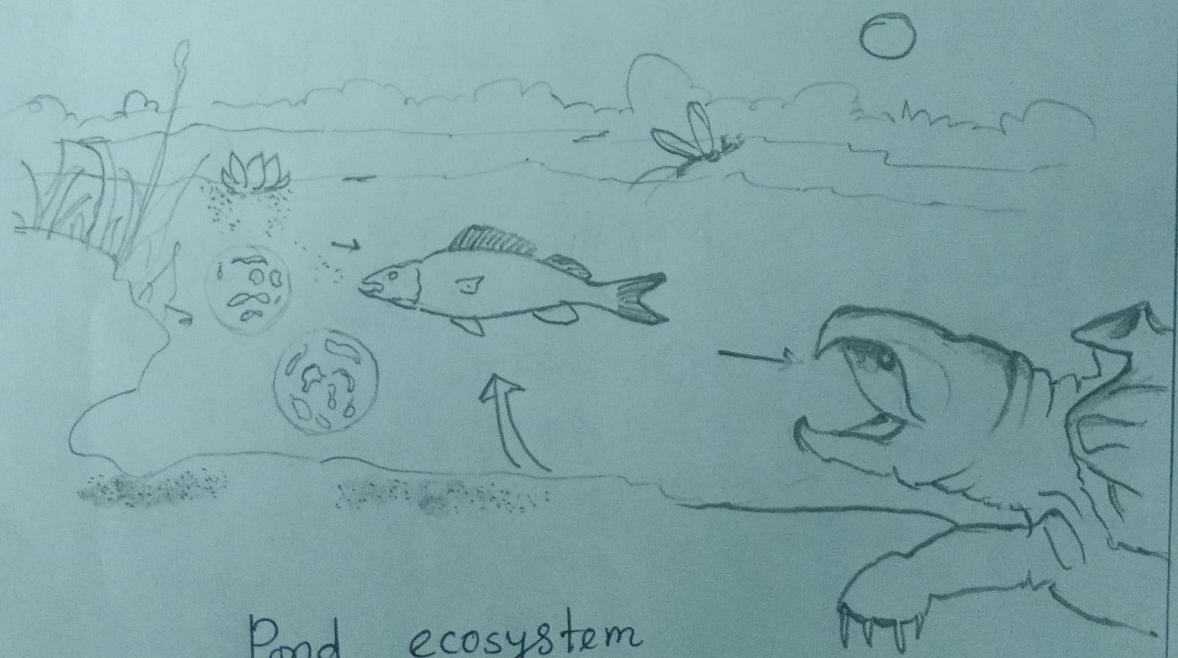
SIGNATURE : Subhadeep Moni

Pond Ecosystem

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 garden pond).

An ecosystem is the technique based 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 & interact.

Pond ecosystem is differed from other water ecosystem unlike the river ecosystem, which is categorised under the lotic system, pond ecosystem falls under the lentic system for the reason that the water remains stagnant in ponds for a relatively longer period of time.



Pond ecosystem

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, 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 & can occur close to the seaside where water logged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach though here they are called rock pools.

It's also possible to find salt ponds. in land, thanks to the presence of brackish streams created through streams flowing through salty rocks.

2) Garden Ponds

Ponds can contain ornamental plant & animal species that come from all over the world (ie non native species)

3) Fresh water pools

Freshwater pools can form anywhere in land 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 & many other kinds of wildlife.

Characteristics of Pond Ecosystem

There are several things that marks pond ecosystem 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 i.e 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.

Importance of Pond Ecosystem

Pond ecosystems are very important & for this reason it is vital that we take steps to protect & 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 & crustaceans as well as insects such as dragon flies, damsel flies & pond skaters.
- 2) 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.

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 safe guarded because they are vital habitats for an abundance of different species.

Unfortunately world's pond ecosystems are being threatened by many factors. These includes the drainage of wetlands for industrial purposes. Pollution, Urban sprawl & global warming which is changing the face of the planet and its weather system. So it is up to us right now to do all that we can to ~~be~~ look after these beautiful and significant ecosystems.

For an ecosystem to work there has to be a flow of energy within it. The organisms of the ecosystem need energy in the form of food.

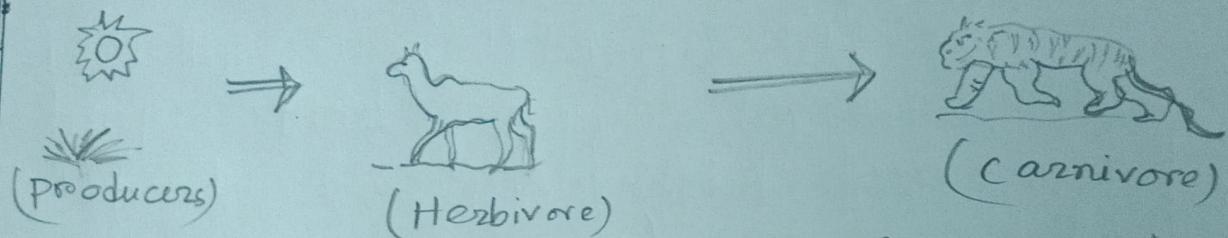
The ultimate source of this energy is the sun. Producers like green plants trap solar energy & convert it into the chemical energy of food. When a primary consumer eats the producer, a part of this energy is passed on to it.

The primary consumer is then eaten by a secondary consumer. And the secondary consumer may be eaten by a tertiary consumer and so on. In this way energy gets transferred from one consumer to the next higher level of consumer. A series of organisms through which food energy flows in an ecosystem is called a food chain. It may also be defined as follows.

A food chain in an ecosystem is a series of organisms in which each organism feeds on the one below it in the series.

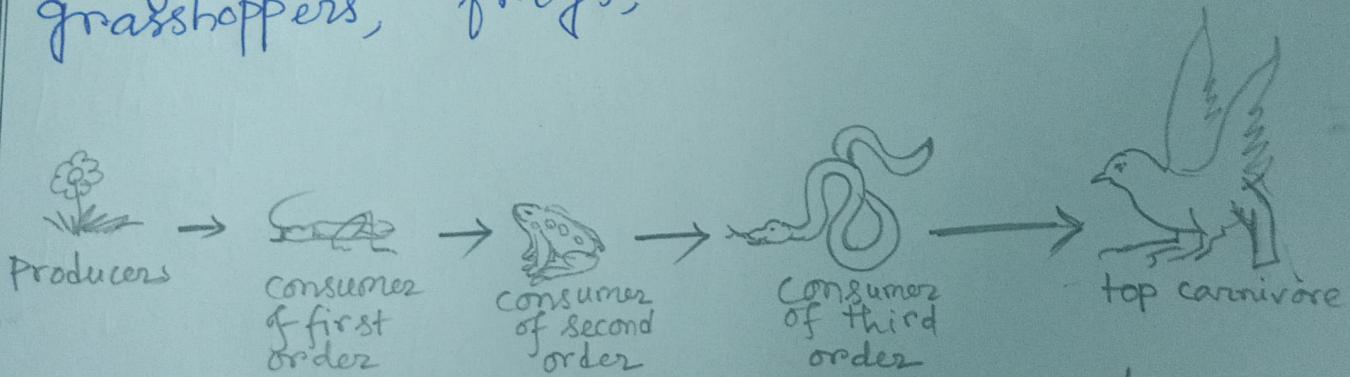
In a forest ecosystem, grass is eaten by a deer, which in turn is eaten by a tiger. The grass, deer & tiger form a

food chain. In this food chain, energy flows from the grass (producer) to the deer (primary consumer) to the tiger (secondary consumer).



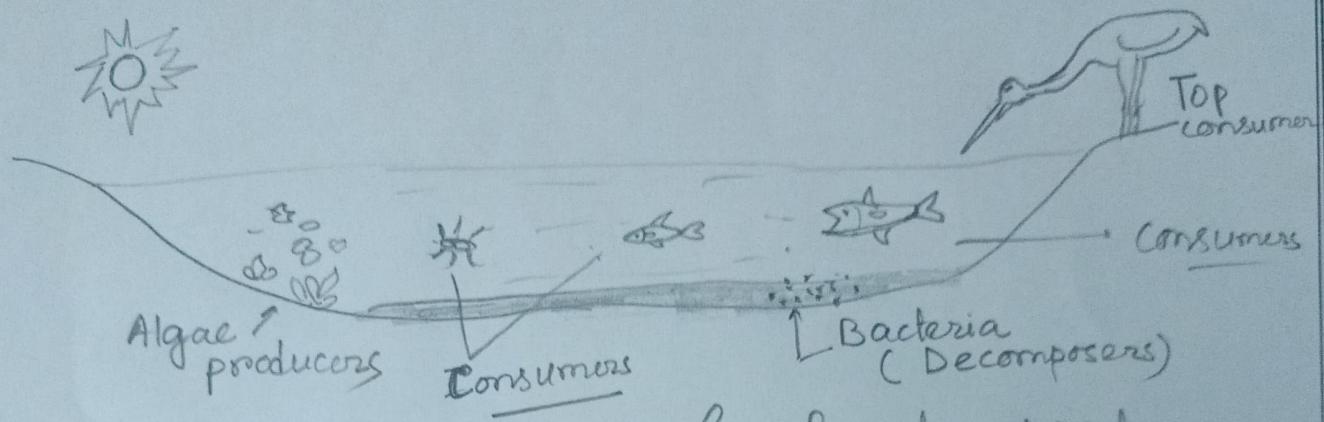
A food chain in forest ecosystem.

A food chain in a grassland ecosystem may consist of grasses and other plants, grasshoppers, frogs, snakes & hawks.



Food chain in Grassland ecosystem

In a freshwater aquatic ecosystem like a pond, the organisms in the food chain include algae, small animals, insects and their larvae, small fish, big fish and a fish eating bird or animal.



Food chain in freshwater pond.

A food chain always begins with producers. Herbivores (plant-eaters) come next in the chain. They are consumed by carnivores (flesh-eaters). A few food chains can be long and may extend to the fourth or even fifth order of consumers.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

POND ECO - SYSTEM

NAME : SUBHAJIT MONDAL
COLLEGE ROLL NO : MTUG/123/19
DEPARTMENT : MATHEMATICS
YEAR : 2020
SIGNATURE : Subhajit Mondal

INDEX

Topic	Page no.
1. Introduction	1
2. Pond eco-system	1
3. Habitat and bio diversity	2
4. Pond Plants	3-4
5. Pond creatures	4-6
6. Food chain and ecology of the pond	7
7. Types of consumers	7-8
8. Acknowledgement	9

Introduction

An ecosystem is a community of living being, organisms (plants, animals and microbes) in conjunction with the non-living components, of their environment (things like air, water and mineral soil), interacting as a system.

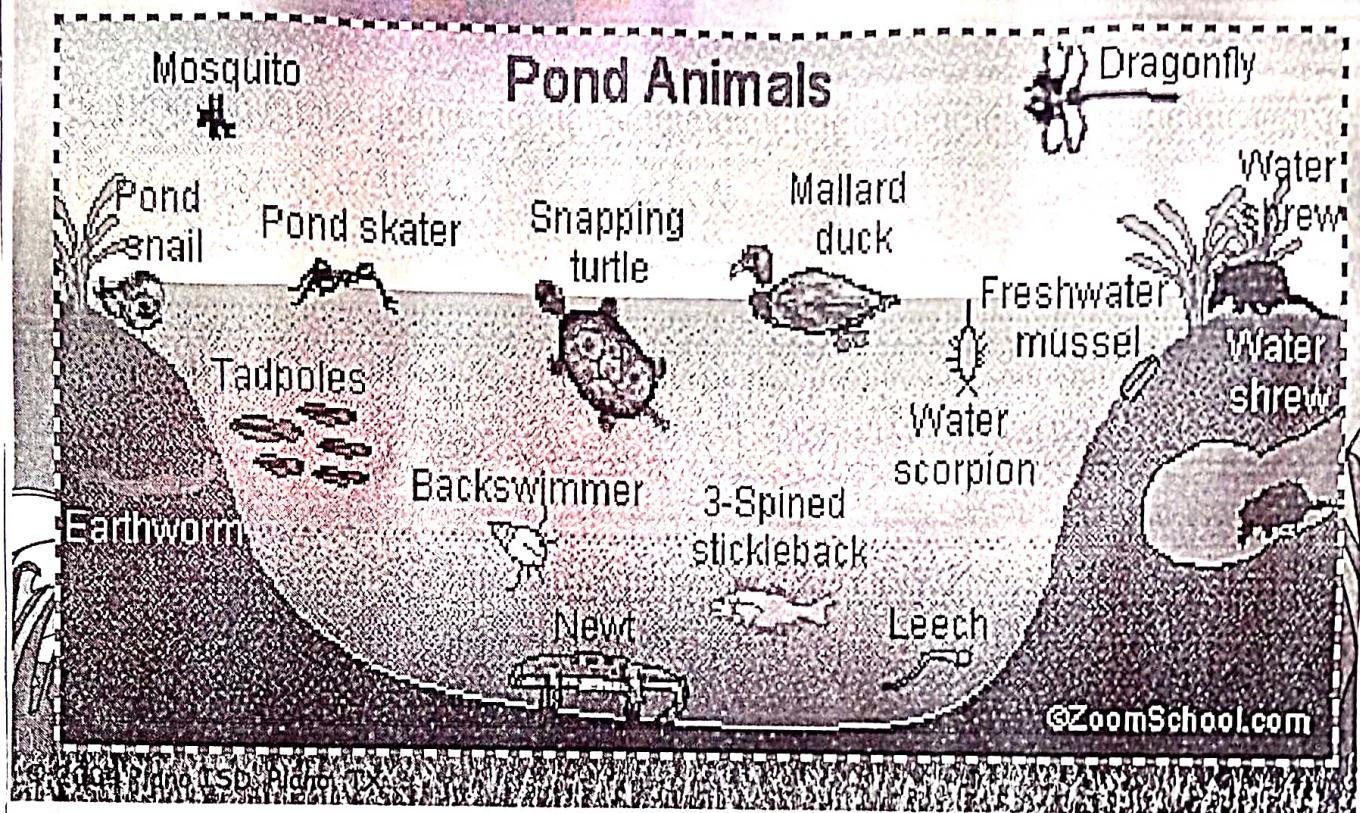
As ecosystem are defined by the network of interactions among organism and between organisms and their environment, they can be of any size but usually encompass specific, limited spaces.

Pond eco-system

A pond is different from a river. Rivers are generally fast flowing. Ponds are hollows with water in them. There is very little water flow in a pond. In this still water, a whole community of plants and animals can grow.

Pond Ecosystem:

List examples of the biotic and abiotic factors in this image.



Habitat and Biodiversity

At one time there were many more ponds than we have today. These ponds have disappeared. This has reduced the habitat available to wildlife. The world for the variety of life is biodiversity. Our native biodiversity is being reduced due to lack of pond habitat.

POND ECOSYSTEM

Biotic Factors

Producers	Consumers			Decomposers
Algae	Primary	Secondary	Tertiary	Bacteria
Hydrophytic Plants	Protozoa	Insects	Fishes	Fungi
	Crustacea	Larvae	Sharks	Microbes

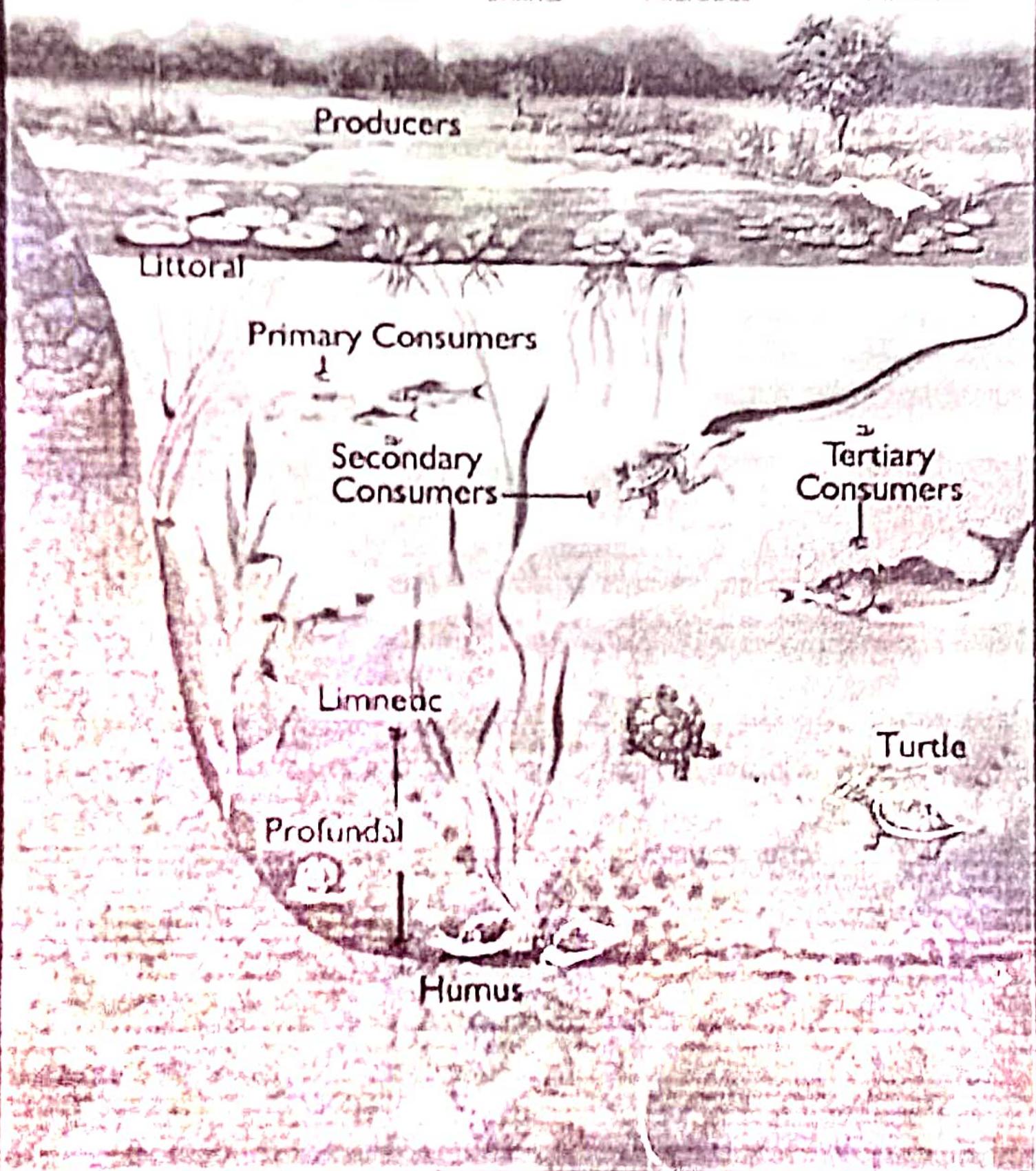
Abiotic Factors

Light

Heat

Water

Minerals



Pond - Plants

The picture above shows many plants that would be expected to find in a pond. Plants are different to animals. They can make their own food. They do this by using water, minerals and carbon-di-oxide to absorb the sun-rays. This is called photo-synthesis. They absorb carbon-di-oxide and produce oxygen which allows animals to breath. They also provide food for animals to eat. This is true for all ecosystems be it on land or water. A simple way to understand this is to do think of a food chain; sun, grass, rabbit and fox. Food chains also exist in ponds and all of them depend upon plants.

1. Plankton and Algae:

The smallest plants are planktons in ponds. These are so tiny that they can't be seen except with a microscope. They provide for many of the smaller creatures in pond. Another small plant is algae. This can be seen floating on ponds as what looks like a green scum.

2. Plant - Succession

In a pond some plants live entirely outside the water and some live entirely in it. Others are partially in the water. Each of these plants need special adaptions to survive where they grow.

Pond creatures

There are many strange looking creatures in the pond. Because they all live in water, they are different from land based animals. They are adapted for living in water. They have things on their bodies which allow them to live successfully in this environment.

1. Snail

They are molluscs and are closely related to their land cousins. They have a hard shell and they can vary from 25 mm to 50 mm in size. It has gills which allow it to breath under water.

2. Water spiders:

They are arachnids they can be about 16 mm. They can't breath under water. They spin a web and use it as an airbell. They are able to breath in this airbell.

3. Shrimps:

The shrimp is about 16 mm long. They have 7 or 9 pair of legs. They swim on their sides. They eat floating dead waters in the pond. They don't live in polluted water. Their presence reduces pollution in the pond.

4. Caddis fly larva:

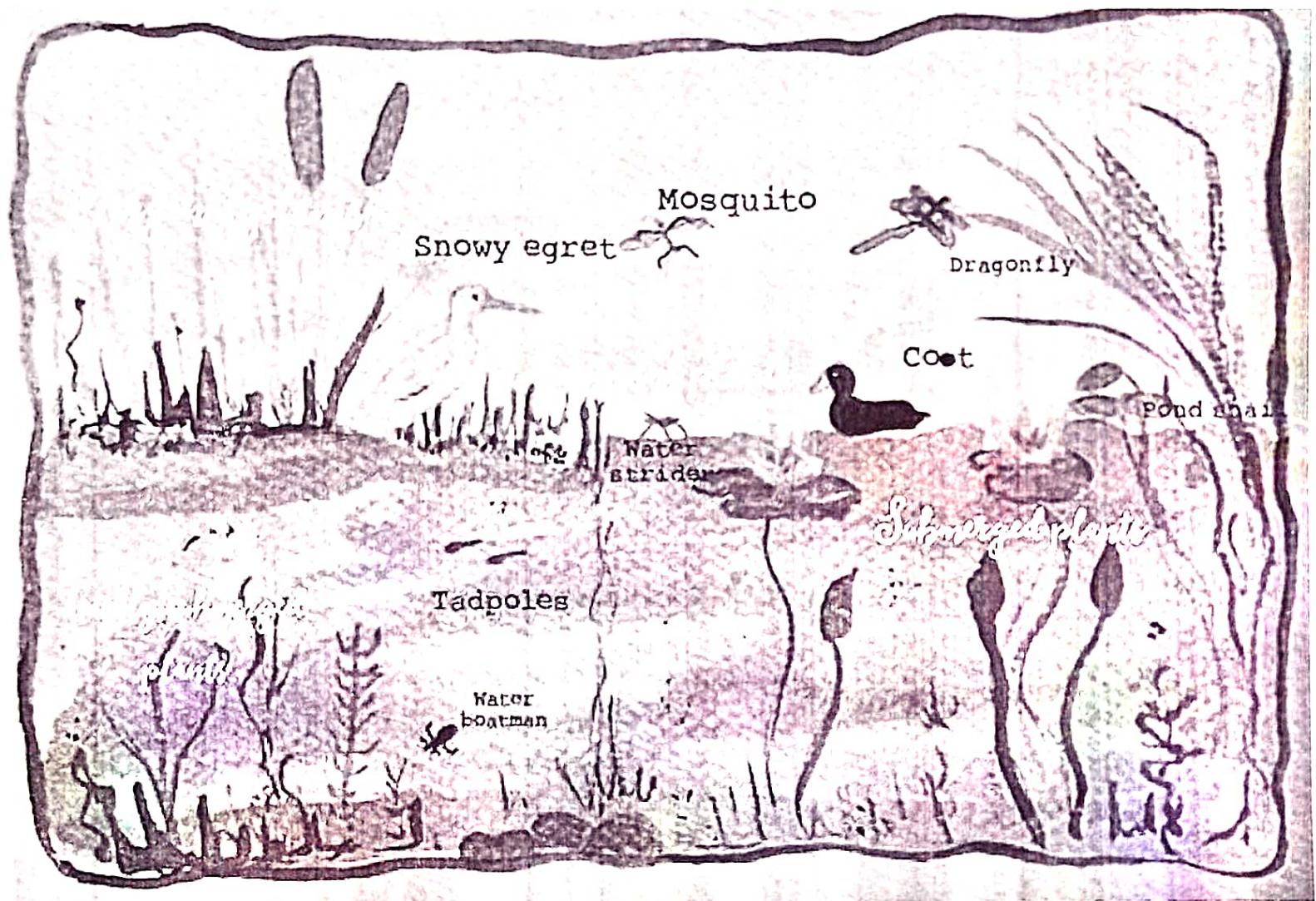
They are about 20 mm long. They are usually grown up from plants, stones or shells. Like other insects, it has a life-cycle of egg, larva, Pupa and adult. The larva stage lives in the water, makes its own case from silk like material surrounding this inner case with different material. The pupa stage also remains in the case. Eventually the adult fly emerges and begins its short life as a fly.

5. Beetle larva:

It is the largest larva in the pond about 50 mm, when fully grown. It is fierce predator eating whatever it can catch.

6. Pond skaters:

They are about 20 mm across. They have six legs. They are held out from the body ~~so~~ so it can spread its weight as widely as possible. This allows it to move across the surface very quickly along it to catch prey, the small creatures, which live on the surface. Some species of pond skater can fly and some others can't.



Food chains and ecology of the pond

All life in the pond depends upon the ability of the plants to photosynthesis. The animals are then able to feed from the plants. One simple food chain might be —

Sun - algae - tadpole - Kingfishers.

All these food chains added together form an interconnected web that make up the pond eco-system. The idea of an ecosystem means that all the living things in the pond depend upon one another. Ponds are very susceptible to pollution. This can destroy the pond eco-system. Ponds are very important for wildlife of all sorts, biodiversity.

Following are the consumers of the pond habitat food chain.

Primary consumers:

These are the herbivores that depend on the producers for food. Examples are tadpoles, very tiny fish, snails.

Secondary consumers:

These are the organisms which depend on the primary consumers for food. Examples medium sized fish, frogs.

Tertiary consumers:

These are the organisms which can feed on the primary and the secondary consumers. Examples are duck, crane etc.

Top consumers:

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

Acknowledgement

I would like to express my special thanks of gratitude to our ENVS teacher who gave me a golden opportunity to do this wonderful project.

Then I would like to thank my friends who helped me with their valuable suggestions and guidance has been helpful for completion of the project.

Subhajit Mondal

Signature

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Water Pollution and
measures to control it.

NAME : Subhasit Patra
COLLEGE ROLL NO : PHU 67 / 203 / 19
DEPARTMENT : Physics
YEAR : 2020
SIGNATURE : Subhasit Patra

Content

Topic

- 1> introduction
- 2> Defination of water pollution
- 3> Different categories of water pollution.
- 4> causes of effects of water pollution
- 5> prevention measures of water pollution
- 6> conclusion.

Introduction

British poet W.H. Auden once noted, ("those who have lived without love, not one without water) water is the essential element that makes life on earth possible. without water there would be no life. let while we all know water is crucial for life, we trash it any way. we usually take water for granted. It flows from our taps when they are turned on and we remained complete careless about that. Like good health we ignore water when we have it.

The wide spread problem of water pollution is jeopardizing our health. unsafe water kills more people each year than war and all other forms of violence combined. meanwhile, our drinkable water sources are finite i.e less than 1% of the earth's fresh water is actually accessible to us. without taking any positive action, the challenges will only increase by 2050, when global demand for freshwater is expected to be one-third greater than it is now.

Still, we are not hopeless against the threat to clean water. To better understand the problem, here we will discuss about an overview of what water pollution is, what causes it and how we can prevent it.

What is water pollution

water pollution occurs when harmful substances often chemicals or microorganisms - contaminated a stream, river, lake, ocean or water of any other waterbody, deg reading water quality and rendering it toxic to humans and to the environment.

• Types of sources of water pollution :-

① Point Source :- where contamination occurs from a single source and that source can be basically identified as it has a definite place where it enters water, then that source is called a point source.



Though this pollution originates from a specific place, it can affect miles of water ways and ocean. Examples :- Municipal and Industrial discharge pipes, waste water discharged from a manufacturing unit, oil refinery etc. It can be from leaking septic systems and illegal dumping also. The EPA has set limits on what can be discharged from a manufacturing unit, oil refinery etc. It can form leaking septic systems and illegal dumping also. The EPA has set limits on what can be discharged by a facility directly into a body of water to regulate point source pollution.

Non-point source

Non-point source of pollution is the opposite of point source pollution, with pollutants released in a wide area. Non-point sources of pollution is harder to identify and also harder to address. It is pollution that come from many places all at once.

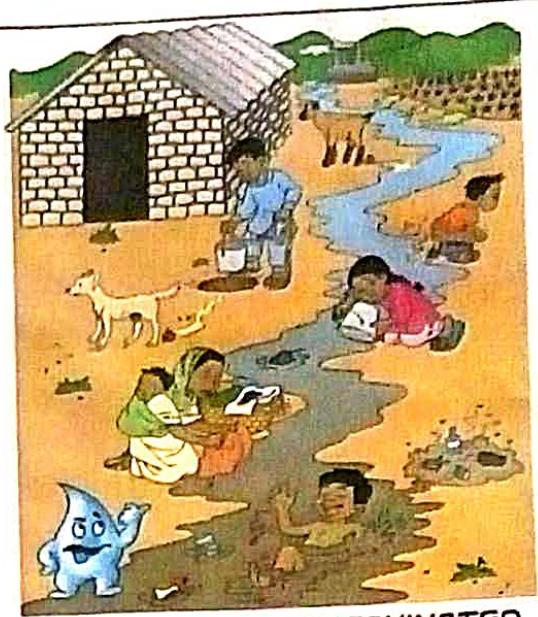
Example → Picture a city street during a thunder storm. As rain water flows over asphalt it washes away drops of oil that leaked from car engines, particles of tire rubber, dog waste and trash. The run-off goes into a storm sewer and ends up in a nearby river.

(3)

- Also in urban areas, people use water in definite water bodies (ponds, rivers, etc.) in many purposes and also various chemicals mixed with that water body from agricultural fields with the run-off of rain water. This is also a kind of non-point source water pollution.

* The pollution from non-point source is very difficult to regulate since there is no single, identifiable culprit.

Different categories of water



HOW WATER IS CONTAMINATED

1) Groundwater Pollution:-

Groundwater is one of our least visible but most critical natural resources. With rainfall, it becomes groundwater as it seeps deep into the earth, filling up rocks, crevices and porous spaces of an aquifer, which is an underground storehouse of water. Groundwater gets polluted when contaminants can be difficult to impossible, as well as costly. Surface water ~~covers~~ covers

2) Surface water pollution

Surface water covers about 70% of the earth, filling our oceans, lakes, rivers and including all blue bits in the world map. Surface water from fresh water surfaces other than sea accounts for more than 60% of the water delivered to our homes. Nutrient pollution that includes nitrates and phosphates, which plants and animals need to grow, causes major pollution that includes nitrates and phosphates, which plants and animals need to grow, causes major pollution that includes organic elements. As per the environmental protection agency of U.S., nearly 50% of our rivers, streams, 1/3 of our lakes and ponds are polluted.

③ Ocean water pollution | 80% of ocean water pollution or marine pollution originates on land along the coast or far inland. It means and rivers carry contaminants such as chemicals, nutrients and heavy metals that are carried from farms, factories and cities into our bays and estuaries, and from there finally they reach the ocean. Marine debris, particularly plastic is blown away by the wind or washed away in storm via drains and sewers. Our seas sometimes get polluted by big and small oil spills and leaks and are also soaking up carbon pollution from air. The ocean absorbs a quarter of human made carbon.

④ Trans boundary

A boundary line can't contain water pollution on a map. Trans boundary pollution happened when contaminated water from one country spilled into other countries' waters. It can result from a disaster like an oil spill or the slow, downriver creep of industrial, agricultural or municipal discharge.

Causes and effects of water pollution

1

Sewage and domestic waste

Nearly 75% of water pollution is due to sewage and domestic sewage unfit for human use. Sewage generally includes biodegradable pollutants like human faecal matter and many dissolved organic compounds like-

carbohydrates, proteins, fats, urea etc. Inorganic salts such as nitrates and phosphates of detergents also. These as nitrates and phosphates are rapidly decomposed.

Pollutants under natural processes are rapidly decomposed.



Effect: In water organic wastes provide nutrition for many decomposers like bacteria, these break down the organic part by using bulk of oxygen and cause deficiency of oxygen in water that kills the fishes and other animals (aerobic). Anaerobic bacteria produces foul food chains. Anaerobic bacteria produces foul smelling gases. These give rise many other pollutants like H_2S , NH_3 etc. organic sulphide and methane also produced by those bacteria that makes the water brownish and turbid.

Industrial wastes and effluents:-

The industrial wastes and their effluents includes the industrial wastes like acids, alkalis, chromium, poisonous materials like phenols, cyanides, insecticides, chlorine, salts, ammonia, hydrogen sulphides, salts of heavy metals such as Cu , Pb , Zn and Hg .

Effects of industrial wastes

- a) The water becomes toxic so this can't support the aquatic life.
- b) Black foot disease, is caused by chronic exposure to AS. Also, exposure of AS may cause skin lesions, skin cancer, lungs cancer etc.
- c) Organic phosphates and nitrates enhance growth of algal blooms which inhibit plankton growth.
- d) Oils deplete oxygen of water, inhibit photosynthesis and photo synthesis. Sea birds also harmed.
- e) Mercury causes Minamata disease, kills fish.
- f) Mercury (Hg) enters the food chain, remains farnece and poisons the remaining farnece.



(3) Dumping

Dumping of solid wastes and litters in water bodies cause huge problems. ~~Litters~~ Litters include glass, plastic, aluminium, Styrofoam etc. Different things take different time of degrade in water.



Effect:- They effect the aquatic plants and animals.

(7)

(4) Mining activities

Mining is the process of crushing the rock and extracting coal and other minerals from the ground. These elements, when extracted in the raw form contain harmful chemicals and can increase the number of toxic elements when mixed up with water, mining activities emit a large amount of metal waste and sulphides from the rocks, which is harmful to water.



Effect:- release of toxic chemicals in water may cause health problems of aquatic animals as well as human.

(5) Accidental oil leakage

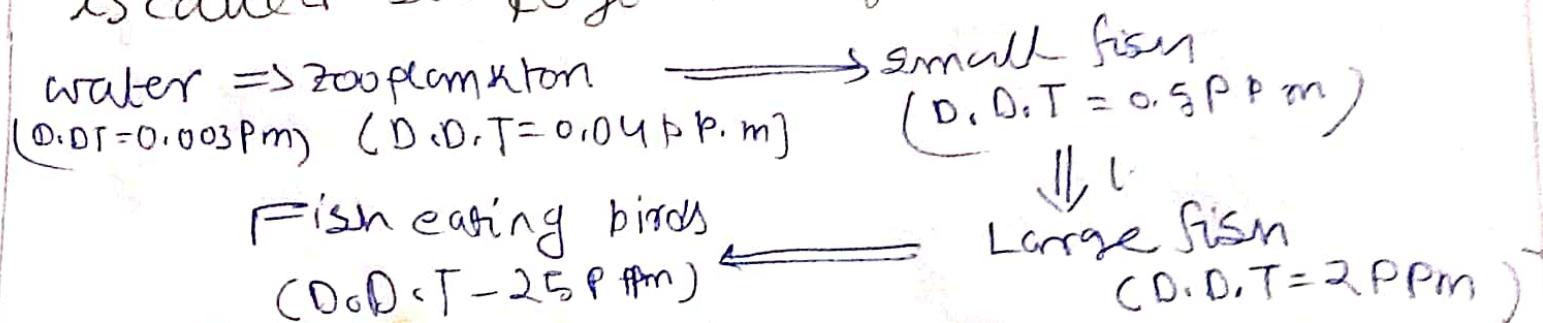
A ship carrying a large quantity of oil may spill oil in sea if met an accident. In 1967 - Large oil tanker Torrey canyon met an accident and released 10000 ton crude oil in Sea of Southern England.

Effect:- Such an oil spill can cause various damages to the species in the ocean depending on the amount of spill, the toxicity of the pollutants and the size of ocean. When a large amount of oil spills into the sea and does not dissolve in water. It causes problem for local marine wildlife including fish, birds, sea urchins. Oil inhibits the plankage growth and photosynthesis. Sea birds smeared oil fall sick and die.

6) Insecticides and Pesticides

Insecticides are biologically active chemicals that are used for pest control. Pesticides include D.D.T, B.H.C, Cusco and Aquatic micro organisms absorb them in fats and oils. Fish feeding on these zooplanktons and phytoplanktons rapidly spread it through other trophic levels.

Effect Aquatic micro organisms absorb the insecticides in ~~food~~ fats and oils. Fish feeding on these, zooplanktons and phytoplanktons further concentrate these increased accumulation of these toxic substances in the food chain at higher trophic level is called biological magnification.



(7) Siltation Excessive agricultural and forestry practices cause soil erosion (removal of top fertile soil) during heavy rain water. Soil particles mixed with rivers or ~~any~~ any other water bodies.



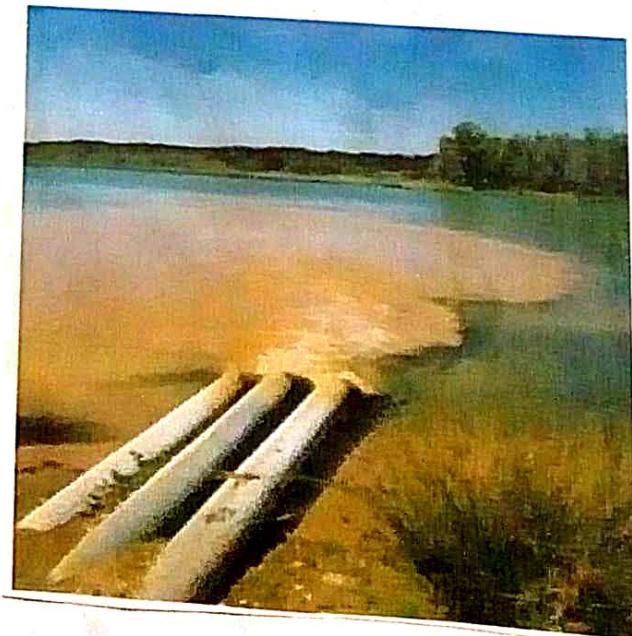
Effect:- The water

becomes muddy which fails to support much plant growth due to poor light.

(8) Thermal pollution

Heated waste water from various power plants and industries which raises the temperature of water to a harmful level is called Thermal pollution.

Effects:- Thermal pollution speeds up the biodegradation of organic matter which results in ecological imbalance of the rivers and streams. Warm water holds less oxygen. Many fish and aquatic animals which are very sensitive to temp. change can't withstand.



⑨ Detergents and fertilizers

Detergents are washing materials in water which cause soaping, these form a film around organic waste. Some of the fertilizers such as nitrates and phosphates are used in agricultural world to increase the crops yield, reach into rivers and ponds through irrigation, rainfall and drainage where they seriously disturb the aquatic ecosystem.

Effects:- when such waters are used by animals, the nitrates in their body by ~~inter~~ intestinal bacteria. The nitrates and phosphates are used in agriculture to increase the crops yield, reach into rivers and ponds through irrigation, rainfall and drainage, where they seriously disturb the aquatic ecosystem. It reduces the oxygen carrying capacity of the blood. It damages respiratory and vascular system and sometimes cause suffocation. The nitrates in the body combine with hemoglobin to cause a serious disease called Blue baby syndrome.

⑩ Eutrophication The natural aging of a lake by biological enrichment of its water is known as eutrophication. In a young lake, the water remains cold and clear supporting little life. with time streams draining into the lake introduce nutrients such as nitrogen and phosphorous, which encourages the growth of aquatic organisms. Now in this

situation growth of aquatic organisms grow in this situation growth of phytoplankton rapidly increase that cover the surface of water, which is called algal bloom.



Now, as the lake's fertility increases, plant and animal life burgeons, and organic remains begin to be deposited over the centuries, as silt and organic debris pile up, the lake grows shallower and warmer, with warm-water organisms



supplanting those that thrive in a cold environment. Marsh plants take root in the shallows and begin to fill in the original lake basin. Eventually, the lake ~~basin~~ grows older and gives way to large masses of floating plants (bog), finally converting into fens. Pollutants from man's activities like effluents from the industries and homes can radically accelerate the aging process. This phenomenon has been called cultural or ~~recreational~~ accelerated phenomenon has been called cultural or accelerated eutrophication.

Radioactive waste nuclear energy is produced using nuclear fission or fusion. The element that is used in production of nuclear energy U²³⁵ which is very toxic chemicals, these wastes are generally disposed in nearby water body of the nuclear reactor.

Effects Nuclear wastes can have serious environmental hazards if not disposed of properly. Release of nuclear wastes in fresh water will cause major water pollution and death of aquatic organisms. Few major accidents have already taken place in Russia and Japan.



• Prevention measures of water pollution:

It is very important to prevent the polluting of water bodies and remove existing contaminants or reducing the concentration of those contaminants or reducing the concentration of these contaminants so as to make it fit for desired use. So now we will follow some of the ways of treating polluted water.

① Industrial waste water treatment

The raw sewage is needed to be treated correctly in a water treatment plant before it can be safely released into the environment. To reduce the toxicity of the waste, it is passed through a number of chambers and chemical processes in water treatment plant.

Industries that generate waste water with high concentration of organic matter (e.g - oil and grease), toxic pollutants (e.g - heavy metals), need specialized treatment systems.

e.g. - air flotation system



dissolved flotation system for treatment of industrial waste water.

(3) Erosion and sediment :-

Sedimentation of loose soil particles we have to plant more and more trees especially aside water bodies that can prevent erosion of soil very much. Also to stop sedimentation of various hard particles in water bodies from construction site, we may apply slit fence, also we can use separate sediment ~~and~~ basins from water body.

(3) Retention basin for controlling urban run-off

Effective control of urban run-off involves reducing the velocity and flow of storm water, as well as reducing pollutant discharge.



Nowadays retention basins are mainly used, which are separated from general water bodies, for discharge of urban runoff.

(4) Denitrification :-

(4) Denitrification:- where nitrates present in water get converted into gas. It is known as denitrification. It is an ecological approach that prevents leaching of nitrates in the soil. It stops groundwater from getting contaminated.



Retention basin for urban run-off.

(5) Ozone waste water treatment

The ~~ozone~~ ozone waste water treatment method has become very popular. In this method an ozone generator breaks down the pollutants in water. Ozone oxidises bacteria, organic materials, molds and other contaminants in water.

24

(6) Septic tanks:- Septic tanks treat sewage right at the place of the location where it originates instead of treating it away from the plant or sewage system. This system is usually put to use at the individual building level. The sewage gets separated into solid and liquid components and separately.

(7) Removing that from waste water

Waste water generated by power plants or manufacturing plants the following technologies are used: cooling by evaporation, convection and radiation. Cooling towers can be used which transfer waste heat to the atmosphere through evaporation or heat transfer.

• Conclusion

Water pollution is mainly cause of our undisciplined actions and irresponsibility. Mainly, we will also carry the burden of these problems. So, let's just realize how important our mother nature is. It is our only source of living. Let's not destroy it nor pollute it. Let us act for a ~~change~~ change. We need and we should help, save and conserve our mother nature, especially that different bodies water, which are very crucial to maintain the balance of nature. Absolutely, there are many simple ways in how we can help and can stop polluting water.

Acknowledgement

I convey my deep sense of gratitude to Sir, for suggesting the way to find suitable for the development, in the preparation of the project manuscript. I owe to him in every sense for providing me with the facilities, valuable guidance and help throughout the course of investigation.

Date: 15/11/20

Subhagrit Patra
Signature of student

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

"WATER POLLUTION
AND
MEASURES TO CONTROL IT"

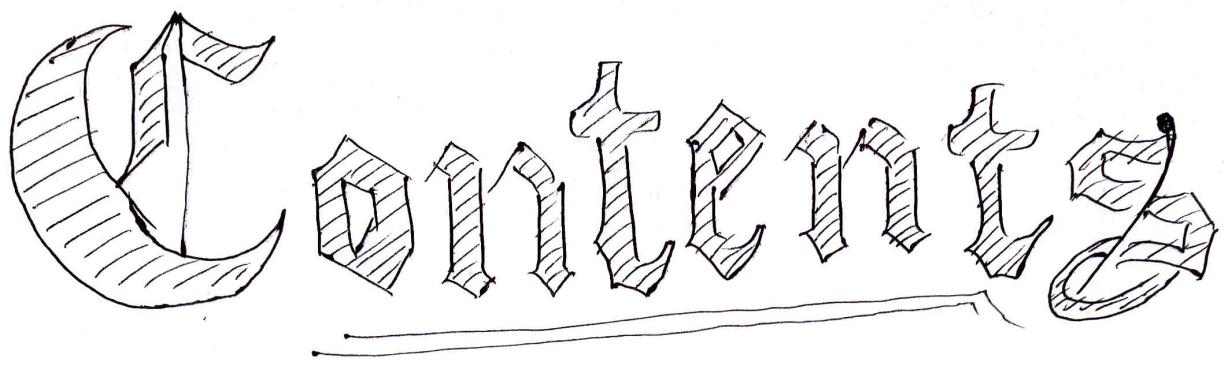
NAME : SUBHAM KUMAR SINGH

COLLEGE ROLL NO : CSUG/195/19

DEPARTMENT : COMPUTER SCIENCE

YEAR : 2020

SIGNATURE : Subham Kumar Singh.



Contents

SL. NO.	TITLE	PAGE NO.
1.	INTRODUCTION	1
2.	WHAT IS WATER POLLUTION	2
3.	POINT SOURCES	2
4.	NON-POINT SOURCES	3
5.	Effects	4-5
6.	Parameters FOR CALCULATING	6
7.	CONTROL MEASURES	7-8
8.	CONCLUSION	9

Introduction

"Water is life's matter and matrix, mother and medium. There is no life without water"

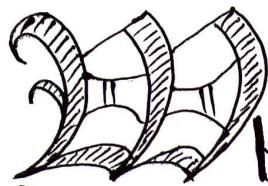
— ALBERT SZENT-GYORGY
M.D., Discoverer of Vitamin C.



Water is one of the most vital natural resources on earth and has been around for a long time. In fact, the same water which we drink has been around in one form or the other since the Jurassic period.

The earth has more than two thirds of its surface covered with water. This translates to just over 1 Octillion litres of water distributed in the ocean, rivers, lakes and streams.

That is a lot of water however, less than 0.3% is accessible for human consumption. As commercialization & industrialisation have progressed, that number continues to dwindle down. Furthermore, inefficient and outdated practices, lack of awareness and a plethora of other circumstances have led to water pollution.



WHAT IS WATER POLLUTION

Water pollution is the addition/presence of undesirable substances to/in water such as organic, inorganic, biological, radiological, heat, which degrades the qualities of water so that it becomes unfit for use.

Natural sources of pollution of water are soil erosion, leaching of minerals from rocks (due to natural solubility & solubility triggered by acid rain) and decaying of organic matter.

Point Sources

When pollutants are discharged from a specific location such as a system of drain pipe carrying industrial effluents discharged directly into a water body it represents point source pollution.

Some examples of point sources of pollution are wastes, soils, rocks, chemicals, bacteria, suspended solids, heavy metals, pesticides and more.

Non-point Sources

In contrast, non-point sources include discharge of pollutants from diffused sources or from a larger area such as run off from agricultural fields, grazing lands, construction sites, abandoned mines and pits etc..

Non-point source pollution can include —

Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas. Oil, grease and toxic chemicals from urban run-off and energy production. Sediment from improperly managed construction sites, crop & forest lands, and eroding streambanks.



Effects

The effect of water pollution depends upon the polluter and its concentration. Also, the location of water bodies is an important factor to determine the levels of pollution.

Water Bodies in the vicinity of urban areas are extremely polluted. This is the result of dumping garbage and toxic chemicals by industrial and commercial establishments.



Water pollution drastically affects aquatic life. It affects their metabolism, behaviour, causes illness and eventual death. Dioxin is a chemical that causes a lot of problems from suppression to uncontrolled cell growth or cancer. This chemical is bioaccumulated in fish, chicken and meat. Chemicals such as this travel up the food chain before entering the human body.

The effect of water pollution can have a huge impact on the food chain. It disrupts the food-chain. Cadmium and lead are some toxic substances these pollutants upon entering the food chain through animals (fish which consumed by animals, humans) can continue to disrupt at higher levels.

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



The ecosystem can be critically affected, modified and destabilized because of water pollution.

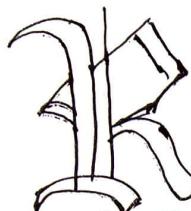
PARAMETERS FOR CALCULATING

Basic parameters for calculating water pollution:-

- Dissolved Oxygen (DO):- It is the amount of oxygen dissolved in water and is usually measured by oxygen probe (DO electrode) or Winkler Dissolved Oxygen test. DO below 8 ppm indicates pollution & below 4 ppm indicates heavy pollution. In unpolluted water, DO should be about 14 ppm.
- Biological Oxygen Demand (BOD):- The amount of oxygen (in mg) required by microorganism to stabilise decomposable organic matter in one litre of polluted water for 5 days at 20°C.
- Chemical Oxygen Demand (COD):- The amount of oxygen of polluted water is measured by chemical method using potassium dichromate as the oxidising agent.



Control Measures



Realising the importance of maintaining the cleanliness of the water bodies, the govt. of India has passed the 'Water (Prevention and Control of pollution) Act, 1974' to safeguard our water resources and an ambitious plan to save the river called the 'Ganga Action Plan' was launched in 1985.

In India, the 'Central Pollution Control Board (CPCB)', an apex body in the field of water quality management has developed a concept of "designated best use".

This classification helps the water quality managers and planners to set water quality targets and identify needs and priority for water quality managers and planning and restoration programmes for various water bodies in the country.



- Treatment of sewage water and the industrial effluents before releasing it into water bodies. Hot water should be cooled before releasing from power plants
- Water hyacinth (an aquatic weed, invasive species) can purify water by taking some toxic materials and a number of heavy metals from water.
- Oil spills can be cleaned from water with the help of bregoli.
- Bioremediation:- Is the use of microorganisms to degrade the environmental contamination into less toxic forms. But, it often takes a longer time than other treatment processes.
- Disinfection:- Water is disinfected before it enters the distribution system to ensure that any disease causing bacteria, viruses and parasites are destroyed.
- Chlorine is used because it is very effective disinfectant, and residual concentrations can be maintained to guard against possible biological contamination in the water distribution system. This addition of chlorine or chlorine compounds to drinking water is called Chlorination.

Conclusion

Hence, preventing water pollution and conserving water are important to assure a continuing abundance of water that is safe to use for ourselves and future generations. Water pollution is any human-caused contamination of water that reduces its usefulness to humans and other organisms in nature.

— X —

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

"WATER POLLUTION
AND
MEASURES TO CONTROL IT"

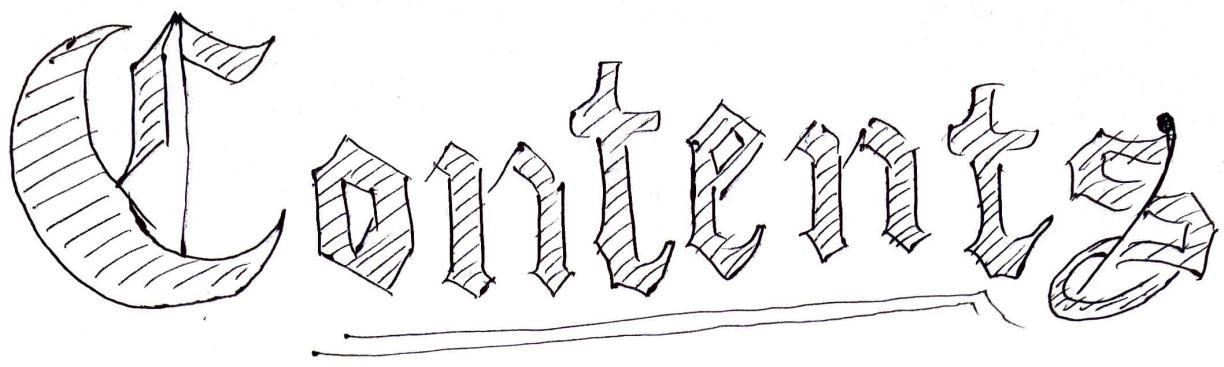
NAME : SUBHAM KUMAR SINGH

COLLEGE ROLL NO : CSUG/195/19

DEPARTMENT : COMPUTER SCIENCE

YEAR : 2020

SIGNATURE : Subham Kumar Singh.



Contents

SL. NO.	TITLE	PAGE NO.
1.	INTRODUCTION	1
2.	WHAT IS WATER POLLUTION	2
3.	POINT SOURCES	2
4.	NON-POINT SOURCES	3
5.	Effects	4-5
6.	Parameters FOR CALCULATING	6
7.	CONTROL MEASURES	7-8
8.	CONCLUSION	9

Introduction

"Water is life's matter and matrix, mother and medium. There is no life without water"

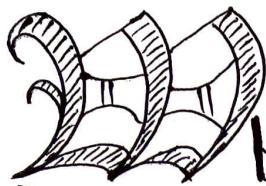
— ALBERT SZENT-GYORGY
M.D., Discoverer of Vitamin C.



Water is one of the most vital natural resources on earth and has been around for a long time. In fact, the same water which we drink has been around in one form or the other since the Jurassic period.

The earth has more than two thirds of its surface covered with water. This translates to just over 1 Octillion litres of water distributed in the ocean, rivers, lakes and streams.

That is a lot of water however, less than 0.3% is accessible for human consumption. As commercialization & industrialisation have progressed, that number continues to dwindle down. Furthermore, inefficient and outdated practices, lack of awareness and a plethora of other circumstances have led to water pollution.



WHAT IS WATER POLLUTION

Water pollution is the addition/presence of undesirable substances to/in water such as organic, inorganic, biological, radiological, heat, which degrades the qualities of water so that it becomes unfit for use.

Natural sources of pollution of water are soil erosion, leaching of minerals from rocks (due to natural solubility & solubility triggered by acid rain) and decaying of organic matter.

Point Sources

When pollutants are discharged from a specific location such as a system of drain pipe carrying industrial effluents discharged directly into a water body it represents point source pollution.

Some examples of point sources of pollution are wastes, soils, rocks, chemicals, bacteria, suspended solids, heavy metals, pesticides and more.

Non-point sources

In contrast, non-point sources include discharge of pollutants from diffused sources or from a larger area such as run off from agricultural fields, grazing lands, construction sites, abandoned mines and pits etc..

Non-point source pollution can include —

Excess fertilizers, herbicides and insecticides from agricultural lands and residential areas. Oil, grease and toxic chemicals from urban run-off and energy production. Sediment from improperly managed construction sites, crop & forest lands, and eroding streambanks.



Effects

The effect of water pollution depends upon the polluter and its concentration. Also, the location of water bodies is an important factor to determine the levels of pollution.

Water Bodies in the vicinity of urban areas are extremely polluted. This is the result of dumping garbage and toxic chemicals by industrial and commercial establishments.



Water pollution drastically affects aquatic life. It affects their metabolism, behaviour, causes illness and eventual death. Dioxin is a chemical that causes a lot of problems from suppression to uncontrolled cell growth or cancer. This chemical is bioaccumulated in fish, chicken and meat. Chemicals such as this travel up the food chain before entering the human body.

The effect of water pollution can have a huge impact on the food chain. It disrupts the food-chain. Cadmium and lead are some toxic substances these pollutants upon entering the food chain through animals (fish which consumed by animals, humans) can continue to disrupt at higher levels.

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



The ecosystem can be critically affected, modified and destabilized because of water pollution.

PARAMETERS FOR CALCULATING

Basic parameters for calculating water pollution:-

- Dissolved Oxygen (DO):- It is the amount of oxygen dissolved in water and is usually measured by oxygen probe (DO electrode) or Winkler Dissolved Oxygen test. DO below 8 ppm indicates pollution & below 4 ppm indicates heavy pollution. In unpolluted water, DO should be about 14 ppm.
- Biological Oxygen Demand (BOD):- The amount of oxygen (in mg) required by microorganism to stabilise decomposable organic matter in one litre of polluted water for 5 days at 20°C.
- Chemical Oxygen Demand (COD):- The amount of oxygen of polluted water is measured by chemical method using potassium dichromate as the oxidising agent.



Control Measures



Realising the importance of maintaining the cleanliness of the water bodies, the govt. of India has passed the 'Water (Prevention and Control of pollution) Act, 1974' to safeguard our water resources and an ambitious plan to save the river called the 'Ganga Action Plan' was launched in 1985.

In India, the 'Central Pollution Control Board (CPCB)', an apex body in the field of water quality management has developed a concept of "designated best use".

This classification helps the water quality managers and planners to set water quality targets and identify needs and priority for water quality managers and planning and restoration programmes for various water bodies in the country.



- Treatment of sewage water and the industrial effluents before releasing it into water bodies. Hot water should be cooled before releasing from power plants
- Water hyacinth (an aquatic weed, invasive species) can purify water by taking some toxic materials and a number of heavy metals from water.
- Oil spills can be cleaned from water with the help of bregoli.
- Bioremediation:- Is the use of microorganisms to degrade the environmental contamination into less toxic forms. But, it often takes a longer time than other treatment processes.
- Disinfection:- Water is disinfected before it enters the distribution system to ensure that any disease causing bacteria, viruses and parasites are destroyed.
- Chlorine is used because it is very effective disinfectant, and residual concentrations can be maintained to guard against possible biological contamination in the water distribution system. This addition of chlorine or chlorine compounds to drinking water is called Chlorination.

Conclusion

Hence, preventing water pollution and conserving water are important to assure a continuing abundance of water that is safe to use for ourselves and future generations. Water pollution is any human-caused contamination of water that reduces its usefulness to humans and other organisms in nature.

— X —

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Corona Pandemic and Role of Common
People to control it

NAME : SUBHANAN MAITY
COLLEGE ROLL NO : ECUG/151/19
DEPARTMENT : ECONOMICS
YEAR : 2020 - 2021
SIGNATURE : Subhanan Maity

① Introduction :-

After H1N1 swine flu pandemic in the year of 2009-2010 where an estimated 60.8 million people got infected, the human civilization got devastated again by the latest ongoing pandemic Covid-19 where an estimated 52.7 million people got infected, 1.29 million died and the numbers are still increasing day after day. This pandemic of coronavirus has made us realized that, no matter how smart and strong human being are, we're nothing to the power of nature.

② First Emergence :-

According to an unpublished report from the Chinese government, the first case can be tracked back to 17th November, 2019, : a 55-year old citizen from Wuhan city of China. From the phylogenetic analysis carried out ~~by~~ with full genome sequence, bats seems to be the covid-19 virus reservoir, but the intermediate host(s) has not been decided till now.

However, India reported the first reported case of corona virus infection on 30th January, 2020 in the state of Kerala. The affected had a travel history from Wuhan, China.

③ Symptoms of coronavirus and complications :-

Most common symptoms of covid-19 are —

- a) Fever.
- b) Dry cough
- c) Tiredness.

Less common symptoms include —

- a) Aches and pains
- b) Sore throat
- c) Diarrhoea
- d) Headache
- e) Loss of taste or smell.

People of different age groups have different type of complications. Elderly people are at higher risk of covid-19 due to their decreased immunity and body reserves as well as multiple associated morbidities like diabetes, hypertension, chronic kidney disease and chronic obstructive pulmonary disease. Complications can be —

- a) Acute respiratory failure
- b) Pneumonia
- c) ARDS
- d) SARS
- e) Acute cardiac injury
- f) Acute Kidney injury etc.

④ Death Toll Across the Globe :-

An estimated 52.7 million people got infected in covid-19, among which 34.1 million recovered and 1.29 million people died. Among countries, USA is on top of the list with an estimated 10.6 million cases and 243000 cases. India is on 2nd in the list, with 8.73 million cases and 129000 deaths, followed by Brazil, France, Russia respectively.

⑤ Role of Common People in Controlling covid-19 :-

Given the current circumstance and emergence and severity of the whole situation, it's hardly possible to come up with a vaccine for corona, as the WHO Director-general Dr. Tedros says, " We have a long way to go. This virus will be with us for a long time ". But, we, the common people doing some steps sincerely, can help preventing the spread of corona drastically. Some important preventive measure can be following —

i) Stay At Home :-

The most important aspect of prevention of covid-19 to spread is to staying back at home. The more we stay back at home, the less we will be social interaction, which inturn decrease the spread as corona virus is highly contagious in nature. The fewer people you're around, the lower is our chance of getting infected. Another most important aspect is to maintaining social distance. A minimum of 6 feet distance is required for protective measure.

ii) Use of Mask, Gloves, Sanitizers :-

Apart from staying back at home and maintaining atleast 6 feet of social distance, another things are use of mask. Being very contagious disease, it can spread through ~~air~~ via air by sneezing, coughing even by breathing. So, a good quality mask is required to prevent droplets of saliva from entering into nose, mouth. N95 is a good quality mask. However, mask made from common cloth available ~~in house~~ at home is also kind of thing to get the work done. However, use of gloves and surgical head cap should be used while going outside. Use of hand sanitizer should be a common habit. Hand wash should be used before taking any meal.

iii) Treat covid-19 patients kindly :-

In case, any of family member gets infected by corona, then basic treatments can be given to them by keeping them back at home. The victim should be placed in an isolated room to prevent the risk of spreading to other people of family. They should be provided with healthy foods to boost immune system. Antibiotics should be provided timely with doctors prescription. If the conditions get worsen, then they immediately should be provided with oxygen mask and taken to the hospital. But basic treatments should be at home as it lowers the risk of cross infectional disease from hospital. We've to keep in mind covid-19 patients are too human like us, so we shouldn't treat them differently and inhumanly.

iv) Promulgate Correct Information:-

Apart from staying cautious and maintaining all the rules, we must take the responsibility to promote the correct information. Nowadays, we're all connected with social medias, hence we can help others easily to get to know all the facts about covid-19. We can teach other different preventive measures, symptoms of covid-19 etc.

v) Mental Health:-

Staying months after months between four walls sounds easy enough, but in reality it has some catch. It effects adversely on our mental health. So, we should do some workouts, yoga, stretches etc., for not only maintaining mental health, but also to boost our immune system.

6. Summary :-

As long as the vaccines come out, we, the common people have to take the responsibilities to protect ourselves by taking preventive measures. Before protecting ourselves from some disease, we need to know everything about that disease, then comes preventive measures. In case of covid-19, we can take some simple preventive measures, like staying at home, maintaining social distance, use of hand sanitizer, hand wash, keeping hands clean etc.. Last but not the least, being social species we should help others to survive and thrive, and in case of covid-19, we should help others to let know preventive measures.

7. Conclusion :-

We should respect and pay gratitude to doctors, nurses, sweepers and other social workers, who are doing their works in the frontline, without even caring corona virus. Also, this lockdown nationwide ~~some has~~ ~~out of control brought some de-~~ has brought severe downturn in economic and business activity. As a result, daily wagers fell into trouble, because they were laid off the factory, working place.. They're the people, who were adversely effected by these preventive measure, but at the same, this is also true that we've no other alternative preventive measure given this scenario of no vaccine. We've stand by them, the govt has to stand by them. We've to realize that we're all connected and this entire world is our family.

8. Bibliography:-

- i) Times of India..
- ii) Wikipedia.
- iii) WHO
- iv) NCBI.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

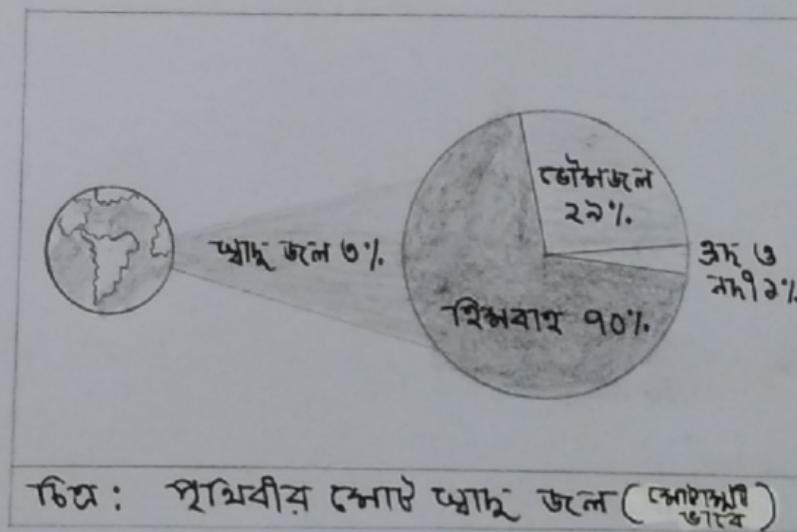


NARENDRAPUR
ENVIRONMENTAL STUDIES
PROJECT TITLE

“জল দূষণ ও তার নিয়ন্ত্রণের উপায়সমূহ”
(Water Pollution and measures to
control it)

NAME : SUBHANKAR KHAN
COLLEGE ROLL NO : HIUG/063/19
DEPARTMENT : HISTORY
YEAR : 2020
SIGNATURE : Subhankar Khan

১. জ্বরিকগ় : কলকাতা বিশ্বব্যাপী, আধুনিক মানবজগতের ওপর তথ্য আবশ্যিক উচ্চ উচ্চ উচ্চজগতের ওপর এক নয়া অভিজ্ঞাপন ই'ল জল দূষণ। আলো ও বাতাসের মধ্যে জলও ই'ল প্রকৃতির অক্ষিভ্যুত শুরুত্বপূর্ণ প্রাকৃতিক অভিজ্ঞান; যার অবর্তনানে পৃথিবীতে প্রায়ে অভিজ্ঞাপ্ত অভিজ্ঞান। বাড়ুত চেইজন্যাই জলের আরেক নাম 'জীবন'। পৃথিবীর মোট জলের ১০০ হাজার মাধ্যে ৭৭ জাগুর ই'ল প্রকৃত্বে (পূর্ব) জলের ২ জাগুর (পূর্ব) দুর লয়নাস্ত জল। যাকি ৩ জাগ ঘাসু জলের ২ জাগুর, যেকুন সুলের হিমবাহ মাধ্যমিক বরফ হিসাবে অবজ্ঞান করছে। আর যাকি ১ জাগ ঘাসু জল নদী, জলাশয়, ঔন অবৎ ফুলত্বে জল হিসাবে অবজ্ঞান করছে। উল্লেখ্য যে, পৃথিবীর মোট জলবাণীর এই খাতে ১ জাগ জলেই কেবলমাত্র পানের ও কৃষিব্যাপ্তির উপন্থুত, যা এবং অভিরিক্ত গুরুত্বকে অন্তিম করে। কিন্তু আধুনিক মান্ত্রিক অভ্যর্তা, নাগপাণ্ডিকে অর্ধান্ত শান্তিপুর সৌবজ্ঞানিক ও অবিবেচন প্রক্রিয়া ব্রাহ্মণের (আভিজ্ঞানাত্মক বিজ্ঞান, দুটি নগরাভ্যন) মধ্যে অস্ত্র নানাবিধি দুর্ঘাত প্রাপ্তির দ্বারা পৃথিবীর আভিজ্ঞাক জলবাণী (ঘাসু ও লয়নাস্ত জল) দুর্ঘাতের বরাল প্রাপ্তি অধিঃপাতিত হচ্ছে যা উচ্চমন্ত্র পৃথিবীব্যাপী ব্যাপ্ত শুরু-জ্বাঙ্গ-জ্বাঙ্গিক প্রাকৃতিক ও জীবজ্ঞানিক পরিবেশের ওপর ঝুকিকর প্রভাব বিচ্ছার করে আরেক এক নিষ্ঠ অস্ত্রের অভিজ্ঞাপ্তে নিয়ন্ত্রণ করে। তাই পৃথিবীকে, অবিষ্যতে তাগ জলন্ধনপ্রত্যক্ষত সহি অবজ্ঞানজ্বাঙ্গী অভিজ্ঞাপনের শাত থেকে শুক্র করতে পৃথিবীর সমাজ নাগবিককে দুটি অগ্রিম হিসেবে অবৎ কাঁধে কাঁধে মিলিয়ে আচতন-জায়ে জল দূষণ নিয়ন্ত্রণের ব্যবস্থা করাত হবে। একমাত্র উবেঙ্গ পৃথিবী আবার অনুমিত, অর্থাৎ অন্তর ইন্দ্র 'জীবনের' আনন্দ আবাস্থায় ইয়ে উঠবে। আমাৰ অন্ত প্রবলমাটিতে এক জল দূষণ ও আর বিষ্টন্তনপ্রত্যক্ষত আমন্ত্রণ ক বিষ্মপটিক্ত আলোচিত হবে।



- ⓪ প্রয়লেক্ষণ উদ্দেশ্য:** → আমাৰ অই 'জল নৃষ্ণন ও তাৰ নিয়ন্ত্ৰণেৰ উপায়সমূহ' শিরোনামবিশিষ্ট প্ৰকল্পটিৱে জলনৃষ্ণনেৰ সেচুন বেশ ফাঁড়কাৰি উদ্দেশ্য রয়েছে। কেচুলি হ'ল—
- ① জল নৃষ্ণন কৈলাকে ধাৰনা লাভ কৰা।
 - ② জলনৃষ্ণনেৰ ধৰণসমূলি কৈলাকে অবগত হওয়া।
 - ③ জল নৃষ্ণনেৰ বণৱৰচুলি কৈলাকে ধাৰনা লাভ কৰা।
 - ④ জল নৃষ্ণনেৰ জ্ঞাতিকাৰক প্ৰজাৰচুলি কৈলাকে অবগত হওয়া।
 - ⑤ জল নৃষ্ণনেৰ জ্ঞাতিকাৰক প্ৰজাৰচুলি থেকে মুক্তিৰ উপায়সমূহসে জল নৃষ্ণন নিয়ন্ত্ৰণেৰ কেচুলি অনুসৰণ কৰা।
 - ⑥ আৰ্যাপৰি বৰ্মণ প্ৰকল্পটিৱে জলনৃষ্ণনেৰ আৰ্য্যমে জলনৃষ্ণন বিশ্বাসি কৈলাকে আনুষ্ঠাক আৰ্থিকভাৱে আচেতন কৰা; যাতে আমাৰে কৱান এও উদ্বিষ্যৎ প্ৰজন্ম অহু আভিশালোকৰ কৰ্মাল প্ৰাপ্ত থেকে ছুঁড় হতে পাৰে।

- ⓪ তথ্য বিশ্লেষণ:** → 'জুনিকা' ও 'উদ্দেশ্য' অংশটিৱ মৰ এবাৰ অই বিশ্বাসিৰ উপনৃষ্টি ব্যাধ্যা ও বিশ্লেষণ প্ৰয়োজন।
- নীচে 'জল নৃষ্ণন ও তাৰ নিয়ন্ত্ৰণেৰ উপায়সমূহ' শিরোনামবিশিষ্ট প্ৰকল্পটি কৈলাকে প্ৰাপ্ত তথ্যচূলি বিশ্লেষণ কৰা হ'ল—

অই অমূলকিৰণ আলোচনাৰ প্ৰথমেই আমাৰে উৎসন্নত হৈব এখন, জল নৃষ্ণন বলতে প্ৰকৃতপক্ষে কী বোৰায় আৰ্য্য 'জল নৃষ্ণন'(Water Pollution) বিশ্বাসিৰ ধাৰনা কৈলাকে প্ৰয়োজন আৰ্য্যামেৰ অবগতি হতে হৈব। আমৰা জ্যানি বিশ্বাসি জল হ'ল দুই সবজানু মাইক্ৰোজেন ও অক পৱজানু অক্সিজেন দ্বাৰা গঠিত একটি প্ৰোচা(H₂O) এপচি দুড়া প্ৰাপ্ত হৈবন অনাপ্তসূশিল। সুধীৰীতে আৰ্যাবিকভাৱে অবজ্ঞানৰত জল বিভিন্ন দেহ, অৱজ্য সহায়, মান হৈত ও বাচায়নিক কৰা অৱৰ্তন মানা জীবনু ইত্যুছি আৰ্য্যাম ক নুবীড়ত অবজ্ঞায় প্ৰাপ্ত হৈব। তবে অই বৰনেৰ ক্লোনো কেচুলি তিথু ফলে ঘনি জলেৰ গুণসত্ত্বানৰ বিশেষ অবস্থি ঘটে অৱৰ্তন কৰে জল কৃতিকাৰ ও সাবীয় হিসাবে ব্যবহাৰৰ অযোগ্য হয় পড়ে, তবে আমৰা একে জলনৃষ্ণন বলে চিহ্নিত কৰাত পাৰি।

- ⓪ জলনৃষ্ণন অংজা:** → আৰ্য্যাবিকভাৱে 'জল নৃষ্ণন' বিশ্বাসিৰ অংজা হৈত কৰলে বলা যায় যে, 'জলেৰ কোঙ্গ বেগনো আৰাপুৰুত সহায় কীলে পোতাৰ ফলে ঘনি জলৰ ভৌতিক, রাজায়নিক ও ইতৰ বৈশিষ্ট্য পদ্ধিবৰ্তন হয় অৱৰ্তন তাৰ ফলে ঘনি উচ্চিতা, আৰী ও আনুষ্ঠান জ্ঞাতিৰ আশঙ্কণ থাকে, তবে জলেৰ কেচুলি পদ্ধিবৰ্তন অসূৰ্ত ধাৰণ অবজ্ঞাকে জল নৃষ্ণন বলে।

□ বিভিন্ন পদ্ধিবৰ্তন ও বিভিন্নীয়া জলনৃষ্ণন নিয়ে মান অংজা দিয়েছেন। তবে আদৰ বৰ্মনাৰ বৰ্মন আলান এলেও জল বন্ধুৰ্য খিচু এক। জল নৃষ্ণনেৰ ওপৰ দেওয়া দুটি জনপ্ৰিয় অৱৰ্তন কেচুৰ অংজা নীচে চিহ্নিত হ'ল—

- পরিষেশাবিদ অনিবার্কাম ১৯৮৪ খ্রিস্টাব্দে 'জল নৃষ্ণন' মুক্তনামে পলিউশন' নামক গ্রন্থ বলাতেন এবং, 'জলের বৈশিষ্ট্য এবং জুনগত মানের কুমালভাবী পরিবর্তনকে জল নৃষ্ণন বলে।' এর মধ্যে জলের উপর্যোগীতা নথি ইহা।
- বিজ্ঞানী আউফটাইক ১৯৭৫ খ্রিস্টাব্দে 'ইকোলজি অ্যান্ড নৃ বেশ্যালিং' অথা 'আওয়ার অনজান্তুনন্মেন্ট' গ্রন্থে জল নৃষ্ণনের অংজাম বলাচান এবং, 'মূলত জাতুষ্যের কর্মকাণ্ড ও প্রাকৃতিক কারণে জলের প্রাকৃতিক, আচারণিক ও দ্রুত ক্লিমাচুনচুলিয়া শুন্ধণ নথি ইত্যাকে 'জল নৃষ্ণন বলে।'

□ জলনৃষ্ণন অভিক্ষেপে থার্ম লাভের পর অবার আমদের ধূপুর্ণ্যের উপরিজাহ্ন (Surface) বা ধূতেজ্যকারে অংশিত জলনৃষ্ণনের ধরণ বা প্রক্ষয়তেন্ত্রনুলি (Types of Water Pollution) অভিক্ষেপে অবহিত হতে হবে। নীচে তা আলোচিত হ'ল—

১. জলনৃষ্ণনের ধরণ: → আনন্দপ্রতিকালে পৃথিবীতে অংশিত জলনৃষ্ণনের ধরণ এক ধূতেজ্যকারে আলোচনা করা হতে পারে। নীচে দুটি অলিখাদ চাহুড়ে বিষয়াবি আলোচিত হ'ল—

আলিকা - ১

ক্রমিক সংখ্যা	জলের 'উৎস' অনুমানী জল নৃষ্ণনের ধরণ	অংশিত বিষয়
1.	ডুগার্জ্য বা রঙাই জল নৃষ্ণন (Ground Water Pollution)	এই ধরনের জল নৃষ্ণনে ধূতেজ্যকারে অঙ্গুত জল নৃষ্ণিত ইহা যা নানাবিধি জলের অকার্য ও নানাবিধি বোগুর প্রার্থীবকে ঝুঁতিলিপ্ত করে।
2.	নদীর জল নৃষ্ণন (River Water Pollution)	এই ধরনের জলনৃষ্ণনে নদীর জল নৃষ্ণিত ইহা। জরাতের গঙ্গা, নর্মদা, বৃষ্ণি, বগুবেরী, গোমাবী, মচুনা নদী; এবং পৃথিবী বিদ্যাত নদীগুলি প্রমত্ন- শ্বেতাংশু, পাতেজ, মিঠিয়া-পি নদীয় জলনৃষ্ণন এবং পত্রক উদ্বাঘন।
3.	অক্ষুরের জল নৃষ্ণন (Sea Water Pollution)	এই ধরনের জলনৃষ্ণনে অক্ষুরের জল নৃষ্ণিত ইহা যা বিশ্বব্যাপী পরিবেশের অবনমনের সংযোগিক।
4.	পুর বা জলাশয়ের জল নৃষ্ণন (Lake Water Pollution)	এই ধরনের জলনৃষ্ণনে পুর বা জলাশয়ের জল নৃষ্ণিত ইহা। জাবতে বেল্লান্দুর অন্ধ (Bellandun Lake) জলনৃষ্ণন এবং প্রকৃতি জীবন।

প্রাঙ্গণ উপর্যোগ এবং, উপরিলিপিত নথি, পুর, পুর বা জলাশয়ের জলনৃষ্ণনকে একই Surface Water Pollution বলেও আলোচনা করা হতে পারে।

গোলিকা-২

ক্ষেত্র নং	জলনৃশনের 'প্রকৃতি' অনুসারে জল নৃশনের ধরণ	অংকিতা বিশ্লেষণ
1.	জলের শারীরিক নৃশন (Physical Pollution of water)	<p>এই ধরনের জলনৃশনে জলের নমনাবধি শারীরিক পরিবর্তন ঘটে।</p> <p>রং: এই ধরনের জলনৃশনে জলের রঙে পরিবর্তন ঘটে যা জলের অভ্যন্তরে অর্ধালোকের প্রবেশে বাধা দৃশ্য বর্ণ জলক টান্ডিন ও প্রানীর আড়া- বিক জীবনে প্রিমাদের মধ্যে অঙ্গীকার যদে।</p> <p>অংশুভূতি: এই ধরনের জলনৃশনে অংশুভূতি হয়ে পড়ে যা জলনৃশনে বা কৃষিক্ষেত্রে বা গৃহস্থানীয় ক্ষেত্র ব্যবস্থারের অনুসরণে।</p> <p>ধ্বনি: বিশুद্ধ জলের কানে বিশ্লেষ ধ্বনি থাকে না। কিন্তু এই ধরনের জল নৃশনে শিল্পায়োজন নথিক পাঠার, মচান-আইরন, ক্যাঙ্গানিচ, ক্লোরিন রয়েনল এবং বিমুচজক দ্বারা সমৃদ্ধ গ্যালাচি, মার্কি, ব্যবস্থাবিহীন প্রক্রিয়া ক্ষেত্রে জলের এবং অঙ্গীক ধ্বনি অ- ঝিট করে।</p> <p>গন্ধ: এই ধরনের জলনৃশনে জলে অবাক্তৃ ত পদার্থের উপস্থিতি জলের জাতীয় চূমক আলাদে গন্ধ দৃশ্য করে।</p>
2.	জলের রাওয়ানিক নৃশন (Chemo- -ical Pollution of water)	জৈবে ও অ-জৈব রাওয়ানিক নৃশনের মধ্যে জলের রাওয়ানিক নৃশন ঘটে। যা হল জলে জলের আক্ষিকতা ও ক্ষারস্থ অ- পৰ্যায় pH আপ্ত পরিবর্তিত হয় এবং জল উরীভূত অক্সিজেনের (DO) মাত্রাও প্রাপ্ত পায়।
3.	জলের জৈবিক ও জীবগতিক নৃশন (Biological Pollution of water)	এই ধরনের নৃশন ক্ষয়ক্ষতি হয় ব্যাকটেরিয়া ও আক্রান্ত, অ্যালগি, প্রোচোটেক্সাই খাব যা আক্তীয় নমলির উৎপত্তি, পোলিও এবং রেসার্চাইটিজ রোগের উৎপত্তি করে।
4.	জলের শারীরস্থানীয় নৃশন (Physiological Pollution of water)	জলের শারীরস্থানীয় নৃশন উৎপত্তি হয় ক্লোরিন, তালসুদ-চাল-অক্রা- -রুড, রক্ষাত্মক জাতীয় পোলিও বিক্রান্ত, রয়েনল প্রক্রিয়া দ্বারা এটি জলের ধ্বনেক উন্মুক্ত ধ্বনি রপ্তানিত করে এবং আপত্তিকর গাঁথনা ক্ষেত্র ধ্বনি।

□ জল নৃসন্ধনের বিষয় অমুক জলানায় পর এবার আ-
মাদের জলনৃসন্ধনের উৎস অথা বায়ুনগুলি অমুকে অবগত হওয়ে
নীচে চোল্লে অমুকে আলোচনা করা হ'ল —

① জল নৃসন্ধনের উৎস কারণভাবের উৎস:

জল নৃসন্ধনের উৎসগুলিকে
প্রধানত দুটি ভাগে ডিগ
করা হত্ত্ব মাকে, যথা - ① জলনৃসন্ধনের প্রত্যক্ষ উৎস (Point Source)
এবং ② জলনৃসন্ধনের অপ্রত্যক্ষ উৎস (Non Point Source)।

● জল নৃসন্ধনের প্রত্যক্ষ উৎস: → এভাব জামগারুলো থেকে জল নৃধিত
হচ্ছে, তাইয়ে যদ্যন অর্বাচি চিহ্নিত করা যায়, যদ্যন আকে জলনৃ-
সন্ধনের প্রত্যক্ষ উৎস বা Point Source যেন। উচ্চারণযুক্তিপ বলা
যায়, কোনো জিলাস্থলের বিভিন্ন কার্যধানায়, মানা নির্মায়, শাক্তি
উৎপাদন কেন্দ্র, পারমাণবিক গবেষণাগার ও শাক্তি উৎপাদনকেন্দ্র
তাৰিখনগত পৰিকল্পনা ও বৰ্ত্য প্রতিযোগিতা প্রতিক্রিয়া
সৰ্ববৈকল্য বৰ্ণনেই নির্দলিতাবে বলা অস্তুব যে তায় ঝৈয়ে কোন জায়-
গারুলি থেকে জলের নৃসন্ধন হচ্ছে। ফলজ্ঞতাপ আইন অন্তর্ব কৰ
চৰকৰে চাধ্যগায় নৃধিত জল, যন্ত্রপাতির দ্বাৰা জ্বারণের দ্বাৰা
চৰখানে জলনৃসন্ধনের অমুকতা নির্মূল কৰা অস্তুব হয়।

● জল নৃসন্ধনের অপ্রত্যক্ষ উৎস: → কোন কোন জামগা থেকে জল নৃ-
ধিত হচ্ছে, যদ্যন আদের অর্বাচি চিহ্নিত কৰা যায় না এবং
কেনো প্রত্যক্ষ ও আসুন আভাস কৰত যদ্যন আদের যন্মেপ-
নুকুজাবে নিয়ন্ত্ৰণ কৰা যায় না, তখন তেন্তে উৎসগুলিকে জল
নৃসন্ধনের অপ্রত্যক্ষ উৎস বা Non - Point Source যেন। অমুক-
নৃসন্ধনের অপ্রত্যক্ষ উৎস বা নির্দলিত ইত্যাদি। ভাষের জমিব-
য়াজ্বাচার ধৰ্মী নোংৱা জল, ভাষের জমি ইত্যাদি। ভাষের জমিব-
য়াজ্বাচার কৃষি অস্তুলের বিভিন্ন জমি ও তাতে ভাষ ইত্যো বিভিন্ন ফ-
লকায়ে কৃষি অস্তুলের বিভিন্ন জমি ও কীৰ্তনাশকাদেৱ ঝৈয়ে থেকে
জল এবং তোষিক বিভিন্ন আৱ ও কীৰ্তনাশকাদেৱ ঝৈয়ে থেকে
কীৰ্তনাশকাদেৱ পাণ্ডুলি জলাশয়গুলি নৃধিত হচ্ছে, তা নির্দলিতে বলা
অস্তুব নয়। যন্তু আই আৰ জল নৃসন্ধনের অপ্রত্যক্ষ উৎস।

উল্লেখ দ্বাৰা আলোচনাব কুবিধীয় জন্যে জল নৃ-
সন্ধনে উৎসগুলিকে তথা উৎসগুলিকে কার্যনগুলিকে নিৰ্মল একটা অভিজ্ঞ-
ক আভিজ্ঞাকে আলোচনা কৰা হ'ল —

● জল নৃসন্ধনের কারণভাবের উৎস: → জলের ঝৈয়ে যেঅমুক বিকলাতীয় পদাৰ্থ
ক্ষেত্ৰে জল নৃসন্ধন হোৱায়, তেজুলোকে 'জলের নৃক' বলা হয়। ঐ
নৃক প্রধানত দুটি প্ৰকাৰ, প্ৰাকৃতিক (যেমন - অস্তুলাহৰণনিত জলনৃধন) ও
অনুস্থৰুষ। তবে পৃথিবীৰ প্ৰায় বেশিৰভাগ বা অৱ জলনৃসন্ধনেৰ জন্ম
মূলত আনুস্থৰুষ হাবী। উল্লেখ্য দ্বাৰা, এই নামাবিধি জলনৃক পদাৰ্থৰ বাৰ-
ক্ষণে উৎসকে কোনো কৰণেই জলনৃসন্ধনেৰ নামাবিধি কারণগুলি অনুচ্ছিত
হয়। জল নৃসন্ধনে উৎসগুলিকে পুৰুষপূৰ্ব কারণগুলি হ'ল —

① জীৱানু-ও শুভ্যানীৰ প্রাত্যক্ষিক আবৰ্জনা থেকে নৃধন: → শুভ্যানীৰ
আভে ব্যবস্থাৰ জলে ধোয়াভোয়ৰ ফোলে দুওম্বা অংশ, শাবকবৰজিৰ
পচা অংশ, অলঘূৰ, দোয়ান, তিচায়েজন্ত ইত্যাদি মিলে থাকে। ব্যাক-
চেত্যুণ, প্ৰাপ্তোজোৱা ইত্যাদি মিশ্রিত এই এনাথৰা জল ও বড়ো
বড়ো বাজাৰ, শাত্রুপাঞ্জল ও চিকিৎসায়েকু থেকে মিশ্রিত কীৰ্তনাশক

বজ্র্য জলে পদ্ম পুনরাবৃত্তি দ্বারা নদী, হৃদ, ধান বা অঙ্গুঠোর জলে পড়ে ডেলন্সন ঘটায়। এছাড়া গুহচূড়ালীর অই নৃধিত বজ্র্য দীর্ঘ দিন ধরে আগিতে ঝাঙাপ্ত ঘোষণা করে শুগারেজ জলও নৃধিত হয়।

- ② শিল্পকল্পনা এবং উৎপন্ন: → শিল্পকল্পনা (Industries) ইল জলে নৃধনের প্রধান উৎস। বিভিন্ন শিল্প কল্পনার মধ্যে নির্গত নৃধিত রাজামনিক সমাচার, যথান— ① পরমাণু শক্তিকেন্দ্র মধ্যে নির্গত প্লাষার্ট প্রোসেস ② গ্যাস ও ফোক শিল্পকল্পনা অ্যামেনিয়া, মেনল, আম্বামার্ট, আলমগার্ড এসেস; ③ রং ও ব্যাচারী শিল্পকল্পনা পীঁপা ও তীব্রাবৃত্ত আনু ও অন্যান্য রাজামনিক শিল্পকল্পনা অন্তর্ভুক্ত, মেনল এসেস অবস্থ অ্যামিন্ড, মেনল এসেস ④ টেল কোর্পোরেশন, এপট্রো ইকার শিল্প ও ইন্ডুস্ট্রিয়াল শিল্প ব্যবস্থা হাইট্রুকার্প এসেস, তেল, চর্বি, প্রজ ইভ্যান্ড ⑤ কুর্মশিল্প ব্যবস্থা উৎপন্নিক অ্যামিন্ড, মেনল, আলমগার্ড ও এক্সপ্রিম্যান এসেস ⑥ তার শিল্পকল্পনা উপকল্পনা ফার্মেস ও এক্সপ্রার্ট এসেস প্রাকৃতি মালা, নদীর দ্বারা নদী বা অঙ্গুঠোর জলে ভিত্তি জল নৃধিত করেছে। প্রত্যক্ষব্যবহৃত বিশেষজ্ঞাবে উল্লেখ্য মে. আরতের একান্তরাজ্য নদীগুলি— শুভ আজুর নদীর ধারে গড়ে ওঠা বিভিন্ন শিল্পকল্পনার অন্তর্ভুক্ত। নীচে অক্ষমি ছবের আগ্রায় আরতের কিছু উল্লেখযোগ্য নৃধিত নদীর নাম ও তাদের নৃধনজাত (শিল্প উৎপন্ন) উৎক্ষেপন উপরকে তথ্য লিপিবদ্ধ করা হল—

আরতের কিছু গুরুত্বপূর্ণ নদীর নৃধনের উৎক্ষেপন

ক্রম	নদীর নাম	নৃধনের উৎস
1.	নদীরাতের 'কালী' নদী	চিনি কল্পনামূল ; উৎকৃষ্টিধান (distilleries); রং, অ্যামান, ইয়েন, ইশ্বর অবস্থ ক্লিয়ার শিল্পকল্পনার মুক্তি।
2.	মিল্লীর নিকাপ বর্তী 'মুমুনা'	DDT ফ্যাক্টরি, প্রদেশের অঞ্চল, ইন্দ্রায় প্রিস্টুকেন্দ্র (মিল্লী)।
3.	কানপুরের 'গঙ্গা'	সাউ, রাজামনিক, ধাতু অবস্থ অল্যাটিকিউড-অ্যালকা শিল্প কল্পনা; উচ্চনগ্রামিকমূল, পটপ্রস্তাবিত শিল অবস্থ প্রচুর সম্বিলেন শুভ্যানী উৎক্ষেপন নদীর বজ্র্য পাহার্দ।
4.	নদীকৌ- এবং নিবন্ধ- 'গোমতী' (U.P.)	কল্পনা অবস্থ ব্লগড অন্তর কল্পনা; নদীর অঞ্চল জল (sewage)।
5.	বেরিনির 'নার্জীরা' (P.R)	কুপ্রিজ ব্রাব একান্তর ফ্যাক্টরি (synthetic rubber factories)।
6.	বোকালো অবস্থ পাহাড়- এবং ঝৰ্ণ্য অবস্থ নদী 'নাম্বোহর' নদী	ইঞ্জিন কল্পনা মধ্যে নির্গত প্লাষার্ট প্লা, আবৃ, বৈগ্রাহ্যকর্তৃত্বলি মধ্যে নির্গত আগ্রিল অঞ্চল অঞ্চল উৎক্ষেপন পাহার্দ, ক্ষেত্র বিস্তু করেন্ত।
7.	কোলকাতাৱ নিবন্ধে 'গুগলি'	প্রিস্টুকেন্দ্র উৎক্ষেপন; ব্লগড জল, সাউ, পটপ্রস্তাবিত, রাজামনিক কল্পনা, রং,

ক্রমিক নং	নামীর নাম	শৈশবের উৎস
		বানিঁও, ধাতু, ইঞ্জিন, এয়ার প্রেস আবা- -ন, টেলিলাই, স্লাইডিং গ্লিস প্রেস নর্মায় বর্জ্য ছল।
৪.	ডালক্ষিণ্যানগাড়ের 'শোন' (বিশার)	চিত্তপুর, অন্ত প্রেস বণগাছ বাসরধানাইমু- -র
৫.	বুম (Boom), আনন্দমাহ (Adyam) এবং বাকিংথার্ম ধাল (আন্দাও)	চোষের গাপির বাসরধানা অনুষ্ঠ, গুরুব্যানীর নোংরা বর্জ্য প্রেসিল ছল।
১০.	'কাবেরী' (আমিলনাপু)	নর্মায় বর্জ্য ছল, চামড়া ছেতান বাস্তাৱ- -চ্যুটনপুরিডামুহ, উৎপিধানা, বণগাছ প্রেস এয়ান বাসরধানা।
১১.	'জামায়ঢী'	বণগাছ বাসরধানাইমুহ।
১২.	'কিওভান' (বিশার)	বণগাছ, ঝালখোড়, চিত্তপুর, চিত্ত প্রেস শিলপার বাসরধানাইমুহ।
১৩.	'বুলু' (বোল্পে ও কল্যানের অর্ধে)	বানান্যনিক বাসরধানা, কুপিম এৱশ্য তেবি- -য বাসরধানা ও চামড়া শিলপার ষ্যা- -তাবিডামুহ।
১৪.	অন্দাও/বেয়ো (বলঢ়াম- -পুর)	চিত্ত শিলপ বাসরধানা।



শিলপ বলঢ়ারধানা থেকে জলনৃপন

প্রাচীনকাল আবেক্ষণি বিষয় 'উল্লেখ্য হ্যু বাধনা কাধনা' শিলপাত্ত
বর্জ্যের আর্থ প্রভূর পরিজ্ঞানে সেকে অবিভাজ্য মূল্যক (non-degr-
-adable Pollutionants) নিলে আকে প্রেতুনি শিলপাত্ত বর্জ্য
প্রাচীন এবং সবৰ্যালে অবজ্ঞিত ছলক বাস্তুতন্ত্রের অবিজ্ঞান
অঙ্গ দ্বীপাৰ্থ ও মানুৱ এছে ক্ৰম্ভাৱিত হয়। এই বিবৰেৰ প্ৰাচীন
অত্যন্ত বিস্তৃতক বাস্তু পৰি ধান্যশুল্কলেৰ মৰ্য্য হ্ৰয় আৰু
চূড়ান্ত কুতি প্ৰাচীন বৰ্য্য। তাৰিখাতোৱশলে উত্তৰ পূৰ্ব বঙ্গোপ-
-সাগৰ বৰ্য্য কৈপুৰুলৰ গুলুৰাবলীত প্ৰাপ্ত এৰু গুৰুত্বপূৰ্ণ
ভোজ্য আছৰ কলে প্ৰতিবেশোৱশল জাৰী ধাতুৰ পুঁজীজৰন
প্ৰজ্ঞন বাস্তা গোছে। নীচে অৰ্পণি অৱলিঙ্গৰ আহাৰ্য রচনি
প্ৰকল্পৰ বাস্তা ইল—

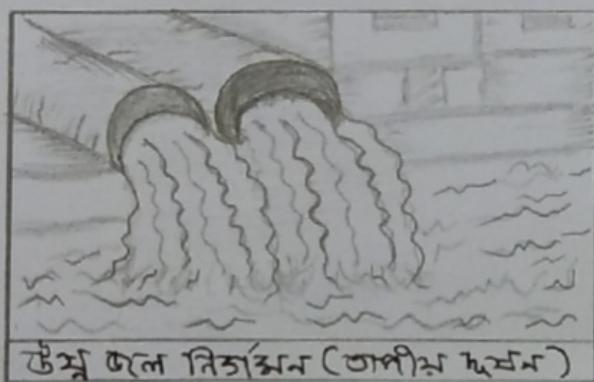
প্রাকৃতিক পদ্ধতি দ্বারা তৈরি আছে এবং পশ্চিমাঞ্চলীয় Pb-এর অন্তর্বেশ (2000 আন্তর্বেশ অংশ অন্তর্বেশ অন্তর্বেশ)

প্রক্রিয়া	আছের প্রজাতি (Fin fish species)	পদ্ধিতিতে ঘোষিত নাম	Pb (in mg/gm dry wt.)
1.	Tenuisosa ilisha	ইলিশ	18.84
2.	Pampus argenteus	পম্পাস্পুচ	3.82
3.	Liza stade	জাঙ্গান	19.11
4.	Liza Persia	সার্ট	18.65
5.	Polyremus Paradiseus	গোড়া	7.62
6.	Thunnus albacares	মুনা	3.38
7.	Coilia neglecta	রূলি	2.65
8.	Cynoglossus Sp.	বানওপাষা	4.16
9.	Scatophagus argus	টেমবা চোখা	6.43
10.	Ilisha elongata	জালা	18.08

৩. কৃষিক্ষেত্র দ্বারা জলনির্ষেণ : → কৃষিক্ষেত্র প্রচল উৎপাদনের জন্য নামাবস্থার বাস্তুমানিক আব (অ্যারজানিয়া, ইউরিয়া) এবং কৃষিক্ষেত্রে অস্থায়ী ব্যবহার দ্বারা বণিকাশের CDDT, BHC, অন্তিম, মালিকেন এবং বায়া শব্দের মাঝে। কৃষিক্ষেত্র দ্বারা একে একাব আব ও কৃষিক্ষেত্র ক্ষেত্র ও কৃষিক্ষেত্র আলোচনাত দ্বারা প্রকৃতে ও নামিত অভ্যন্তর পর্যন্ত একটি জলক নির্ধিত ব্যব।

৪. ধানিজ তেল দ্বারা জলনির্ষেণ : → নৃস্য জলনির্ষেণ তেলবাহী জাহাজ দ্বারা অস্থায়ী উৎপাদন তালুর ধরনির তেল উৎপাদন ক্ষেত্রে জলনির্ষেণ ঘটায়। অগ্রন্থিত বাণিজ্যে উৎপাদন উৎপাদন ক্ষেত্রে জলবাহী ফলে তেল এবং শাশুলকের ক্ষেত্র বর্ণার বেশীয় উৎপাদনের মাঝে আব আব গোছে।

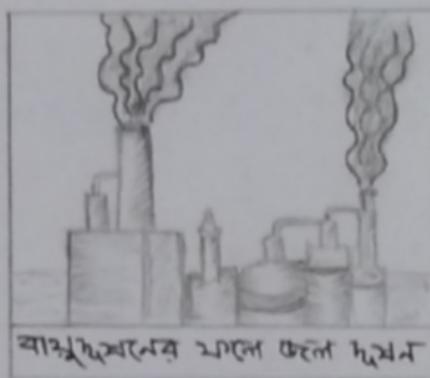
৫. পাপীয় নির্ষেণ : → পাপীয় বেন্দু, সারমানবিক বিন্দু বেন্দু, ক্ষেত্রবাসী গবাস ব্যবহৃত উষ্ণ নির্ধিত বর্ণ জল জরাওয়ি জলাশয়ে, নামিত ক্ষেত্রে জলে অন্তিমেতের পাপীয় বর্ণিয়ে আব ও জলনির্ষেণ ঘটায়।



উষ্ণ জল নির্জন (পাপীয় নির্ষেণ)

৬. গোচার্প্প পানার্প দ্বারা জলনির্ষেণ : → পানমানবিক হুলি, চিকিত্সাকর্তৃ বা ইত্যাদিক পদ্ধতিগারী ব্যবহৃত গোচার্প্প পানার্প গুলো ব্যবহারের পর চোচার্প বা নামিত ফেলা হয়। পানমানবিক বিশ্বে বাসের পর গোচার্প্প পানার্প গুলো ক্ষেত্রে নির্ধেণ করে নির্ষেণ ঘটায়।

- ৩. বাস্তুভূষণের বলবৎ জলনৃমন:** → বন্দরগামী ধান এবং প্রানবাহনের বৈঁচ্য।
 -এই ক্ষেত্রে বাতাসে আলগায়-ফাই-অক্সিইড, নাইট্রোজেনের অক্সি-
 -ইচ বর্ণন-কর্মসূচাইড ইত্যাদি রয়েছে। বৃক্ষিক জলের দাফে
 চানমায় ডাই-অক্সিইড ও নাইট্রোজেন ডাই-অক্সিইড বিক্রিয়া
 কূঝ। বাতাসে কালীম আপেক্ষ কোথে কৃষীজূত পরিবে অ্যামিগের
 অনুকূলি রেশি কৃষীজূত অবগুম্য কিসিয় ও বৃক্ষিক জল
 (অক্সিইড কৃষি) কৃষীজূত কৃষ সুস্থিরীত পরে পড়ে ও জল-
 আমৃত জলের পানিকাতা কৃষি কৃষ প্রা আর অনাকাশহিলুত
 পরিষ্কার কৃষি জলকে সুস্থিত কৃষ।



বাস্তুভূষণের ফল জল নৃমন

- ৪. আর্থিক নৃমন:** → আর্থিক নীচের ঘৰ একে অনিয়ন্ত্রিতভাবে অতি-
 -বিক্রি জল জল কুমার মানে আর্থিক নীচে মানবণ আর্থ-
 -বিক্রিয় প্রোগ বাতাসের কোথ বিক্রিয়া কৃষ বিষাক্ত প্রোগ কৃষি
 কৃষ। এই প্রোগ জল কিশো নলদুপের জলের আর্থিক পারিমাণ
 জল কিশো কৃষ; জল কৃষ বিক্রিয় প্রোগ, কোরিন অতিরিক্ত পরিমা-
 -নে প্রক্রিয় জল সুস্থিত কৃষ।

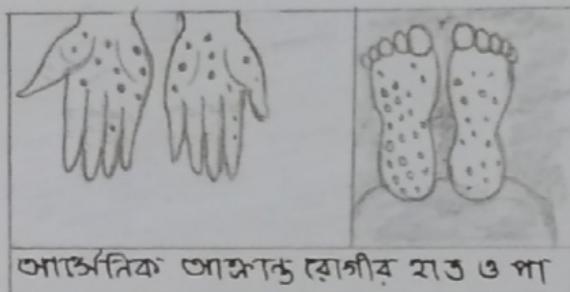
□ জল নৃমনের উৎসাপত্র নানাবিধি বণরনজুলি
 কামকে অবগত কৃষ্ণায় পয় এবং তামাদের জলনৃমনের ক্ষতিকারক
 প্রায়শুলি বা মানামালকুলি কামকে অবগত হতে হবে। নীচে কোই
 কামকে কৃষকে আলাদা কৃষ কৃষ কৃষ —

- ৫. জলনৃমনের প্রভাবসমূহ:** → জলনৃমনের ফলে আশ্চর্যজনকভাবে অ্যালজা
 -ও জলজ বায়ুজূত ক্ষতিগ্রস্ত হচ্ছে।
 - নজু অরুকীয় পেনিটেন্সিয়াল একে শুরু কৃষ চর্বীর জীব আরু
 - সম্পুর্ণ এই জলনৃমনের ক্ষতিকর নামপাশে আবাহন। সুস্থিত জল নান-
 - কৃষজ আরু নানাবিধির জলবাহিত রয়েছে আক্রান্ত কৃষ মালধূরের
 প্রায়শ্যবাহিনি ছাপে। জলবাহিত খিঞ্চ বোগের নাম নীচে মারনীত ক্ষেপণত
 হচ্ছে —

কারণ জীববৰ্ষ প্রকল্প	ক্ষেপণ নাম
কার্বনাইজেশন	ডাইকাল এক্সপ্রেস সি.ও.এ, পেনিল, লিশুরে আমাবিমা ইত্যাদি
ব্যাক্সারিমাইজেশন	চার্টেলাম্ব, ব্যাক্সারিমাইজেশন, ব্যাক্সারিমাইজেশন ইত্যাদি।
প্রাক্টিকার্বনাইজেশন	আক্সাশন্য, কিস্যুরিমাইজেশন ইত্যাদি।
কুমিলাচিম্ব	কুমিলাচিম্ব, আক্রান্তব্যারিমেজেশন ইত্যাদি।

ଅହାଣ୍ଡା ଜଳାଶୟେ ଫ୍ରାନ୍କିଲ୍ମେଟ୍ ଜାଗିନ୍ ଆସିଥିଲୁ
- ଭାବୀରେତେ ଇତ୍ୟାହି ଖିଳାଳେ ଟେଲିଵାଲେର ଯାମକ ଯୁଦ୍ଧର ଫ୍ରାନ୍କିଲ୍ମେଟ୍
ଜଳେ ପୂର୍ବିଷ୍ଠ ଅକ୍ରିଟରେ ବା DOC (Dissolved Oxygen) ଏବଂ ଘାଷି
ଦେଖା ଯାଏ । ଏଇ ପାଞ୍ଚମାକେ 'ଇଞ୍ଟର୍ବୋମିଲେଶନ' ବଳେ । ଅହାଣ୍ଡା ଏଇ ତୌଳେ
- ଏ ଲାରିଲୋପକାରିତା ବଳଯିନେ ଅନ୍ୟତଃ 'ଇଞ୍ଟର୍ବୋମିଲେଶନ' ଫାଲ ଗାଲ
ଅକ୍ରିଟରେ ଲାରିଜାନ ବଳମ ରାତଳ ଟେଲିଵାଲର ପଢନ ଘାଷି ଏବଂ ଗଲ
ନୂପିତ ହୁଏ । ଏଥକ 'ଟେଲିଵାଲ ବୁମ' (TVIpal Bloom) ବଳେ । ଏବଂ ଏକ
ଜଳେ ଶୁନନ୍ତ ଆନ ପ୍ରାଣ ପାଏ । ଜଳ ପୁର୍ବିଷ୍ଠଙ୍କ ବିଧାନ, ପାନେର
ଓ ବରାବାରେ ଆମାଗ୍ଯ ହୁଏ ପଡ଼େ ।

ডেভেলপমেন্ট অধিকারীর পদে আসেন। এই সময়ে মাল উৎপাদিত
আর্থিক নৃপর্ব মাল কল ও আর্থিক নৃপর্ব মাল উৎপাদিত
জন সার ও যুবস্থার মাল হাতের রেখে ও পার্শ্ব তন্ত্র বাস
কলা কর এবং একে 'ক্লাকমুঠ ব্যৱস্থা' বলে। পছন্দও চার্চের গ
বক্তৃতার পর্যন্ত, মুসলিম, ফুকেব ব্যাকাবও এতে সারে। মুসলিম
নৃপর্ব প্রেরণ 'মুসলিম'; হাত, হাতের উৎপত্তি, সাধা নৃপর্ব
'মিতামাছ' ও ব্যাকাবমাজ নৃপর্ব 'ইসাই ইসাই' দ্বোগ এবং। সমিতি
বেঙ্গলীর আলো, নথিপ্রাণ, মুগালি, হাওড়া, বর্ধমান, কুড়া এবং একের ন
২৪ সংবর্ধনা কলাভ আর্থিক নৃপর্ব প্রজাব সরিনামিত এবং।



ଆର୍ଥିକା ଆମାନ୍ତ ସୋଗିବୁ ହାତ ଓ ପା

পানীম ছলে নাইট্রোজেন এবং গ্যাসের ক্ষেত্রে শিশু
দের অভ্যন্তরীণ পার্সুলেশন (Blue Babies) ঘটায়, এতে শিশুর
পার্সুলেশন নাইট্রোজেন রূপান্তরিত হয়, একটা বৈজ্ঞানিক
ক্ষেত্রে একাধিক প্রয়োজনীয়তা আছে। এই পার্সুলেশন ক্ষেত্রে শিশুর
স্থান্ত্রিক পরিপন্থনা ঘটায়। এছাড়া পিণ্ডের শিলমসক্রবণানা হয়ে পিণ্ডে
ক্ষেত্রে শাফুলেজ ক্ষেত্রে জীবনের বাণিজ্য (Tissue) উৎপন্ন হয়
ক্ষেত্রে ক্ষেত্রে প্রাচীবন্ধুত্ব প্রতিম্যা ও পৃষ্ঠাতে বাঁধা
অস্তি হয়। পিণ্ডের বিদ্যনের ক্ষেত্রে বর্ণ্যগুলি শুধু ক্ষেত্রে অবীকৃত
অঙ্গের ক্ষেত্রে পরিমাণের ক্ষেত্রে না, তার প্রাপ্ত ক্ষেত্রে ক্ষেত্রে
পিণ্ডের ক্ষেত্রে ব্যাখ্যাতে পরিমাণেরও পৃষ্ঠাতে ঘটায়; যদি
ক্ষেত্রে আচরণ অংশের ক্ষেত্রে একটা গভীর মাত্রিক প্রচেষ্টন
ক্ষেত্রে হয়। অছাড়া ঘনিষ্ঠ ক্ষেত্রের নৃমনের ফলে অঙ্গুলীয় ক্ষেত্রে
অঙ্গুলীয় অংশ সামুহিক অঙ্গের ক্ষেত্রে অবীকৃত অঙ্গুলীয়
ক্ষেত্রে অংশ হ্যান্ড অবং ক্ষেত্রে আলোর অনুসরিষ্ঠ ক্ষেত্রেও গুরু
হ্যান্ড। যার ফলে আঙ্গুলীয় ক্ষেত্রে ক্ষেত্রে বাঁচুক্ত ক্ষেত্রে মুক্ত হয়।

ଜୀବିତରେ କ୍ଷାତିକାରୀ ପାତାବଜୁଲୋକ ଏବଂ ବରଣରେ ଅବଶି ପ୍ରତ୍ୟେକ ବାବା ହେଲା
ଜୀବିତରେ ନୃଧିକାମନ୍ଦିର; ଡିକ୍ଟାର୍‌ମନ୍ଦିର, ପାତାବଜୁଲୋକ ଏବଂ ଅବଶି କାମନ୍ଦିର

ନୃଧିକାମନ୍ଦିର	କ୍ଷାତିକାରୀ ପାତାବଜୁଲୋକ ନୃଧିକାମନ୍ଦିର	କ୍ଷାତିକାରୀ ପାତାବଜୁଲୋକ	residence time
ଆଶ୍ରିତେ ସମ୍ବନ୍ଧରେ ଜୀବିତର ବର୍ଣ୍ଣ (କୈବିଧିମୁକ୍ତ) କାର୍ଯ୍ୟାନ୍ଵର ବର୍ଣ୍ଣ, ମଞ୍ଚଧାରା ବର୍ଣ୍ଣ ବର୍ଣ୍ଣ)	କୁହାୟାନୀର ମେଠା ଫଳାଖିଲ ପଞ୍ଚଭାଗାତ ବର୍ଣ୍ଣ	ଜୀବିତ ଆଶ୍ରିତେ ଆଶ୍ରିତେ ଜୀବିତ, ଜୀବିତ ମୁହଁ, କୁହାୟା କୁହାୟାନୀର କୁହାୟା, ମେଠା ମୁହଁ	ଦିନ ଥେବେ କାମନ୍ଦିର ବର୍ଣ୍ଣ
ପାତାବଜୁଲୋକ (Pathobiology)	କୁହାୟାନୀର ନାମାତାତ ବର୍ଣ୍ଣ, ପଞ୍ଚଭାଗାତ ବର୍ଣ୍ଣ	ପାତାବଜୁଲୋକ ବୋଲାର ପାଦ- ଭାବ	ଦିନ ଥେବେ କାମନ୍ଦିର
ଅଭ୍ୟାସିତ	ଶିଳ୍ପକାରୀତ ବର୍ଣ୍ଣ, ଅଭ୍ୟାସିତ ନାତ ଅବଶେଷନ	ଜୀଲା ଜୀବିତ ମୁହଁ, ଜୀଲା ବାଧ୍ୟ କ୍ଷାତିକାରୀକ ପାନ୍ଦାର୍ଥ ଆମାଗାତ ବୁଲିଙ୍	ବହୁବ୍ୟ ନାମନ୍ଦିର
ବିଭିନ୍ନ ପ୍ରକାର ନାମ	ଜୀଲାର୍ମିଟ, ଶିଳ୍ପକାରୀତ ବର୍ଣ୍ଣ	ଜୀଲା ନବନାତାବ ବୁଲିଙ୍, ଜୀଲା ଜୀବିତ ମୁହଁ, ନାମବ, କୁହି- ବୁଲିଙ୍, କୁହାୟାନୀର ଓ ଶିଳ୍ପକାରୀ ବାନାନ ବ୍ୟବହାରର ନାମାଗାତ ମାତ୍ର ମାତ୍ର	ପାନ୍ଦାର୍ଥ- ଶିଳ୍ପକାରୀ
ଆଶ୍ରିତେ ଆଶ୍ରିତେ ଆଶ୍ରିତେ ନିକ ଏବଂ ତ୍ୟାନ୍ତି	ଶିଳ୍ପକାରୀତ ବର୍ଣ୍ଣ, ଆଶ୍ରିତେ ଆଶ୍ରିତେ ନାମାଗାତ ବର୍ଣ୍ଣ	ନାମବଦେହେ, ପଞ୍ଚମୁଦେହେ ଏହିତେ ଜୀଲା ଜୀବିତ ଉପର ବିପତ୍ତ ନାମାଗାତ କ୍ଷାତିକାରୀକ ଆଶ୍ରିତେ	ଆଶ୍ରିତେ ବହୁବ୍ୟ ବର୍ଣ୍ଣ
ଉତ୍କଳ୍ୟ ପ୍ରମିମେଲ (P03, P04)	କୁହିକୁଳାପ୍ରେବ, କୁହାୟାନୀର ଏହ ଶିଳ୍ପକାରୀତ ବର୍ଣ୍ଣ	ଇଂଟେପ୍ରୋଗାଲବେଳନ, ଜୀଲା ମୁହଁ, ଜୀଲା କୀରତିକୁଳାର୍ଥ ଗଠନକାରୀତ ଆଶ୍ରିତେ ଆଶ୍ରିତେ	ବଳ୍ମୟ ନୃଧିକା ମାତ୍ର
ଆପ	ଆପବିନ୍ଦ୍ୟକୁଳନ୍ତ ଓ କାର୍ଯ୍ୟ ନାମାଗାତ ନିର୍ମାଣ ଉପର ନିର୍ମାଣ ବର୍ଣ୍ଣ ଜୀଲ	ନୃଧିକୁଳନ୍ତ ଆଶ୍ରିତେ ଆଶ୍ରିତେ କୁଳନ୍ତ, ଜୀଲା ଜୀବିତ ମୁହଁ ।	ଦିନ ଦିନ- ଦିନ
ଅଭ୍ୟାସିତ ବର୍ଣ୍ଣ ପାନ୍ଦାର୍ଥ	ପାଯବାନବିକ ଝୁଲ୍କି, ଚିକିତ୍ସା କ୍ଷାତିକାରୀକ ବା ବ୍ୟବହାରିକ ନାମାଗାତ ବ୍ୟବହାର	ଫିଡାଆବଜନକ, ମିର୍କୋଜେନ୍ରି- କ ବୋଲାର ତାଙ୍କରାନ	ଦିନ ଥେବେ ବହୁବ୍ୟ
କ୍ଲୋବିନ ଏବଂ ଏବଂ ନାମାବିର୍ଦ୍ଧ ଏହିଗା	କାଗଜ ଏବଂ ଅନ୍ୟାନ୍ୟ ଶିଳ୍ପ ଜୀଲର ନାମାବିର୍ଦ୍ଧ (disin- fection)	ଆଶ୍ରେ ମାରାଅକା କ୍ଷାତି ତଥା ମୁହଁ	ପାନ୍ଦାର୍ଥ- ଶିଳ୍ପକାରୀ
ତେଲ ଏହିତ ଚାରି	ଶିଳ୍ପକାରୀକ ପାନ୍ଦାର୍ଥ ଏହିତ ପାଦ ପାନ୍ଦାର୍ଥ, ମୋଟ୍ରୋଲିମାର୍କ ବର୍ଣ୍ଣ	ବାତ୍ତୁକୁଳନ୍ତ ଅଭ୍ୟାସିତ କୁଳି, ଝୋନ୍- ଗନ୍ଧାନିତ ଓ ପାନ୍ଦାର୍ଥ ଏହିତା	ଦିନ ଥେବେ ବହୁବ୍ୟ
ବଣିତାନାଳକ ଓ ଆଶ୍ରିତେ ଦ୍ୱାନାଳକ	କୁହିକୁଳନ୍ତ, ବଣିତାନାଳକ ଓ ନାମାଗାତାରାଳକ ଟେକିବ କାର୍ଯ୍ୟାନ୍ଵର	ଜୀଲା ଜୀବିତ ମୁହଁ, କୁହିକୁଳନ୍ତ ପାନ୍ଦାର୍ଥ ଆଶ୍ରିତେ କୁହିକୁଳନ୍ତ (କ୍ଷାତିକାରୀକ ଓ ଆଶ୍ରିତେ- ବାଜାରିକାରିତ)	ଦିନ ଥେବେ ବହୁବ୍ୟ
ଅନ୍ୟାନ୍ୟ କୁତିର୍ମ କୈବିତ ବର୍ଣ୍ଣ (ପା- ନଳ, ଏହିଯ୍ୟ, କ୍ଲୋ- ବ୍ୟବହାର, ମାରିପ୍ରି- ରେଜାଇନ (Repro- -surgery)) ଏବଂ ତ୍ୟାନ୍ତି	ଶିଳ୍ପକାରୀତ ନୃଧିତ କୁଳ	ଜୀଲା ଜୀବିତ ମୁହଁ, କୁହିକୁଳନ୍ତ ପାନ୍ଦାର୍ଥ ଆଶ୍ରିତେ କୁହିକୁଳନ୍ତ (କ୍ଷାତିକାରୀକ ଓ ଆଶ୍ରିତେ- ବାଜାରିକାରିତ)	ଆଶ୍ରିତେ ବହୁବ୍ୟ

ପାତାବଜୁଲୋକ କ୍ଷାତିକାରୀକ ମହାନାଳ ଏହିତରେ

অবশ্যিত ইওয়ার পর এবাব আমাদের এই অবস্থালেখের উপরেকে গুরুত্ব-
পূর্ণ অংশটি তাৰ্মাণ্য জলনৃষ্ণন নিয়ন্ত্ৰণৰ ক্ষিপ্তিৰ বিষয়ে আলোচনা
কৰতে হৈব। বছুত আৰে উভয় পৰম্পৰাটি পূৰ্বতা পাবে। নীচে গ
আলোচিত হ'ল—

① জলনৃষ্ণন নিয়ন্ত্ৰণৰ উপায়ত্বসূচী: → জলনৃষ্ণনৰ কথাল প্রায় অমু-
অঙ্গতা আজ প্ৰতিনিধিত্ব
কৰ্ত্তব্যে অভিজ্ঞান প্ৰদান ধাৰণ। অক্ষুটি অৱকাশৰ ব্ৰিলোভৰ্ত্ত তথ্য-
অনুমোদনী আৰাতৰ আৰ্থ ৫০% রেজিল রেজ আৰু নৃষ্ণনৰ কথনে
তাৰাঙু চা জলজ আৰু ও আনবঢ়াঘৰ্যৰ অবস্থানৰ সাবিভাবিক।
ডায়ত ছাড়া অনৰান্ত এড়ো বড়ো শিল্পতিতিক রেজলগ্নিলিঙ্গ আৰ
একজু অভয়। বছুত রেজলৈজন্যই জলনৃষ্ণনৰ এই প্ৰতীক্ষণলক্ষ্য কৰা
ন প্ৰায় একেক বিশুক ঝুক বছুত উভয় আনবঢ়াঘৰ্যৰ কৌৰে কুঁৰ
ত্ৰিলিয়ে জলনৃষ্ণন প্ৰতিবোধ বলয়ে নামতে হৈব, তবেই কীৰনৰ
আৰ্থিবঢ়াঘৰ্যৰ জলনৃষ্ণন আৰাব ঝুনিষ্টল ইয়ে সামৰে পিচু ধৰাব
জোৱাইত হৈব। জলনৃষ্ণন প্ৰতিবোধ আৰুৰ পৰ্যান বৰ্ণন্য হ'ল
জল নৃষ্ণনৰ অনুপৰেশকে বন্ধ কৰা ও সমৰ্পণ চৰ্যাদানতা অৱস-
্থন বৰ্ত্ত তা নিয়ন্ত্ৰণৰ ব্যৱহাৰ কৰা। বিশ্বালিদিত উপায়ে জলনৃ-
ষ্ণন নিয়ন্ত্ৰণ বলা হৈত পাৰে —

- ② জলেৰ প্ৰধান প্ৰধান আৰাব অৰ্থাৎ নদী, সুৰুৰ, ধাৰ-
বিল, অৰু এবত চৰকুচ প্ৰায়ৰ আৰৰ্জনা বা বিলৰ ব্যৱহাৰত জল আৰ
বন্ধ কৰা।
- ③ কোনো নদী, সুৰুৰ বা চৰকুচ জল ধৰণাৰ আৰাব জলকে উপায়ৰ পাহাতি-
তে সাৰিলোচিত কৰা।
- ④ সুৰুৰ বা নদী পাড়ে আৰাবলক্ষ বা বাধনপ্ৰ তিপোথাতেই দিয়ে বৰ্ত্তা-
ও গৱানী মশুৰ খান বৰ্ত্তাৰ্নে বন্ধ কৰা।
- ⑤ ধাৰ আৰাবৰ বাকে অভিব্ৰুক্ত পাৰিবাবে আৰ ও বণিকৰালক সদা-
ব্যৱ পাখাচা বন্ধ কৰা।
- ⑥ জলকুচৰ জল তেল হাতিয়ে সড়া বন্ধ কৰা।
- ⑦ আৰৰ্জনা দিয়ে সুৰুৰ বা জলাশয় অৱৰাপ কৰা এবত অইডারে
চৰকোড়ামাণ্য মৌখ এলাবণ বা বিলৰা জলেৰ কৰ্তৃ অভিযোগ পৰিমাণ
বৃদ্ধি কৰাৰ প্ৰয়োগ বন্ধ কৰা।
- ⑧ পাৰিষেশ বিদ্যা, নৃষ্ণনৰ প্ৰকৃতি ও প্ৰজাৰ ইত্যৰাহ দিয়ে জন্মাচ-
তনা কৃতি কৰা আৰু বৰ্ত্তন।
- ⑨ জলনৃষ্ণন অংশাঙৰ আৰ্জন প্ৰযোগ ও আৰ অটিক প্ৰযোগে নৃষ্ণন
তথ্য বৰাব ব্যৱহাৰ কৈওয়া আৰু বৰ্তন। জলনৃষ্ণন নিয়ন্ত্ৰণৰ জন্য প্ৰয়ো-
গৱে ১৯৭৪ চৰাল প্ৰতিবোধ ও নৃষ্ণন নিয়ন্ত্ৰণ আইন প্ৰযোগ কৰা হৈ যা
১৯৭৬ চৰাল অংশলোচিত হৈয়। প্ৰযৱতীবলে ১৯৭৭, ১৯৮৮ এবত ১৯৯১
চৰাল জলনৃষ্ণন নিয়ন্ত্ৰণ ও স্থানৰ প্ৰযোগ কৈয়ে আইন প্ৰযোগ কৰা
হৈয়। পৰিও আৰ্জন লোৱেৰ এই কৈয়ে চৰকোড়ামাণ্য আৰাব আছ।
- ১০ জলনৃষ্ণনৰ জাতিবৰ্ষ আৰাব উভয়কে দোষগ্ৰহণ আৰে
চৰচৰত কৰা।

প্ৰচৰকৃত উপলব্ধ হৈ, জলনৃষ্ণন নিয়ন্ত্ৰণ আইনৰ পৰ্যান
কৰেশৰ হ'ল— ① জলনৃষ্ণন প্ৰতিবোধ ও নিয়ন্ত্ৰণ ② জলেৰ গুণাত মান
কৰাব থাবা ③ জলবিদ্যুৎ আইন বলৰ অৱৰাপ কৰা আৰে বাঁচা ও বৰ্তুৰ

କର୍ତ୍ତା ଜୀଲେର ଶୋଭନ ଓ ନୂଷନ ଦୂରୀକରଣ : → ଶିଳ୍ପ ଓ ଲୋକ ବଗର୍ଯ୍ୟ ସ୍ଵରଥତ ଏହା
ଜୀଲେର ପାଖିଜ୍ଞାଧିନେତ୍ର ବିଭିନ୍ନ ମାନ୍ଦ୍ରାତିକୁଳଙ୍କ ଥିଲା — ① ଆତମାନ କର୍ମିନ ମ-
ନାର୍ଯ୍ୟ (ର୍ଜୀତ, ଝାଜାମ୍ବନିକ ଦେଇର) ଦୂରୀକରଣ ଏବଂ ଅର୍ପନ, ପରିପ୍ରେକ୍ଷଣ,
ଅଭିଭ୍ରାବନ, ଆଚନ, ପାତନ ଉତ୍ୟନି ର୍ଜୀତ ମାନ୍ଦ୍ରାତିକ ଆଶ୍ରମ୍ୟ ମେତ୍ତା
ରୁହା ⑩ ⑪ ବିଭିନ୍ନ ଦେଇର କା ତୌରେ ମାନ୍ଦ୍ରାତିକ ମେମନ, ନାର୍ଦ୍ଦୀପ୍ରାଚେତନ, ମନ୍ଦିରକ୍ଷାମ,
ଉତ୍ୟନିକ ମୋଳ ଘର୍ମିତ ନୂଷନ, ଯା କେବଳ ମାନ୍ଦ୍ରାତିକୁଳର ଆଶ୍ରମ୍ୟ ଦୂର କରା
ପାରି ନା ତାର ଅନ୍ୟ ଝାଜାମ୍ବନିକ ମାନ୍ଦ୍ରାତିକ ଆଖାନା । ପ୍ରଧାନତଃ ଏକାତ୍ମେ ଅନ୍ତିମ
ଦେଇର ଆଶ୍ରମ-ବିକାଶନ ମାନ୍ଦ୍ରାତିକ ଓ ରଜମାନ୍ବନିକ ଉତ୍ୟନିକାର ସ୍ଵରଥାର
କମ୍ପା ରୁହା ।

ନୂଷିତ- ଜଳ ସରିଶୋଧନ ପାଇଁ : → ଜାଗମ୍ ଓ ରାଜ୍ୟ ସାହିତ୍ୟର ନିର୍ମାଣକୁ ଅନୁଯାୟୀ
ଜଳନୂଷିତର ଆନ ନିଯନ୍ତ୍ରନ କରା ଅବ୍ୟକ୍ତ ଆବଶ୍ୟକ । ଆଏ ବିଲାପ ବ୍ୟାଧିରେ
ଓ ଏମୀର ବଳାବନ୍ ସ୍ଥର୍ଥରେ ଜଳ ସରିଶୋଧନ ନା କାହାଁ ଦେଖନେ କରୁଥିବେ
ଯେବାନ ପୁରୁଷ, ନନ୍ଦୀ, ଅନ୍ଧମୁଦ୍ର ପ୍ରୟାନ୍ତରେ ଯେବା ସାହିତ୍ୟର ବିକାଶ ବଣ । ଯେବା
- ୧୨ ବିଲାପକ୍ଷାଦେବ ବର୍ଣ୍ଣ ଗଲ ଅବ୍ୟକ୍ତ ଏମୀର ବଳାବନ୍ ସ୍ଥର୍ଥରେ ଜଳ
ବିକାଶ ପାଇଁ ପାଇସୋଧନ କରା ପ୍ରମାଣନ । ନୂଷିତ ଜଳ ସରିଶୋଧ-
- ନେବା ଧାର୍ମିକ, ଜୀବ୍ୟାକ୍ରିଯ ଓ ଇତ୍ୟକୁ ଆଧ୍ୟାତ୍ମିକ ନିର୍ମାଣିତ
ହଲ —

- ଆଧୁନିକ ଜ୍ଞାପତ : → ପରିପ୍ରାୟନ : ଏହି ପାଦତ ଜ୍ଞାନ-ଆମଜାନ (ଅନ୍ତର୍ଯ୍ୟ) କଣ୍ଠେ ବନାଗାଣିମ ଦୂଷନ ଦୂର କର୍ଯ୍ୟ ହୁଏ । ଦୂଷିତ ଚଲକେ ପ୍ରବାହିତ କର୍ଯ୍ୟ ଏହି ବିଭିନ୍ନ ଭାବରେଲିର ଝର୍ଯ୍ୟ ହୁଏ । ଅଧିକରଣୀ ଆବାରେଯ ଛିନ୍ମଶ୍ଵର କାଳି ଓ ଗର୍ବେ ଅର୍ଥମାକୃତ ଦ୍ରୋଷୀ ଛିନ୍ମଶ୍ଵର କାଳିର ଝର୍ଯ୍ୟ ଦ୍ୱାରା ପ୍ରବାହିତ କର୍ଯ୍ୟ ହୁଏ ।

অর্ধঃক্ষেপণ: জলে ডাম্ভুন দুর্ঘট আক্ষয়ের ক্ষমিন ব্যবসাগীন দুর্ঘট
দুর্ঘট ব্যবসায় তাঙ্গ দুর্ঘট জলকে প্রশংসি ব্যহ জলাধারের অর্ধে দিয়ে
চুক্ষে শীর গতিতে প্রয়োগিত ব্যব্য হয়। এবং যালে ক্ষমিন কান্তাগীন
দুর্ঘট জলাধারের দুলাখ অর্ধঃক্ষেপণ হয়।

● ଜ୍ଞାନ୍ୟମିଳିକ ଶୋର୍ବନ : ଆଧୁନିକ ଜ୍ଞାନବଦ ପରେ ହୁଏ ଜାଗତି ଜ୍ଞାନ୍ୟମିଳିକ ଶୋର୍ବନ ଏଥିରେ ଚାକେ। ଅର୍ଦୁଲି ଉଲ — ପ୍ରକଳିତ ମିଳଣାର୍ଥ: ଏହି ପ୍ରାକ୍ ବା ପ୍ରାଚୀ ରେ ଯାଏ ନୂପରକ ନୂପରିବଳାର୍ଥ ଏବଂ ସୂର୍ଯ୍ୟବଳାର୍ଥ ଏବଂ କେମ୍ବାଣ୍ଡି ପାଇଁଲି ଏଥାରେ ଅଳାଇ ନୀତି ଭାଙ୍ଗାବୁନି ପାଇଁ ଅଜ୍ଞପ୍ର ରୁଦ୍ଧିପାଥରର କୁବେଷ ମର୍ତ୍ତ୍ଵ ହୁଏ ଅଲାକେ ଉତ୍ତର ମୋକ୍ଷ ମୀଠେ ପ୍ରବାନ୍ତିତ ବନ୍ଦୀ ହୁଏ । ରୁଦ୍ଧିର ଅଧ୍ୟଧିକ୍ୟ ଭାବୁରୁଚିଲାଭଲେଯ ଅନ୍ୟ କୀମିର ଓ ମୀଠେର କୁବେଷ ଅନ୍ତର୍ମାଶାଶ୍ଵର ଏଥେରେ ମୋକ୍ଷକା ଦୂର୍ମିଳ ବନ୍ଦୀ ହୁଏ ଚାକେ । ମାନତ: ରୁଦ୍ଧିଗୁଲିବ ରୈଜ୍ୟ କୁବ ଗଚ୍ଛ ହୁଏ ଯା ଅନ୍ୟକୁ ଘନ ଥିଲା ତାକେ ମୂର୍ଖକ ବଳ ହେଉଥା ହୁଏ । କୁବାଟିର କୁର୍ଦ୍ଦ୍ୟ ଦ୍ଵିତୀୟ ପ୍ରବାନ୍ତିତ ହେଲାର ପରେ ଦଳ ଅନ୍ୟ ଏବଳି ଅନାଧିକ୍ରମ ହେଲାଯାଇଥାରେ ଅନ୍ୟକୁ ବନ୍ଦୀ ହୁଏ । ରୁଦ୍ଧିଗୁଲିବ ଉତ୍ତର ଅନ୍ତିତ ରୈଜ୍ୟ କୁବର ଝର୍ଣ୍ଣ ଶାବଳ ହୁଆ ଏହାରେ, ଏହି ପ୍ରଥମ ପ୍ରଥମ ଆଲେ କେମାନ୍ତିତ କୈନ୍ତ ନୂପରକେ ଧାର୍ଯ୍ୟ ଦ୍ଵିତୀୟ ପ୍ରଥମ ଏହାର ଅଲାକେ ବିଶ୍ଵାସ ବହୁରୁଷ ।

অঙ্গীকৃত গান্ধি পাইতে : এই পাইতে বর্ণ কলেব ঘৰ্য্যে ঘৰ্য্যেষ্ট অৰিবাদ
কৰাৰ উপভূতি আচুৰ ইন্দ্ৰিয়ৰ রেখাৰ প্ৰয়োগ প্ৰয়োগ কৰা হ'ব। এই
কৰাৰ উপভূতি দৈনন্দিনৰ চাহুদাৰ প্ৰয়োগ কৰিবলৈ গান্ধি হ'ব। এইৰ
কৰাৰ উপভূতি দৈনন্দিনৰ চাহুদাৰ প্ৰয়োগ কৰিবলৈ গান্ধি হ'ব। এইৰ
কৰাৰ উপভূতি দৈনন্দিনৰ চাহুদাৰ প্ৰয়োগ কৰিবলৈ গান্ধি হ'ব। এইৰ
কৰাৰ উপভূতি দৈনন্দিনৰ চাহুদাৰ প্ৰয়োগ কৰিবলৈ গান্ধি হ'ব।

● ভূক্তি কোর্ট: → এটি জোরিমের জর্বলেয় পর্যায়।

জলবন: আধিকারিক ও জার্জিভিক জোরিমের সব জলে কঁপিয়ত অবশিষ্ট বেশ বিশুদ্ধ অধিত্বর ঘোষণা প্রেমন নাইট্রোজেন, ফার্মাচুয়ার্স এসেস, মাঝ অধিকার বিষাক্ত দূষণ পদার্থ, তা অক্সিজেনের উপরিভিত্তিতে জোরে পানীয় বিষাক্ত দূষণ পদার্থ, তা অক্সিজেনের উপরিভিত্তিতে জোরে পানীয় বিষাক্ত দূষণ পদার্থ। এই পানীয়ের বিষাক্ত দূষণ পদার্থক অচোর্য অধিক: একজন পরিষেবক করা হয়। এই পানীয়ের বিষাক্ত দূষণ অথবা বেলনে দূষণের ঠাব্য প্রাণীয় পরিষেবক করা হয়।

এছাড়া শিল্পকর্মের বর্জ্য জলে নানা অজ্ঞ বা জ্ঞান জাতীয় পদার্থ থাকে। অবিবেচ্য বর্জ্য জল ছান্ক পরিষেবক জন্মের করায় অনেক বিশেষ পদার্থ পদার্থক অচোর্য গ্রহণ করায় অনেক বিশেষ পদার্থ পদার্থক অচোর্য গ্রহণ করায়।

পানীয় জলবাহিত ঘোষণা পানীয়ের পানীয়তি: জার্জিমের খিলড়োর ব্যবস্থার ক্ষয় শুধুমাত্র জারী অচোর্য যন্ত্রকনা ও কলচিন পদার্থ হাত্তা অন্য বেলনে দূষণ পরিষেবক করা চান্দুর হয়। অগ্রিমের বিশেষ ব্যবস্থার গ্রহণ অক্সিজেনের করার পরিচালনের ঠাব্য করা জলে বেলন বেলনকারু মিথালা। তবে একে জালা হলে পানীয় জল পুরিয়ে দাওয়া।

③ পানীয় জল ১০-২০ মিলিলি পুরিয়ে ঠাব্য কর দাওয়া করতে। এছাড়া পানীয় জল পরিষেবকের জন্য লিহায় স্থান ১৪০ ক্ষয় হ্যালোজেন প্রিপারেট দিয়ে তার্টেক্টোর পর তেল জল সান করা হয়। এর বাধার গ্রহণ পদার্থ কীবানুচ্ছুক্ত এবং পরিষেবক বাধা প্রাপ্ত হন। ক্ষেত্রে বা মোৎস্য আপনার ধোয়ার হলুড়ে লে বাধা তৈরি কর। ④ পানীয় পানীয়ে পরিষেবকের জন্য ৩০০-৫০০ শাম প্রিপিং পাওড়ার তেল কমপক্ষে ১২ ঘণ্টা সময় কেবল সানুয়ার্মে কর স্বত্ব করা প্রিপুড়ো জল প্রিপ করে বাবি জল প্রাপ্ত জনসাত ব্যবস্থার করা হাবে। ⑤ গাড়ীর নলবৃপ বা পিংকির উপরে ক্ষেত্রে তার আন্দে পুরু একশিনটি প্রয়োগ করলে নিয়ম নালের মার্ক ৩-৪ টামট প্রিপিং পাওড়ার তেলে প্রস্তুতি ও বাধা অন্তর মাত্রা নালিদের দ্বিতীয় হাবে। একেক্ষেত্রেও কমপক্ষে বাধা করা পর প্রাপ্ত উপরিভিত্তে বেশ বিশুদ্ধ। জল বের করা হ্যাল দিয়ে গবেষণা করা করা হাবে।

* বিশুদ্ধ উপরিভিত্তি তালোচনার পরিপোক্তি পরিষেবকে এবল্যা করা হয় ক্ষেত্রে, উল্লেখ্য কর্মকর্তা কৌশল তার্টেক্টোর কাবে উচ্চতর হলে, তবেও, উল্লেখ্য নিম্নতর কর্মকর্তা কর্মকর্তা কৌশল বিশুদ্ধ করার ক্ষেত্রে কৌশল কর্মকর্তা কর্মকর্তা কৌশল করার ক্ষেত্রে এবং পুরিবীও উল্লেখ্যের কৌশল করার ক্ষেত্রে পুরু হয় কৌশল করার পুরিবীও কৌশল করার ক্ষেত্রে পুরু হয়।

① গ্রন্থপত্র: → অন্তর্গত প্রকল্পটি রূপান্বিত আসি বেশ বিশুদ্ধ গ্রন্থপত্র দায়ায় নিয়েছি। ক্ষেত্রে জল —

- ① Asthana, D. K. (2006). Text Book of Environment Studies. S. Chand Publishing.
- ② Basu, R. N., Ed. (2000). Environment. University of Calcutta, Kolkata.
- ③ Khidaliya, R. K. Environmental Pollution. S. Chand Publication.

④ বালা, কুজত রুম্মান. (২০১৭). প্রাতক সাধিকেন্দ্রিকা প্রচারণা. মাইক্রো মার্কেট. বালকান।

এক্সেল ছাপাও এই প্রবলমাটি কল্পান্তর আমি শুন্ধায়নের একক একে বিষু অর্টিকেল (Article) তথ্য বলতেছি, এবং গুলো এই প্রবলমাটির কল্পান্তর আমাকে বিজ্ঞপ্তিতে আহম্মদ বলবাদ। নিচে এই উভয়কির্তি বিষু শুন্ধায়ন অর্টিকেল-এর নাম ও আসব ডায়েবলেন্সে একুলি উল্লিখিত ই'ল —

ক্রমিক নং	Article - এর শিরোনাম	ওয়েবসাইট
1.	Water Pollution - sources, effects and control.	www.researchgate.net
2.	Water pollution: Sources, effects, control and management.	agro.icm.edu.pl
3.	Water Pollution and human health.	www.alliedacademies

⑩ বৃত্তজ্ঞতা প্রীকারণ :→ বৃত্তজ্ঞ প্রবলমাটি কল্পান্তর আমাদের উপর

- বিজ্ঞানের পরিবেশ বিজ্ঞানের অধ্যাপক শ্রী নাবান্ধন চন্দ্র মাঝি আমাকে এই বিষয়ে শুন্ধায়ন উপরে দিয়ে বিজ্ঞপ্তিতে আহম্মদ বলবাদ। আই আমি তাঁর প্রতি প্রশংসন্তাবে বৃত্তজ্ঞতা জানাই।

⑪ ছাত্রের প্রাক্তন :→ Subhankar Khan

⑫ শিক্ষকের প্রাক্তন :→

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

AIR POLLUTION IN CITIES AND
MEASURES TO CONTROL IT

NAME : SUBHAYAN MOITRA
COLLEGE ROLL NO : CSUG/178/19
DEPARTMENT : COMPUTER SCIENCE
YEAR : 2020
SIGNATURE : Subhayan Moitra

RAMKRISHNA MISSION RESIDENTIAL COLLEGE
NARENDRAPUR

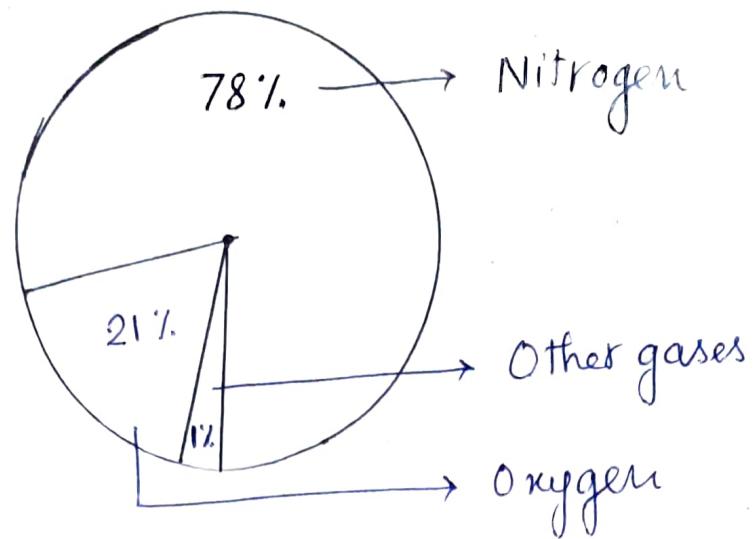
Name : SUBHAYAN MOITRA
College Roll No. : CSUG/178/19

Page 1

ENVIRONMENTAL STUDIES

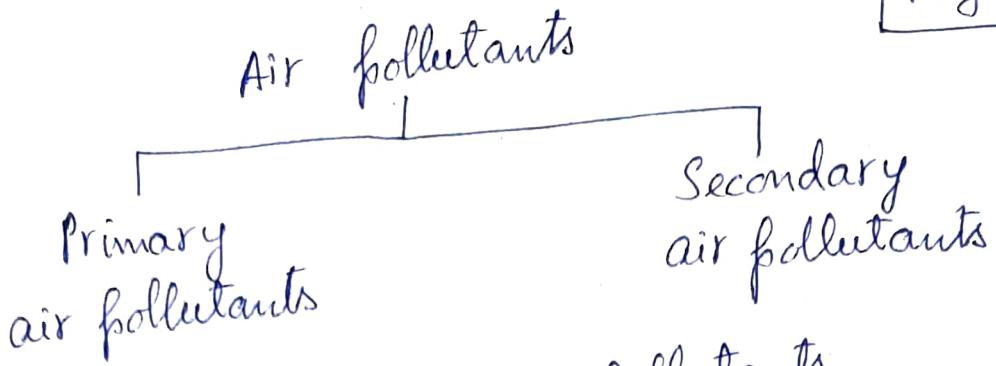
Air pollution in cities and measures
to control it

Air is the most vital constituent of environment for the sustenance of life on earth. Air forms nearly 80% of man's daily intake by weight. In pure air, the proportion of different constituents like oxygen, nitrogen, and other gases is fixed and definite. It may be noted that air cannot be pure because some gases like sulphur dioxide, carbon monoxide, oxides of nitrogen, emission from volcanoes and swamps, salt spray, pollens from plants, etc., are continuously added to the air by natural processes. Thus, air is polluted when its natural composition is disturbed either by natural or man-made sources.



Constituents of air

According to World Health Organization (WHO), air pollution is defined as situation in which the outdoor ambient atmosphere contains materials in concentration which are harmful to man and its environment. In general sense, air pollution may be defined as the imbalance or disequilibrium in the quality of air due to introduction of foreign materials from natural or anthropogenic sources to the air so as to cause adverse effect to biological communities in general and man in particular. The nature, dimension and magnitude of air pollution depends upon a number of factors such as source of pollutants, nature of pollutants, quantity of pollutants, residence time of the pollutants in atmosphere.



Classification of air pollutants

Primary air pollutants are the harmful chemicals which directly enter into air due to natural events or human activities.

It is seen that there are mainly five primary pollutants which contribute together more than 90% of global air pollution. These are namely,

- i) carbon monoxide (CO)
- ii) nitrogen oxides (NO_2)
- iii) sulphur dioxide (SO_2)
- iv) hydrocarbons & ~~H₂~~ (HC)

Transportation accounts for more than 46% of the total pollutants produced per year and hence remains as the principal source of air pollution.

Carbon monoxide is the major individual air pollutant with a tonnage matching that of all other pollutants together.

Secondary air pollutants are the harmful chemicals produced in air due to chemical reaction in between

two or more components i.e. the reaction in between primary air pollutant and some components of air. Just like primary pollutants, the secondary pollutants have significant detrimental effects on animals, soil's vegetation, crops & materials.

Air pollution

Natural Sources

- Forest fire
- Wind
- Soil Erosion
- volcanic Eruption
- Bacterial Decomposition

Anthropogenic Sources

- Automobile Exhaust
- Industrial Exhaust
- Release of CFC's
- Photochemical Oxidants
- Many others

Source of Air Pollution

Some potent air pollutants are:

i) CO ii) SO₂ iii) NO₂ iv) HC

Sources of carbon monoxide:

- @ Transportation
- ② Agricultural burnings
- ③ Industrial processes

The release of CO to the atmosphere is taking place in such a large scale that the concentration is supposed to be doubled in every five years. CO interferes with oxygen carrying function of haemoglobin by forming carboxy haemoglobin complex. Prolonged exposure of plants to higher concentrations of CO causes hazards in plants. About 74% of all the CO emission is from automobiles. So control efforts must be focused on it.

Sources of sulphur-dioxide :

(a) Natural source

- Volcanic eruption

(b) Anthropogenic source

- Fuel combustion
- Transportation

The quantity of SO₂ in atmosphere is very small as compared to its annual emission. Sulphur dioxide is the most dangerous air pollutant affecting both living and non-living world.

Sources of Nitrogen Oxide :

(a) Natural sources

- Bacterial action
- Photo chemical reaction
- Volcanic eruption.

(b) Anthropogenic sources

- Combustion of coal and natural gases.
- By products like HNO_3 .
- Thermal power plants
- Nuclear explosion
- Manufacture of nylon intermediates.

The accumulation of NO_x in the environment causes varieties of hazards such as acid rain, depletion of ozone layer, smog formation. It is also toxic to both plants and animals. In view of the detrimental and adverse effects of NO_x on the entire living and non living world, it is necessary to keep the level of NO_x below the threshold value.

Sources of Hydrocarbons :

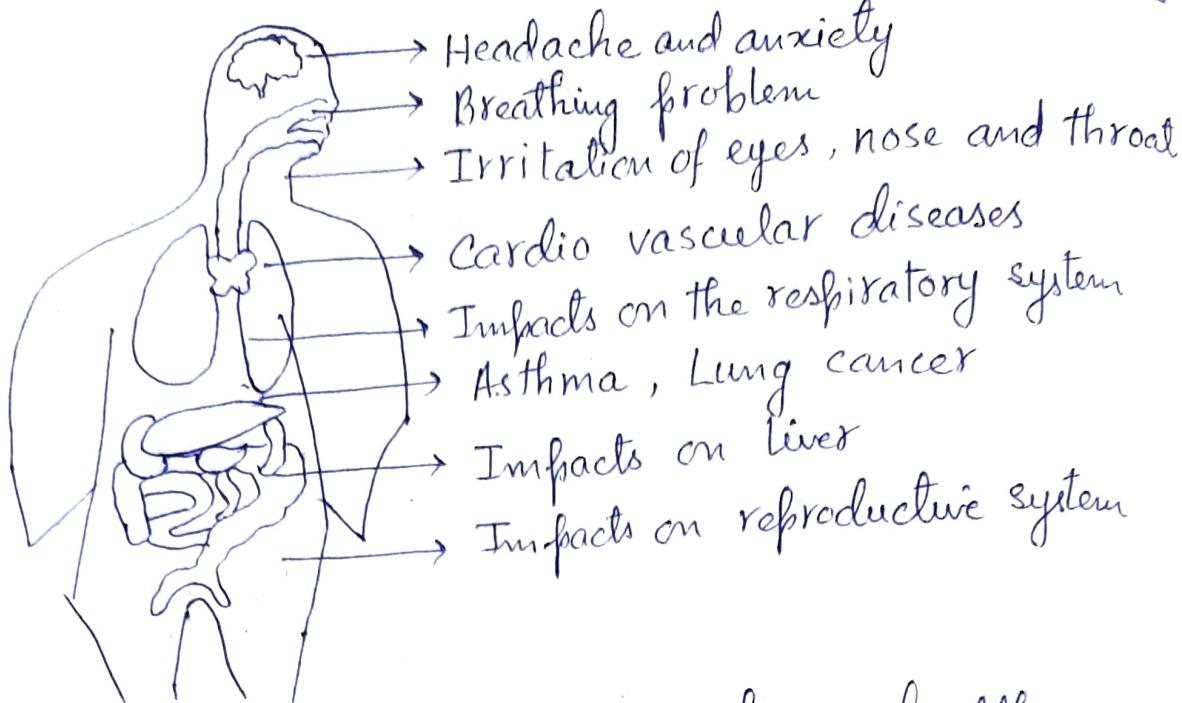
@ Natural sources :

- Emission from trees.
- Anaerobic decomposition
- Emission of methane

(b) Anthropogenic sources :

- Automobile exhaust
- Industrial exhaust
- Incinerator and refuse burning
- Burning of coal and wood.

The level of hydrocarbons can be reduced by controlling their emission from the source.

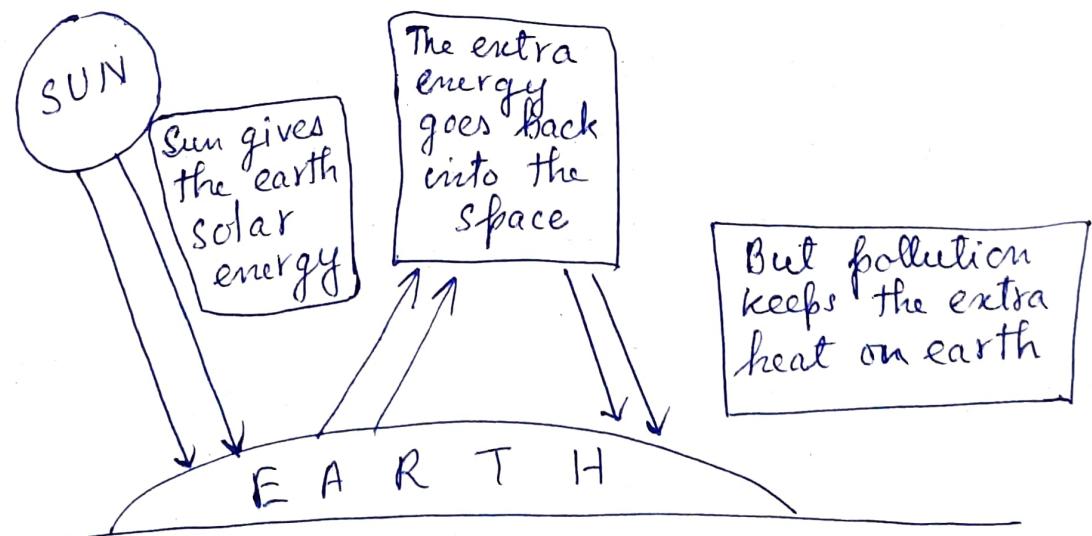


Effects of pollution on human health

There are many effects of air pollution. Atmospheric particles, due to fuel combustion for industrial and household heating purposes, can scatter and absorb sunlight and thus reduce visibility. Increased level of CO_2 causes greenhouse effect. CFCs and nitrogen oxides cause ozone layer depletion and ozone hole. The effect of particulate matter includes corrosion of metals and erosion. The oxides of sulphur and nitrogen combine with water vapours of the atmosphere and cause acid rain. The accumulation of pollutants in air causes a number of disasters to the living world. Ozone layer present in the stratosphere strongly absorbs

UV radiation and thereby protects life on earth. from severe radiation damage. But due to continuous and non-interrupted release of CFCs, oxides of nitrogen, etc. by the civilised world, the ozone layer is constantly depleted. Due to depletion of ozone layer, the harmful solar radiations easily penetrate into the environment and causes hole in ozone. By protecting the ozone layer of the stratosphere, we can protect the human beings, all plants and animals, ecosystem and finally biosphere from destruction. The greenhouse is that body which allows short wavelength solar radiation to pass through it but does not allow the long wavelength infrared radiation to escape. Due to rapid and unplanned industrialization the gases like CO_2 , CFCs, CH_4 , NO_x , O_3 , etc. accumulate in the atmosphere. The layer of these gases behave like wall of a green house and transmit short wave solar radiations but does not allow the longer wavelength heat radiation to be reflected back into outer space. That is green house are transparent to solar radiation but not to heat radiation. Thus, the greenhouse effect may be defined as the

progressive warming up of the atmosphere at the surface of earth due to blanketing of infrared radiation from the earth's surface by green house gases. The green house effect is based on principle of infrared absorption characteristic of gases. The green house effect is also known as Global Warming. CO_2 , CFCs, CH_4 , N_2O are the sources of greenhouse gases. Global warming has significant impact on agricultural productivity. Consumption of fossil fuels should be reduced, methanol as a substitute should be used in transport sector, biogas should be used for domestic purposes, CFCs should be banned and deforestation should be banned in order to control greenhouse effect.

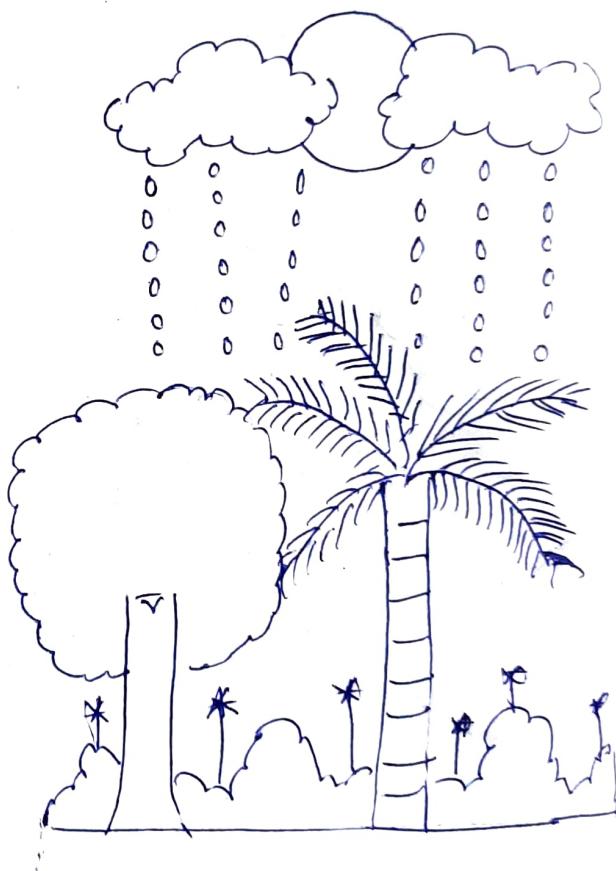
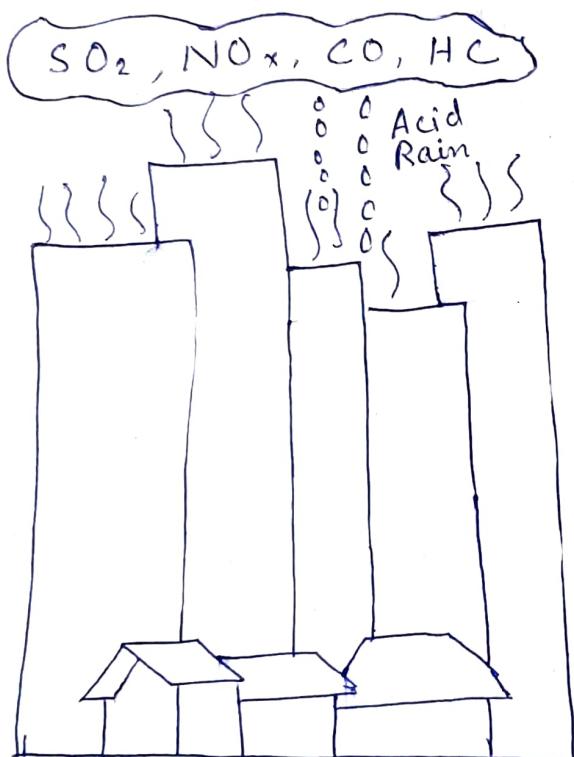


The greenhouse effect

Smog is a combination of two words, smoke and fog. Dust combines with smoke and later with fog to produce 'smog', which appears in the form of cloudy layer in the atmosphere. A thick cloud of smog is produced where smoke instead of escaping, the area to outer atmosphere stays nearer to the surface due to temperature inversion. The smog is caused either due to the presence of oxidising pollutants or due to reducing pollutants. If the smog is caused due to oxidising pollutants then it is called oxidising smog whereas if it is caused due to reducing pollutants then it is called reducing smog. Smog can also be classified as sulphurous smog and Los Angeles smog. The formation of smog is highly destructive and influences both the physiological and metabolic activities of the living organisms. To reduce smog, the production of NO_x and CH_4 should be controlled.

Nowadays, one of the major consequences of environmental pollution is the acid rain. It has become serious threats to water bodies and also to the terrestrial eco systems. It also

increases the soil acidity affecting land flora and fauna. It corrodes buildings, monuments, statues, bridges, fences, railings etc. It may cause respiratory and skin diseases. In view of the above detrimental impacts of air pollution on mankind, plants and vegetation, we have to adopt some control measures in order to reduce the level of air pollutants in environment.



Control of air pollution by planting trees

Pollution from domestic fire should be controlled to the house holder's use. Alternative methods like smokeless chullah should be used in order to increase the fuel efficiency and reduce the emission of solid particulates. Welled air house with high chimneys and scattered dwellings can reduce the problem of air pollution. As the plants absorb mainly air collecting gases like CO_2 , there should be massive afforestation programme in industrial areas and big cities. Setting of air quality standard for protection of environment and human health is highly essential. Particulate emissions should be controlled. Usage of individual auto vehicles should be minimized. More and more diesel multiple unit trains should be introduced. Use of unleaded petrol and diesel should be made compulsory. The use and production of CFCs should be banned with suitable substitute. The production of NO_x and hydrocarbons should be controlled and the vehicular exhaust should be minimised.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

AIR POLLUTION in CITIES and
MEASURES TO CONTROL IT

NAME : SUBHRA SANKAR DUTTA
COLLEGE ROLL NO : PHUGI/132/19
DEPARTMENT : PHYSICS
YEAR : 2020
SIGNATURE : Subhra Sankar Dutta

SL NO.	TOPIC NAME	PAGE NO.
1.	choice of project	01
2.	Air pollution in cities Causes / Sources	03
3.	Major air pollutants and their effect	05
4.	Case study of Cities	08
5.	Measures and controls	10
6.	Acknowledgement	13

Choice of Project:

Exam department and the teachers of our college has given us several topics to work on it. like -

- ① Pond ecosystem and food chains

- ② Corona Pandemic and role of common people to control it.

- ③ Air Pollution Practices and measures to control it.

- ④ Water pollution and measures to control it.

- ⑤ Nitrogen cycle and its importance for living beings

- ⑥ Solid and liquid waste management in hostel campus.

With help of my teachers and their consultation I decided to work on the project.

Air Pollution in Cities and Measure to Control it

I can go through the whole project complete my learning of project and earn knowledge from this.

Air Pollution in Cities and Measure to Control it

Introduction :

When due to human activities or some natural processes the amount of solid wastes or concentration of gases other than oxygen, increases in the air more than normal percentage of different gases, the air is said to be polluted and this phenomenon is regarded to as 'Air Pollution'.

Most cities worldwide suffer from serious air quality problems, which have received increasing attention in the past decade. Air pollution in cities is a serious environmental issue especially in the developing countries. To prevent air pollution in cities some measures should/would be taken.

Definitions Of Air Pollution :

Air pollution means the presence in the atmosphere, or injection into, of substances that are not present naturally, or present naturally but are in much lesser concentrations and that may be harmful for living organisms directly (Allaby 1995)

Many places' air may be polluted but most affected air is the cities' air. They are too much polluted. These pollution may be the most harmful towards the whole world though we are not enough cautious about it. We are going to elaborate on it.

Causes/Sources of Air Pollution in Cities:

Various gaseous emission and other source of microparticles are responsible for air pollution which are injected continually into the atmosphere from different sources!

The probable sources are given below:

● Emissions from industries:-

There are many industries which act as the major sources of air pollution. Of these, petroleum refinery, cement factories, stone crushers, food processing, chemical fertilizer factories etc. emit gases through the chimney of the factories. Among those, petroleum refineries are the major sources of SO_2 and NO_x . Similarly



► Polluting Gases emitting from the industries.

Dust releasing from cement factories cause health hazards. Stone crushers, hot mix plants also create a menace, the SPM (Suspended Particulate Matter) is five times more than the safety limits. Smokes of fertilizer and food factories emit various poisonous gases. Acid vapour is coming continuously from the chemical factories.

Mather-based petroleum refineries been accused to aggravate pollution-related decay of the Taj Mahal in Agra as well as monuments of Fatehpur Sikri.

● Thermal Power Station:-

Both normal and super-thermal plants are present in or near the cities and coal are

used as a fuel ⁱⁿ of most of these plants. The fly-ash, SO_2 and other harmful gases and hydrocarbons are regularly released in air and these make the air polluted and unhealthy. These are major part.

● Automobile Exhaust:-

Toxic exhaust of automobile is a source of considerable air pollution in cities. It contains CO_2 , SO_2 , NO_2 , CO and other toxic substances. According to EPA motor vehicles collectively cause 75% of carbon monoxide pollution in the U.S. "



► automobile emission

Sites and raw materials such as bricks and concrete cause haze and foul air which is hazardous for people especially children and elderly citizen.

● Use of Chemical and Synthetic process:

Talking about air pollution in cities we should always consider outdoor pollution dangerous for our lives but never talk about indoor air pollution. Household products cause indoor pollution, which is 10 times more harmful than outdoor air pollution. Volatile Organic compounds (VOCs) found in paints, cleaners and personal care products such as perfume and deodorants

● Construction and Demolition:-

With rise of population in city, construction and demolition is part of ever going development phase of cities. Several construction



► Construction and demolition

are reason for common health issues - Risks like asthma or other fatal issues.

○ Rapid Population Growth and felling Trees :-

A major probable reason for the air quality problems is population growth, combined with change in land use due to increasing urban areas. The population growth is caused by drift to the cities and excess of births over deaths in cities.

Also we can see hardly a green area in cities. Most of the trees are cut down for construction and road-development.

○ Smoking :-

Smoking is the most dangerous and fatal to human health. A lot of air pollutants are exhausted during smoking. It affects the lungs and breathing system of primary consumers as well as non-consumers also.

Major Air Pollutants and Their Effect:

The major air pollutants of cities and their effects are given below:-

1. Carbon dioxide (CO_2)

Source: Industrial foul air, thermal plants automobile exhaust, smoking all carbon burning places.

Effect: It is the main cause of Global Warming it also disturbs the respiratory actions of animal beings when highly present in amount.

2. Carbon Monoxide (CO)

Source: Smoke of automobiles and burning of fuel in industries, smoking.

Effect: CO is highly toxic gas, it combines with haemoglobin of the blood and blocks the transportation of oxygen. Thus it impairs respiration and it causes death due to asphyxiation when inhaled in large.

3. Unburnt Hydrocarbons -(3,4 Benzophyrine, Benzene).

Source: Automobile, burning of fossil fuel
(petrol, diesel, coal)

Effect: Hydrocarbon causes lung cancer.

4. Nitrogen Oxides: (NO , NO_2)

Source: Burning (combustion) of fossil fuel in automobiles, aromatic nitrogen containing compounds etc.

Effect: These nitrogen oxide form photo-chemical smog in atmosphere and release ozone. These are also responsible for acid rains, and cause health problems like emphysema, bronchitis, swelling of lungs and lung cancer etc.

5. Sulphur Oxides: (SO_2 , SO_3)

Source: Main source of sulphur oxides are coal burning, smelters, oil refineries.

Effect: These causes chlorophyll destruction and also responsible

Some Secondary Pollutants:

(A) Smog :- [smog = smoke + fog] It is two types

(i) Photo chemical :

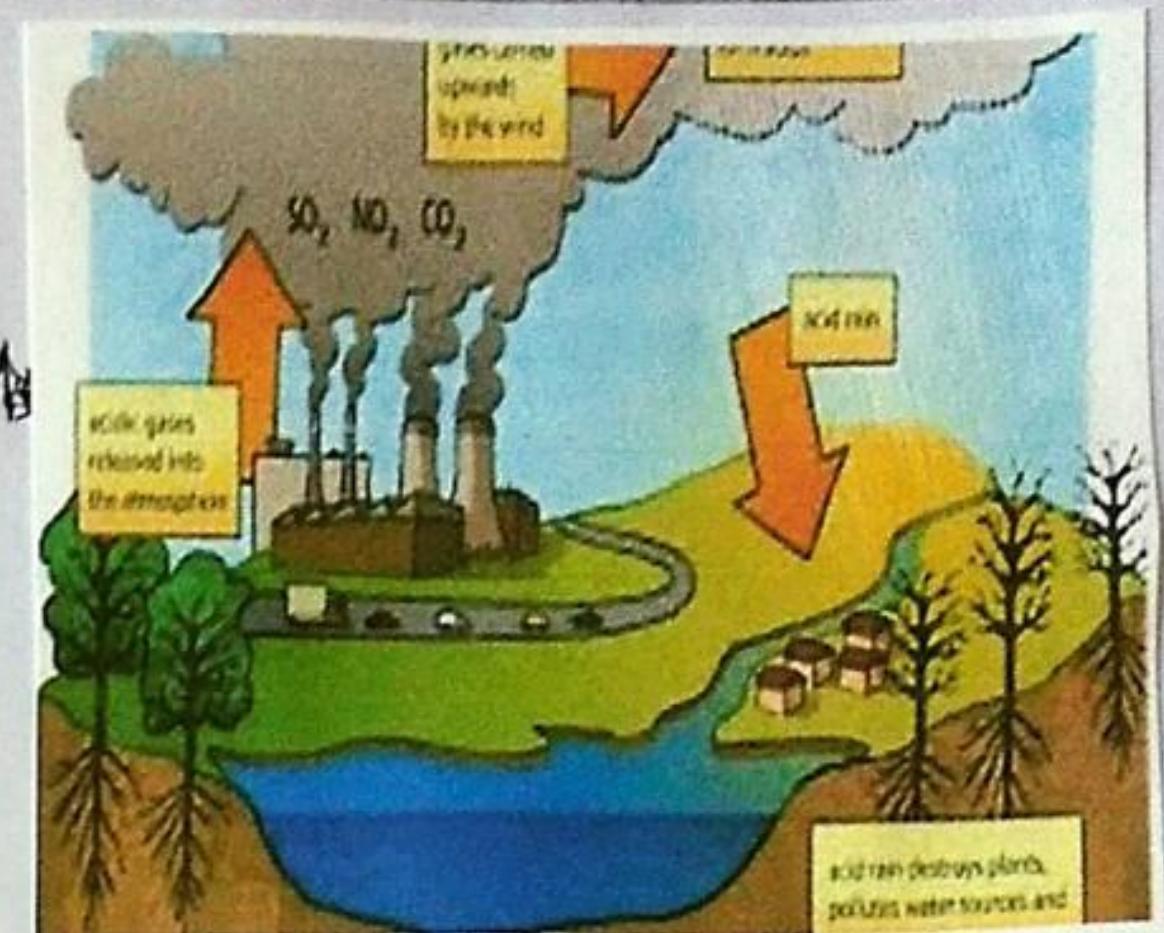
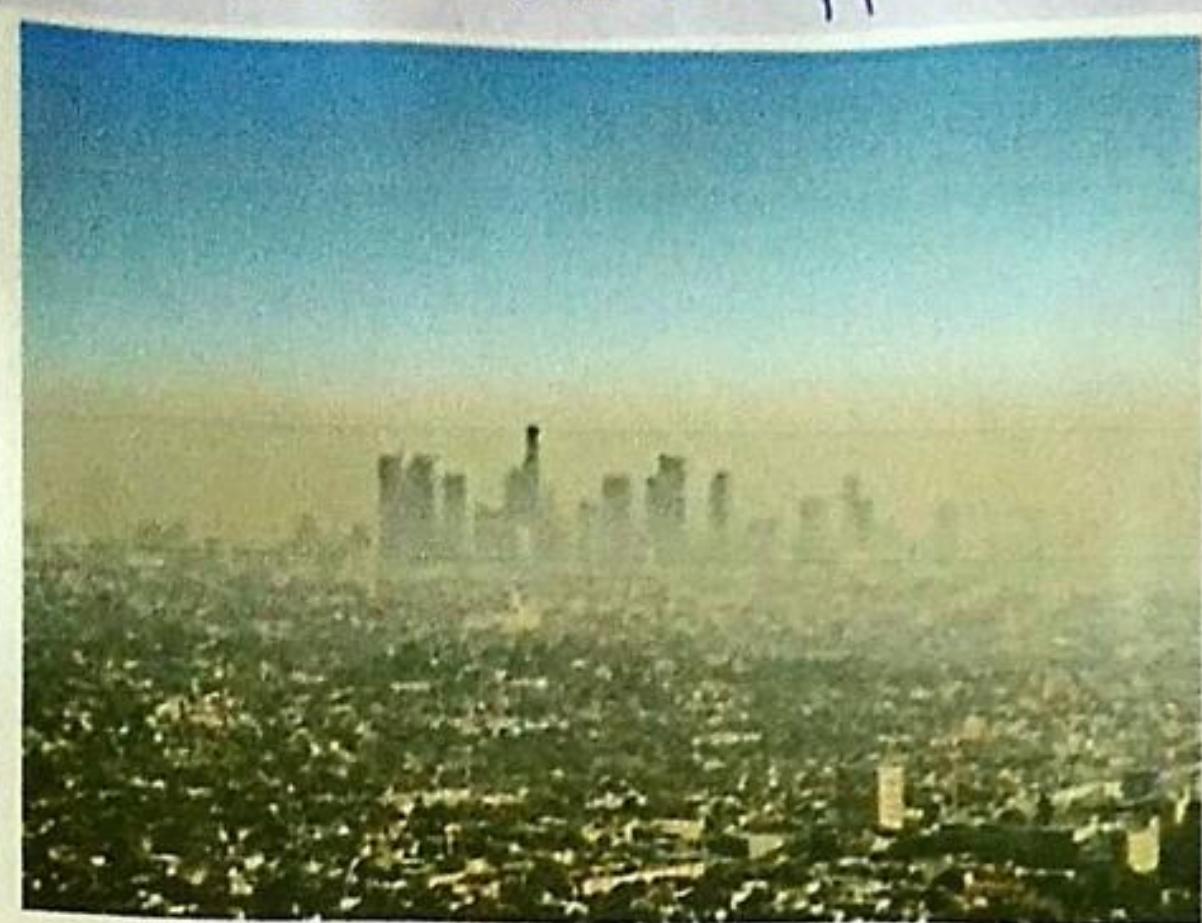
It was first observed in Los Angeles. In this process smog, fog, nitrogen oxide, hydrocarbons, oxygen, UV light and high temperature are essential. These components react with each other and form reddish brown smog. ($\text{PAN} + \text{O}_3 + \text{Nitrogen}$) or brown haze

(ii) London Smog or Sulphur Smog:

It is first observed in London. In these process coal, smoke, fog, sulphur oxide and low temperature are essential. These components react with each other and form vapour of H_2SO_4 which is known as London Smog (first seen in London).

Effect:- Photochemical smog causes irritation in eyes and harms the lungs. Due to smog elastic

Substances also effected.



► acid rain formation

► smog around cities

- ② In Sulphur smog, due to inhalation of H_2SO_4 vapour with fog people may die.

(B) Acid Rain:-

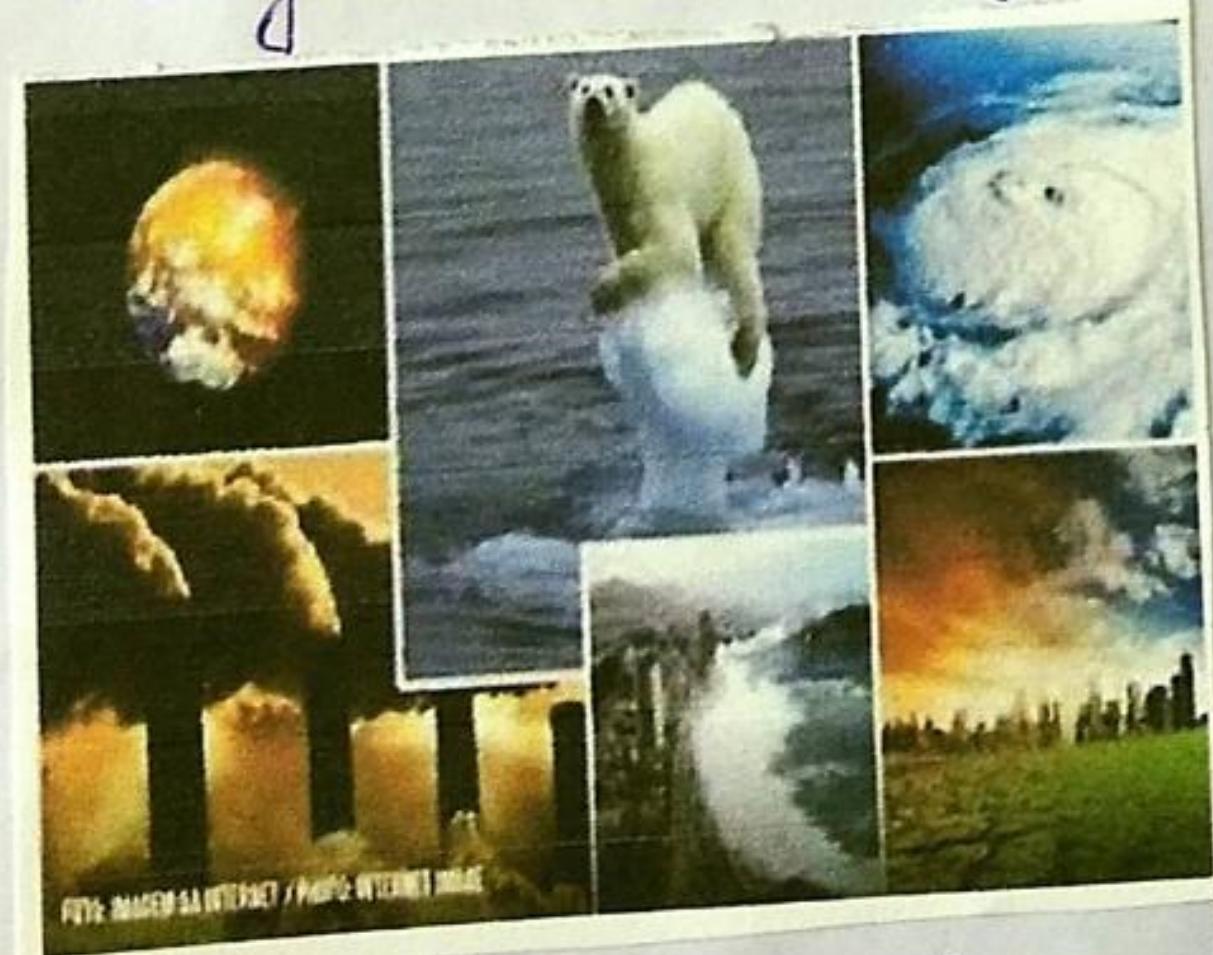
NO_2, SO_2 released from different sources in form of smoke dissolved in atmosphere's water vapour to form acid ($H_2SO_4 + HNO_3$) These come down as acid rain.

Effect:- Due to acid rain acidity of soil and water increases. Acid rain also causes damages of historical monuments e.g. Taj Mahal; Red fort

One of the Most Harmful Effects of Air Pollution of Cities and Effect:-

Increasing of City Temperature:-
The green house effect on the city surface becomes much active as

the substances of Green House Gas due to air pollution increases. That's also called as Global Warming for temperature increase for the whole world in a gradual way.



► Global Warming and its effects.

A Case Study on Air Pollution in Cities

Case Study of Delhi:-

Delhi ranks highest in number of vehicles in India. According to the record in 1990, the number of cars of Delhi were more than the total of WB and Gujarat. It was 30 years ago. It now become one of the most polluted cities in world. Residents are suffering from burning eyes and respiratory problem. In 2018 and 2019's winter Delhi was covered by the dark smog, for that harmful smoke school-colleges and daily works of Delhi has been stopped. In the report of October 2017 the AQI (Air Quality Index) of Delhi was 999, which is equivalent of smoking 45 or 50 cigarettes per day. It became like the "gas chamber". due to this Sri Lanka vs India match was postponed. People inspite of wearing mask have been suffering due to this.

Case Study of Kolkata:-

Kolkata is also in the grip of rising air pollution and multipollutant crisis. Official ambient air quality monitoring has shown 61% increase in particulate matter from 2010 to 2013. With growing vehicles' numbers and resultant congestion and dieselisation air pollution is growing concern in 'the city of joy'. Like Delhi in Kolkata the air quality became much poor in winter and this enhances public health risk.

Some effective steps like banning of too old vehicles, decreasing the use of diesel, petrol and increasing CNG, using public vehicles as the means of transportation rather than private one like Bike, car would be taken to prevent following this air quality falling problem.

Measures to Control Air Pollution in Cities

Different kinds of air pollution can be controlled by modern day inspiring technology. Emission from factories and power plants can be made free from gaseous pollutants by these methods:

① Combustion Technique:

Only oxidisable pollutants can be removed by this method. Emissions are burnt at very high temp. This process applied in petrochemical and plant industries.

② Absorption Form and Technique:

Here scrubbers with packing material are used to absorb gaseous pollutants. A fine spray of water is also ~~say~~ applied that dissolves NH_3 , SO_2 etc. Sometimes a bed of lime is also employed to absorb SO_2 .

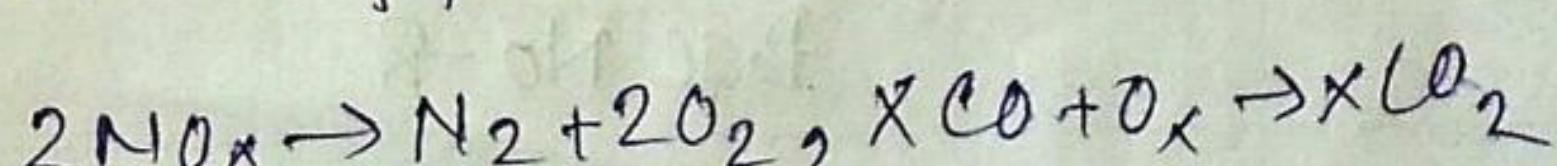
③ Adsorption Technique:

Activated charcoal, a chief adsorption material is used in this technique. It can absorb toxic vapours, gases and other harmful matters.

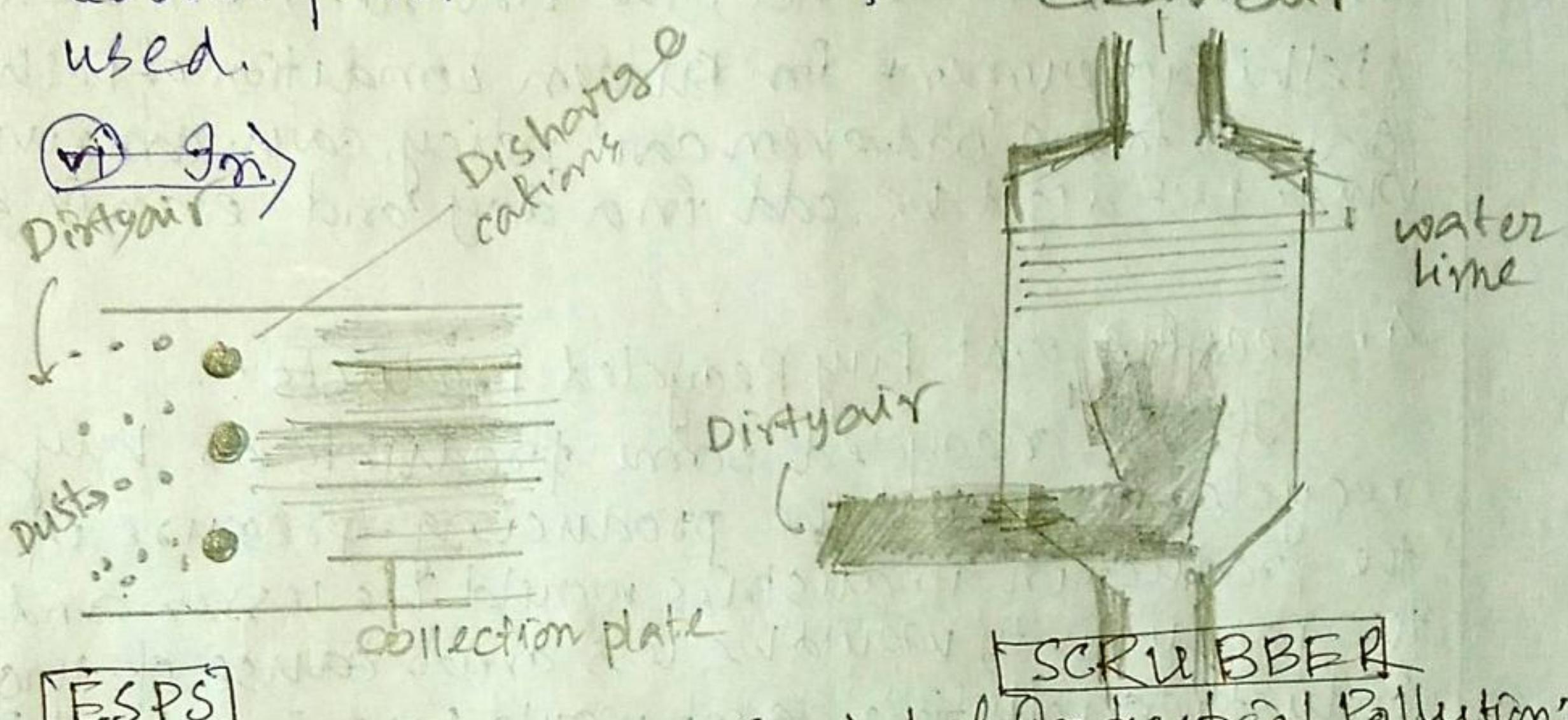
Following steps have to be taken to control air pollution of cities ^{amt} source as well as after the release of pollutants in atmosphere.

1. Prevention and Control of Vehicular Pollution:

i) Curbing the pollutant emission from vehicular exhaust by using various devices, s.t. as positive crankcase, ventilation valve, catalytic converter. Catalytic converters consist of metals like palladium, platinum and rhodium as catalyst. The exhaust gases when passed through the following conversions happen.



- (iii) Control of Evaporation from fuel tank and carburettor by several mechanical and chemical processes.
- (iv) Filters can be used to capture and recycle the hydrocarbons from the engine.
- (v) Periodic checking of vehicles for pollution control.
- (vi) Lead Petrol should be avoided instead un leaded petrol and low-sulphur diesel or CNG be used.



[ESPS] 2. Prevention and Control of Industrial Pollution:

In different industries air pollution can be checked at 5 points of control process

(i) Removal of Particulate matters :

It involves cyclone collector, electrostatic precipitator like equipments. In cyclone collector centrifugation process is applied and in electro-static precipitators, ESPs can remove 90% by electrical static force and matter's precipitation.

(ii) Removal of Gaseous Pollutants :-

It can be evolved through wet system, dry system and wet-dry system. Wet system evolves SO_3 which reacts with liquid and precipitate. Dry-wet system gases react under a dry phase (presence of lime, limestone) and SO_2, SO_3 .

where in wet dry system water is absorbent it involves $\text{Ca}(\text{OH})_2$, SO_2 and hot gases to evaporate simultaneously. where wet system is used in washing towers, wet dry system is less expensive and effective.

3. Control Air Pollution of Cities through law:

There have been several legislative measures to prevent and control different type of air pollution. Eg. Bengal Smoke Nuisance act (1905), The Motor Vehicle Act, The Environment act (1981)

Delhi Government in sudden condition of Delhi order to follow 'odd-even car' policy. cars can run which last digit be odd in a day and even in another

4. Recycle and Buy Recycled Products:-

If we recycled some products or buy recycled it, then the producing pressure of the product in industries would be lesser and the productivity would be less and cause of that industries polluting agent would less involved in air.

5. Tree Plantation:

The most effective measure of air pollution is tree plantation. Tree can only refresh the air with much possibilities. So we have to stop tree ~~the~~ felling and we have to plant more and more trees. It only can save us.

6. Raise Mass Awareness:

(1) Mass awareness is most important thing in this regard. We have to aware the world's people about their danger in future.

(2) We have to motivate ours to use Natural Products, non toxic cleaners.

(3) We have to motivate not to smoke. We have to make them comfortable.

Conclusion :

Air pollution is not the problem of cities or towns or villages. This is the problem of this living world. Danger is coming. We have to resist it, we have to resist air pollution, we have to be careful about ourselves and others to obtain so. So to be safe we have to save others and then we can together achieve more. By doing this project I come to know how cities are polluted and their reasons, how we can prevent those things and their measure and so on.

Reference Books :

- ① Guide to Environmental Science.
Dr. R. B. Singh.
- ② A Textbook of Environmental Sciences.
Dr. D. K. Asthana & Dr. M. Asthana
- ③ Sampriti Essential Biology : Sampriti Publication
- ④ Wikipedia, Internet (Google).

Acknowledgement

I would like to express my hearty gratitude and special thanks to my environmental science department and their teachers Mr. Narayan Maity , Mr. Souvik Banerjee for their enormous help and support in completing my project work.

Sribhra Sankar Datta

Teacher's signature

Student's signature

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NAME : SUDIPTA DAS
COLLEGE ROLL NO : MTUGC/053/19
DEPARTMENT : MATHEMATICS
YEAR : 2020
SIGNATURE : Sudipta Das.

TABLE of CONTENTS

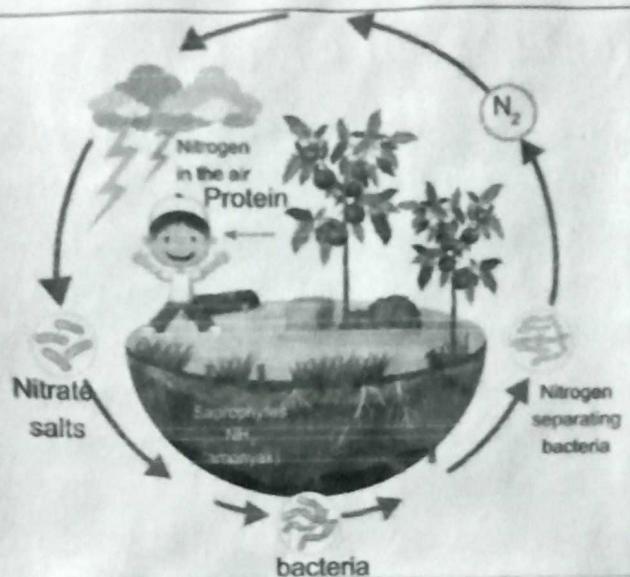
Topic	Page
What is nitrogen cycle?	01
Processes in nitrogen cycle	02 - 06
The global nitrogen cycle	07
Nitrogen cycle in marine eco.	08
Importance of nitrogen cycle	09
Conclusion	10
Acknowledgement	11
Certificate	12

■ WHAT IS NITROGEN CYCLE?

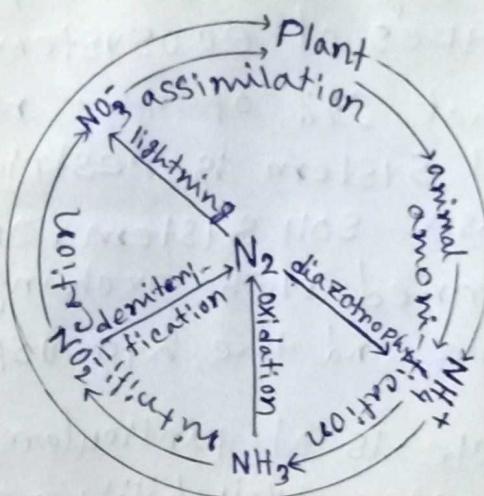
Nitrogen cycle is the biogeochemical cycle by which nitrogen is converted into multiple chemical forms as it circulates among atmosphere, terrestrial, and marine ecosystems. The conversion of nitrogen can be carried out through both biological and physical processes. Important processes ~~in the~~ in the nitrogen cycle include fixation, ammonification, nitrification, and denitrification. The majority of Earth's atmosphere (78%) is atmospheric nitrogen, making it the largest source of nitrogen. However, atmospheric nitrogen has limited availability for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems.

It is shown that 95% of the nitrogen flow in the global terrestrial system is restricted to the Plant-microorganism-soil system. Only 5% of the total flow is concerned with exchanges to and from the atmosphere and the hydrosphere.

The nitrogen cycle is of particular interest to ecologists because nitrogen availability can affect the rate of key ecosystem processes, including primary and decomposition. Human activities such as fossil fuel combustion, use of artificial nitrogen fertilizers, and release of nitrogen in wastewater have dramatically altered the global nitrogen cycle. Human modification of the global nitrogen cycle can negatively affect the natural environment system and also human health.



* A Classical representation of the nitrogen cycle:-

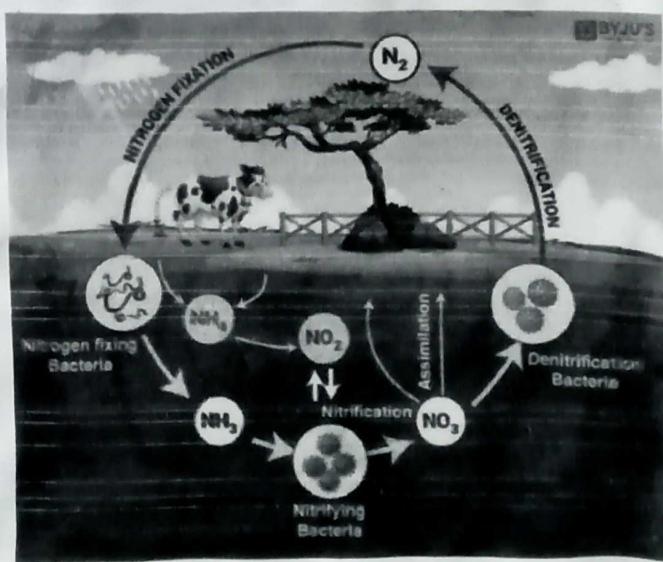


PROCESSES IN NITROGEN CYCLE

Nitrogen is present in the environment in a wide variety of chemical forms including organic nitrogen ammonium (NH_4^+), nitrite (NO_2^-), nitrate (NO_3^-), nitrous oxide (N_2O), nitric oxide (NO) or inorganic nitrogen gas (N_2). Organic nitrogen may be in the form of a living organism, humus or in the intermediate products of organic matter decomposition. The processes in the nitrogen cycle is to transform nitrogen from one form to another.

Nitrogen Fixation

The conversion of nitrogen gas (N_2) into nitrates and nitrite through atmospheric, industrial and biological processes is called nitrogen fixation. Between 5 and 10 billion kg per year are fixed by lightning & strikes, but most fixation is done by tree-living or ~~symbiotic~~ symbiotic bacteria known as diazotrophs. These bacteria have the nitrogenase enzyme that combines gaseous nitrogen with hydrogen to produce ~~ammonia~~ ammonia, which is converted by the bacteria into the organic compounds. An example of free-living bacteria is Azotobacter. Symbiotic nitrogen-fixing bacteria such as ~~Rizo~~ Rhizobium usually live in the root nodules of legumes (such as peas, alfalfa, and locust trees). Here they form a mutualistic relationship with the plant, producing ammonia in exchange for carbohydrates. Today, about 30% of total fixed nitrogen is produced industrially using the Haber-Bosch process, which uses high temperatures and pressures to convert nitrogen gas and a hydrogen source into ammonia.



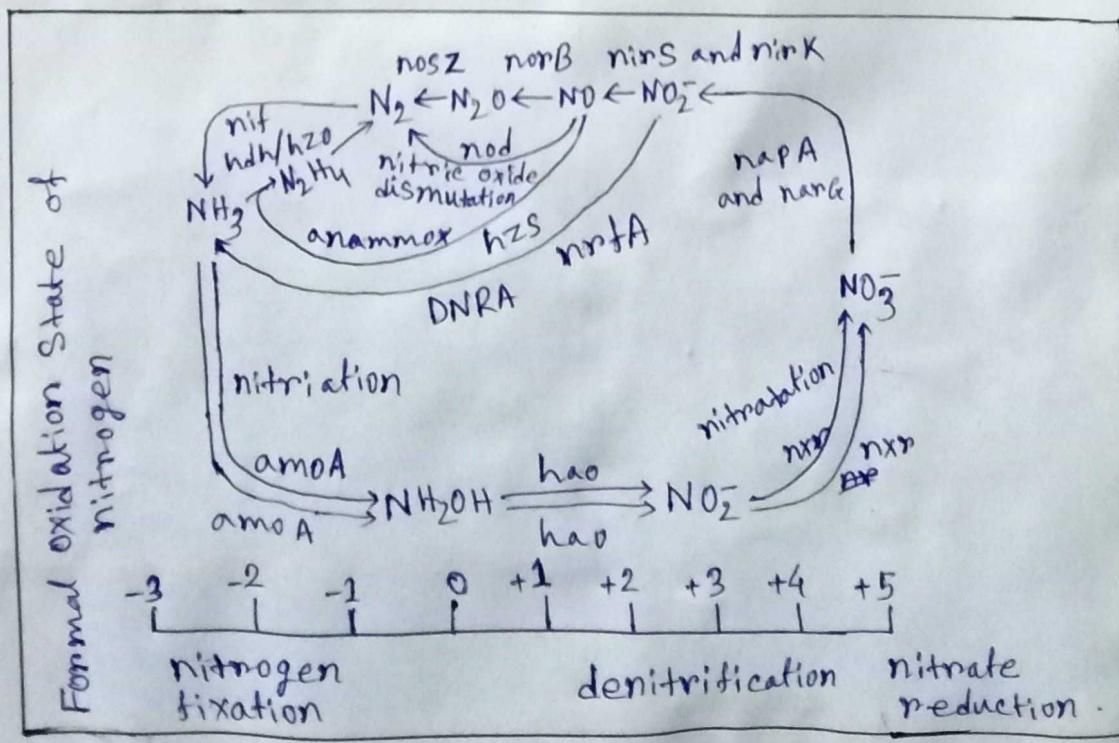
■ Assimilation

This process is the formation of organic nitrogen compounds like amino acids from inorganic nitrogen compounds present in the environment. Organisms like plants, fungi and certain bacteria that can't fix nitrogen gas (N_2) depend on the ability to assimilate nitrate or ammonia for their needs. Other organisms like animals depend entirely on organic nitrogen from their food.

■ Ammonification

When a plant or animal dies or an animal expels waste, the initial form of nitrogen is organic. Bacteria or fungi convert the organic nitrogen within the remains back into ammonium (NH_4^+), a process called ammonification or mineralization. Enzymes involved are:

- * GS: Gln Synthetase (cytosolic and plastid)
- * GOGAT: Gln-2-Oxoglutarate aminotransferase (Ferredoxin and NADH)
- * GDH: Glu Dehydrogenase: P_450 dependent
 - Minor Role in ammonium assimilation.
 - Important in amino acid catabolism.



■ Nitrification

The conversion of ammonium to nitrate is performed primarily by soil-living bacteria and other nitrifying bacteria. In the primary stage of nitrification, the oxidation of ammonium (NH_4^+) is performed by bacteria such as the *Nitrosomonas* species, which converts ammonia to nitrites (NO_2^-). Other bacterial species such as *Nitrobacter* are responsible for the oxidation of the ~~nitrites~~ (NO_2^-) into nitrates (NO_3^-). It is important for the ammonia (NH_3) to be converted into nitrates or nitrites because ammonia gas is toxic for plants.

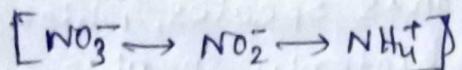
Due to their very high solubility and because soils are highly unable to retain anions, nitrates can enter groundwater. Elevated nitrate in groundwater is a concern for drinking water use because nitrate can interfere with blood-oxygen levels in infants and cause methemoglobinemia or blue-baby syndrome. Where groundwater recharges stream flow, nitrate-enriched groundwater can contribute to eutrophication, a process that leads to high algal population and growth, especially blue-green algal populations. While not directly toxic to fish like ammonia, nitrate can have indirect effects on fish if it contributes to this eutrophication.

■ Denitrification

Denitrification is the reduction of nitrates back into nitrogen gas (N_2), completing the ~~nito~~ nitrogen cycle. This process is performed by bacterial species such as *Pseudomonas* and *Paracoccus*, under anaerobic conditions. They use the nitrate as an electron acceptor in the place of oxygen during respiration. These facultatively anaerobic bacteria can also live in aerobic conditions. Denitrification happens in anaerobic conditions e.g. waterlogged soils. The denitrifying bacteria use nitrates in the soil to carry out respiration and consequently produce nitrogen gas, which is inert and unavailable to plants.

■ Dissimilatory nitrate reduction to ammonium

Dissimilatory nitrate reduction to ammonium (DNRA), or nitrate/nitrite ammonification, is an anaerobic respiration process. Microbes which undertake DNRA oxidise organic matter and use nitrate as an electron acceptor, reducing it to nitrite, then ammonium.

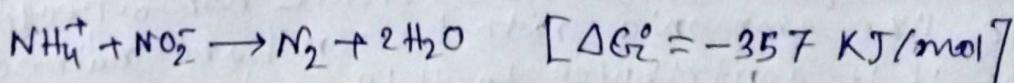


Both denitrifying and nitrate ammonification bacteria will be competing for nitrate in the environment, although DNRA acts to conserve bioavailable nitrogen as soluble ammonium rather than producing dinitrogen gas.

■ Anaerobic ammonia oxidation

In this biological process, nitrite and ammonia are converted directly into molecular nitrogen (N_2) gas. This process makes up a major proportion of nitrogen conversion in the oceans.

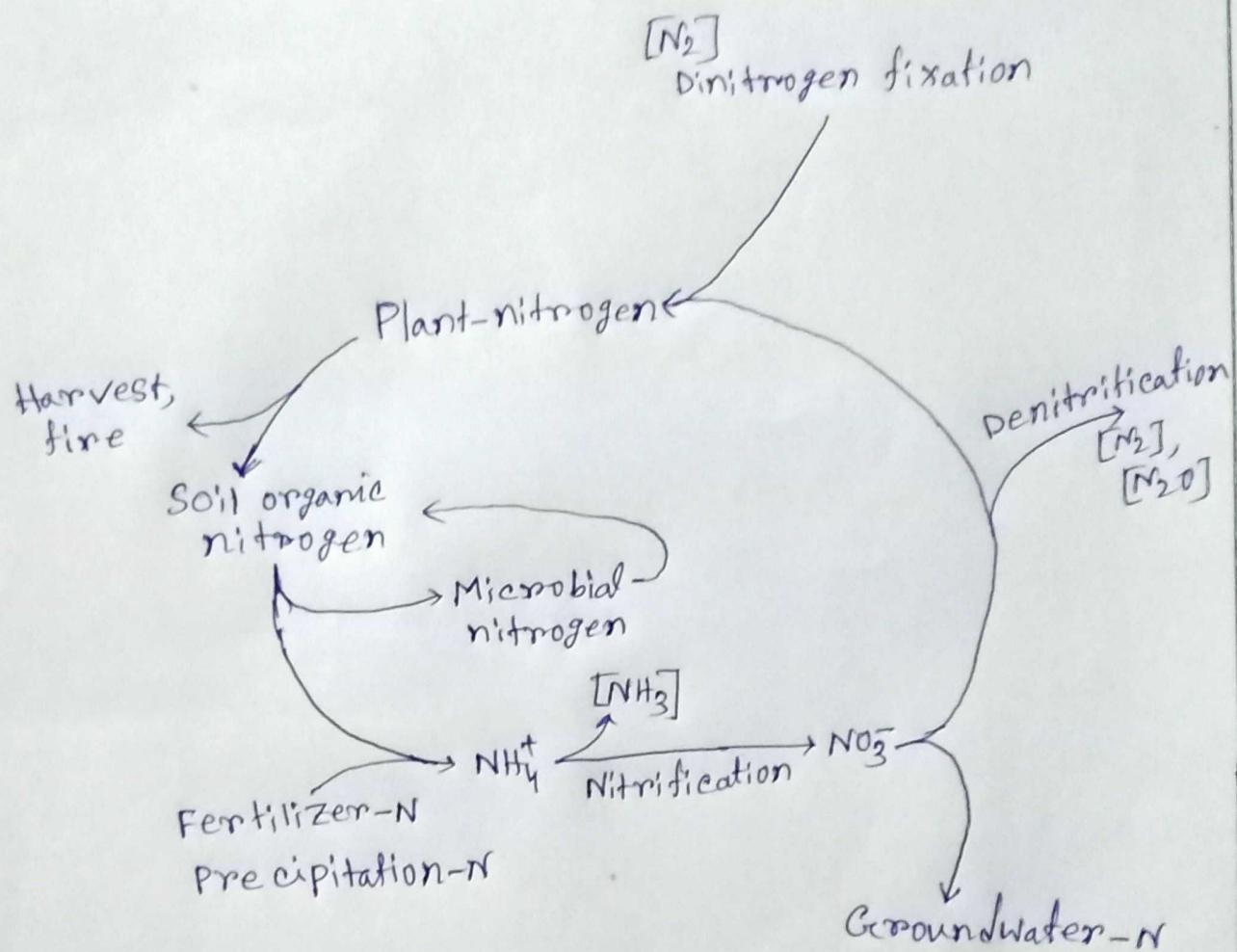
The balanced formula for this anammox chemical reaction is:



■ Other processes

Through nitrogen fixation is the primary source of plant-available nitrogen in most ecosystems, in areas with nitrogen-rich bedrock, the breakdown of this rock also serves as a nitrogen source. Nitrate reduction is also part of the iron cycle, under anoxic conditions Fe(II) can donate an electron to NO_3^- and is oxidized to Fe(III) while NO_3^- is reduced to NO_2^- , N_2O , N_2 and NH_4^+ depending on the conditions and microbial species involved.

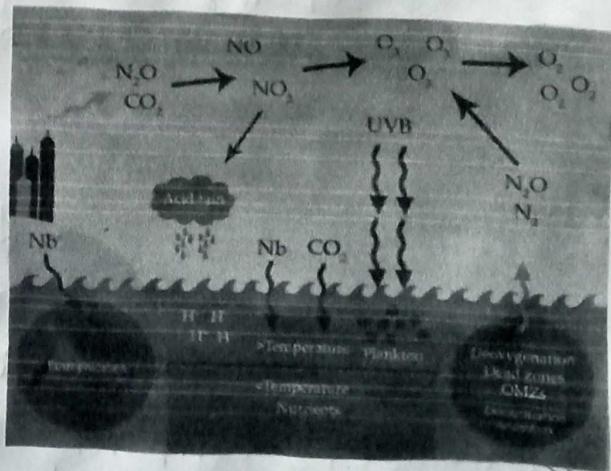
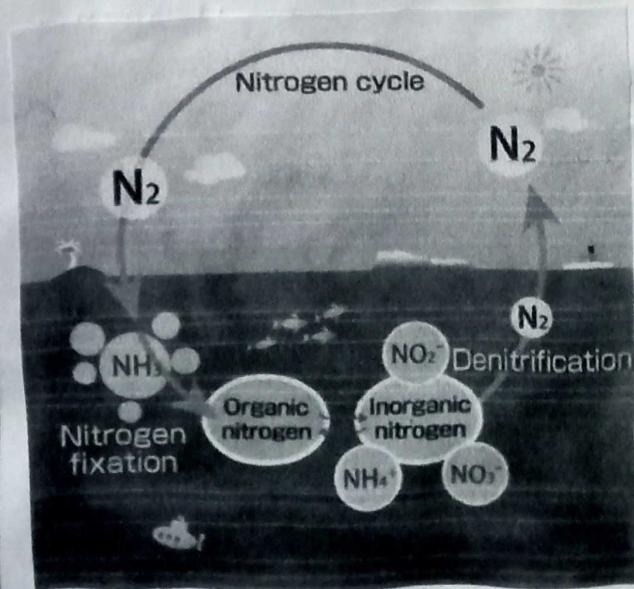
THE GLOBAL NITROGEN CYCLE



NITROGEN CYCLE IN MARINE ECOSYSTEM

The process of the nitrogen cycle occurs in the same manner in the marine ecosystem as in the terrestrial ecosystem. The only difference is that it is carried out by marine bacteria.

The nitrogen-containing compounds that fall into the ocean as sediments get compressed over long periods and form sedimentary rock. Due to the geological uplift, these sedimentary rocks move to land. Initially, it was not known that these nitrogen-containing sedimentary rocks are an essential source of nitrogen. But, recent researches have proved that the nitrogen from these rocks is released into the plants due to the weathering of rocks.



■ IMPORTANCE OF NITROGEN CYCLE

Importance of nitrogen cycle are as follows:

- 1) Helps plants to synthesise chlorophyll from the nitrogen compounds.
- 2) Helps in converting inert nitrogen gas into a usable form for the plants through the biochemical process.
- 3) In the process of ammonification, the bacteria help in decomposing the animal and plant matter, which indirectly helps to clean up environment.
- 4) Nitrates and nitrites are released into the soil, which helps in enriching the soil with necessary nutrients required for cultivation.
- 5) Nitrogen is an integral ~~compound~~ component of the cell and it forms many crucial compounds and important biomolecules.

Nitrogen also cycled by human activities such as combustion of fuels and the use of nitrogen fertilisers. These processes, increase the levels of nitrogen-containing compounds in the atmosphere. The fertilisers containing nitrogen are washed away in lakes and rivers and results in eutrophication.

CONCLUSION

Nitrogen is abundant in the atmosphere, but it is unusable to plants or animals unless it is converted into nitrogen compounds.

Nitrogen-fixing bacteria play a crucial role in fixing the atmospheric nitrogen into nitrogen compounds that can be used by the plants.

The plants absorb the usable nitrogen compounds from the soil through their roots. Then, these nitrogen compounds are used for the production of proteins and other compounds in the cell.

Animals assimilate nitrogen by consuming these plants or other animals that contain nitrogen. Humans consume proteins from these plants and animals and then, the nitrogen assimilates into our system.

During the final stages of the nitrogen cycle, bacteria and fungi help decompose organic matter, where the nitrogenous compounds get dissolved into the soil which is again used by the plants.

Some bacteria then convert these nitrogenous compounds in the soil and turn it into nitrogen gas. Eventually, it goes back to the atmosphere.

These sets of processes repeat continuously and thus maintain the percentage of nitrogen in the atmosphere.

ACKNOWLEDGEMENT

I convey my deep sence of gratitude to sir, for suggesting the way to find suitable for the development, in the preparation of the project manuscript. I owe to him in every sence for providing me with the facilities, valuable guidance and constant help throughout the course of ~~investigation~~ investigation.

Date- 15/11/20

Sudipta Das
Student's signature

GEKILICVLE

CERTIFICATE

certified that the project work
Submitted by SUDIPTA DAS is done
under the supervision of honourable
Subject teacher as a part of curriculum
for the partial fulfilment of the class
UGC 2nd semester.

Date - 15/11/20

Teacher's signature

ACKNOWLEDGEMENT