

NARENDRAPUR RAMAKRISHNA MISSION
RESIDENTIAL COLLEGE

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ROLL : CSUA/028/19

TOPIC : Nitrogen Cycle

SUBJECT : Environmental Studies

NITROGEN CYCLE

Nitrogen is one of the primary nutrients critical for the survival of all living organisms. Although nitrogen is very abundant in the atmosphere, it is largely inaccessible in this form to most organisms. This article explores how nitrogen becomes available to organisms and what changes in nitrogen levels as a result of human activity means to local and global ecosystems.

INTRODUCTION

Nitrogen is one of the primary nutrients critical for the survival of all living organisms. It is a necessary component of many biomolecules, including proteins, DNA and chlorophyll. Although nitrogen is very abundant in the atmosphere as dinitrogen gas (N_2), it is largely inaccessible in this form to most organisms, making nitrogen a scarce resource and often limiting primary productivity in many ecosystems. Only when nitrogen is converted from dinitrogen gas into ammonia (NH_3) does it become available to primary producers, such as plants.

In addition to N_2 and NH_3 , nitrogen exists in many different forms, including both inorganic (e.g. ammonia, nitrate) and organic (e.g. amino and

nucleic acids) forms. Thus, nitrogen undergoes many different transformations in the ecosystem, changing from one form to another as organisms use it for growth and, in some cases, energy. The major transformations of nitrogen are nitrogen fixation, nitrification, denitrification, anammox and ammonification. The transformation of nitrogen into its many oxidation states is key to productivity in the biosphere and is highly dependant on the activities of a diverse assemblage of microorganisms, such as bacteria, archaea and fungi.

NITROGEN FIXATION

Nitrogen gas (N_2) makes up nearly 80% of the Earth's atmosphere. Yet nitrogen is often the nutrient that limits primary production in many ecosystems. This is because plants and animals are not able to use N_2 directly. For nitrogen to be available to make proteins, DNA, and other biologically important compounds, it must first be converted into a different chemical form. The process of converting N_2 into biologically available nitrogen is called nitrogen fixation.

Nitrogen fixation is an energetically demanding process, so only a few prokaryotes are able to carry it out. Nitrogen can also be fixed abiotically by lightning or certain industrial processes.



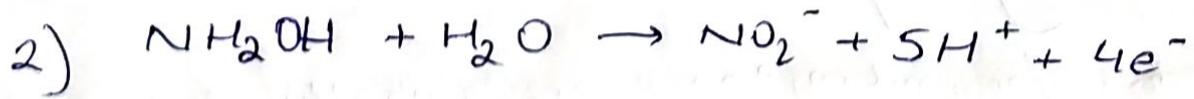
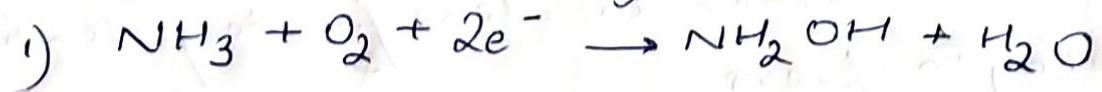
Some nitrogen-fixing organisms are free-living while others are symbiotic. Most of the symbiotic associations are very specific and have complex mechanisms that help to maintain the symbiosis. For example, root exudates from legumes serve as signal to certain *Rhizobium*, which are nitrogen fixing bacteria. This signal attracts the bacteria to the roots and a very complex series of events then occurs to initiate uptake of the bacteria into the root and trigger the process of nitrogen fixation in nodules that form on the roots.

Although there is great physiological and phylogenetic diversity among the organisms that carry out nitrogen fixation, they all have a similar enzyme complex called nitrogenase that catalyzes the reduction of N_2 to NH_3 , which can be used as a genetic marker to identify the potential for nitrogen-fixers.

Genes for nitrogenase are globally distributed and have been found in many aerobic habitats and also in habitats that may be anaerobic or microaerophilic. The broad distribution of nitrogen-fixing genes suggest that nitrogen-fixing organisms display a very broad range of environmental conditions, as might be expected for such an important life process.

NITRIFICATION

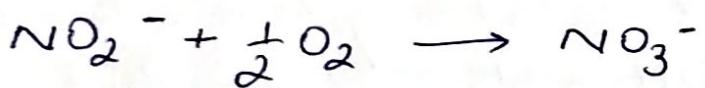
Nitrification is the process that converts ammonia to nitrite and then to nitrate and is another important step in the nitrogen cycle. Most nitrification occurs aerobically and is carried out exclusively by prokaryotes. The first step of nitrification is the oxidation of ammonia to nitrite, which is carried out by microbes known as ammonia-oxidizers. Aerobic ammonia oxidizers convert ammonia to nitrite via hydroxylamine. This process generates very small amount of energy relative to many other types of metabolism; as a result, nitrosifiers are notoriously very slow growers. Additionally, aerobic ammonia oxidizers are also autotrophs, fixing carbon dioxide to produce organic carbon, much like photosynthetic organisms, but using ammonia as the energy source instead of light.



The second step in nitrification is the oxidation of nitrite (NO_2^-) to nitrate (NO_3^-). This step is carried out by a completely separate group of prokaryotes, known as nitrite-oxidizing bacteria. Some of the genera involved in nitrite oxidation include Nitrosopera. The energy generated in this

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Oxidation step is very small, and thus growth yields are very low. For complete nitrification both ammonia oxidation and nitrite oxidation must occur.



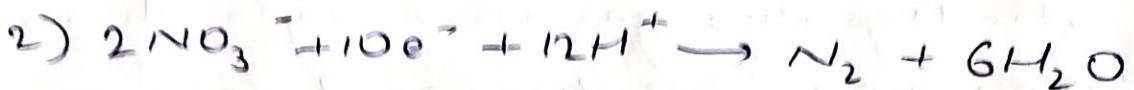
ANAMMOX

Traditionally, all nitrification was thought to be carried out under aerobic conditions, but recently a new type of ammonia oxidation occurring under anoxic conditions was discovered. Anammox Bacteria oxidize ammonia by using nitrate as the electron acceptor to produce gaseous nitrogen. Anammox bacteria were first discovered in anoxic bioreactors of wastewater treatment plants but have since been found in a variety of aquatic systems. In some areas of the ocean, the anammox process is considered to be responsible for a significant loss of nitrogen. Whether anammox or denitrification is responsible for most nitrogen loss in other areas, it is clear that it represents an important process in the global nitrogen cycle.



DENITRIFICATION

It is the process that converts nitrate to nitrogen gas, thus removing bioavailable nitrogen and returning it to atmosphere. Dinitrogen gas (N_2) is the ultimate end product of denitrification, but other intermediate gaseous forms of nitrogen exist. Some of these gases, such as nitrous oxide (N_2O), are considered greenhouse gases, reacting with ozone and contributing to air pollution.



AMMONIFICATION

When an organism excretes waste or dies, the nitrogen in its tissues is in the form of organic nitrogen. Various fungi and prokaryotes then decompose the tissue and release inorganic nitrogen back onto the ecosystem as ammonia in the process known as ammonification. The ammonia then becomes available for uptake by plants and other microorganisms for growth.

ECOLOGICAL IMPLICATIONS OF HUMAN ALTERATIONS TO NITROGEN CYCLE

Many human activities have a significant impact on the nitrogen cycle. Burning fossil fuels, application of nitrogen-based fertilizers and other activities can dramatically increase the amount of biologically available nitrogen in the ecosystem.

This leads to severe alterations of the nitrogen cycle in both aquatic and terrestrial ecosystems. Industrial nitrogen fixation has increased exponentially since the 1940s, and human activity has doubled the amount of nitrogen fixation.

In terrestrial ecosystems, the addition of nitrogen can lead to nutrient imbalance in trees, changes in forest health, and declines in biodiversity. With increased nitrogen availability there is often a change in carbon storage, thus impacting more processes than just the nitrogen cycle. In agricultural systems, unused nitrogen from excessive fertilizer use can leach out of the soil, enter streams and rivers, and ultimately pollute drinking water.

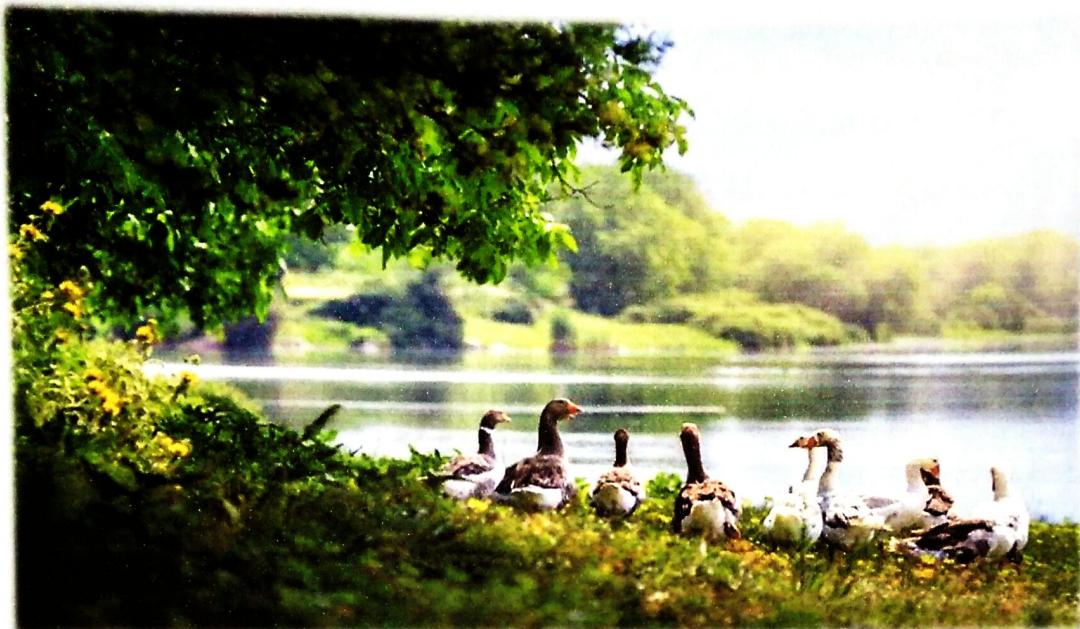
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Much of the nitrogen applied to agricultural and urban areas ultimately enters rivers and nearshore coastal systems. In nearshore marine systems, increases in nitrogen can often lead to anoxia or hypoxia, altered biodiversity, changes in food web structure, and general habitat degradation.

**RAMKRISHNA MISSION RESIDENSIAL
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Environmental Science project(Pond Ecosystem)

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Introduction :

The pond ecosystem is a fresh water environment that can reveal the health of a local area. Fresh water environments such as the pond ecosystem have specific life forms that show its overall health. Toxins or pollutions can affect the pond ecosystem adversely. The importance of understanding the pond ecosystem involves the life forms and plant cultures that are part of the healthy environment.

The pond ecosystem begins with what lives in the water. From the smallest microbes, single cell creature to the guppies, leeches and midges, only clean water can sustain life. The plants that convert oxygen for these creatures are as important as the fauna. The healthy pond ecosystem will have a balance of both plant and animal living within its parameters. Studying the balance between plant and animal and soil, sedges and underlying strata can give an overall view of the quality of the water table and land. With human activity impacting on the pond ecosystem, toxins can affect the quality of the pond ecosystem. If the toxin affect the water, plants can die. Agriculture and the impact of human activity both on the pond ecosystem can affect the quality of and purity of soil and water. Fertilizer, oil, introduced species, pollution, fishing can all upset the delicate balance that exists in a healthy pond ecosystem. Maintaining the balance, keeping every species alive and in good numbers will ensure a healthy, vital pond ecosystem.

Types of ecosystem:

- Same kind of ecosystems are known as biomes, means they have similar kind of living and non-living things.
- All ecosystems can be divided into two parts
 - Aquatic
 - Terrestrial
- Aquatic ecosystem refers to ecosystem which exists in water body — like in ocean and freshwater.
- Terrestrial ecosystem are found anywhere away from water bodies.

Pond ecosystem: Pond ecosystem falls in fresh water ecosystem which is further divided into three parts which are littoral zone, open water zone and deep water zone. Pond ecosystem generally classified in five types which are salt ponds, garden ponds, freshwater ponds, vernal ponds and underground ponds.

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

Garden ponds are those which are artificial in nature.

Fresh water pool can form anywhere because of rains.

Vernal ponds are those which are created because of rains, depressions in the ground and are seasonal.

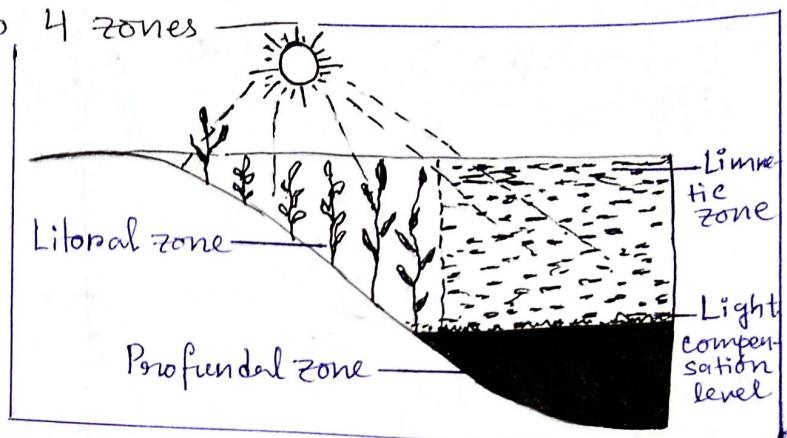
Underground ponds which are created near the rocks.

Pond ecosystem comes under Aquatic Ecosystems and it contains both Biotic and Abiotic factors.

Biotic Zones of a pond :

A pond is broken up into 4 zones

1. Littoral zone .
2. Limnetic zone .
3. Profundal zone .
4. Benthic zone .



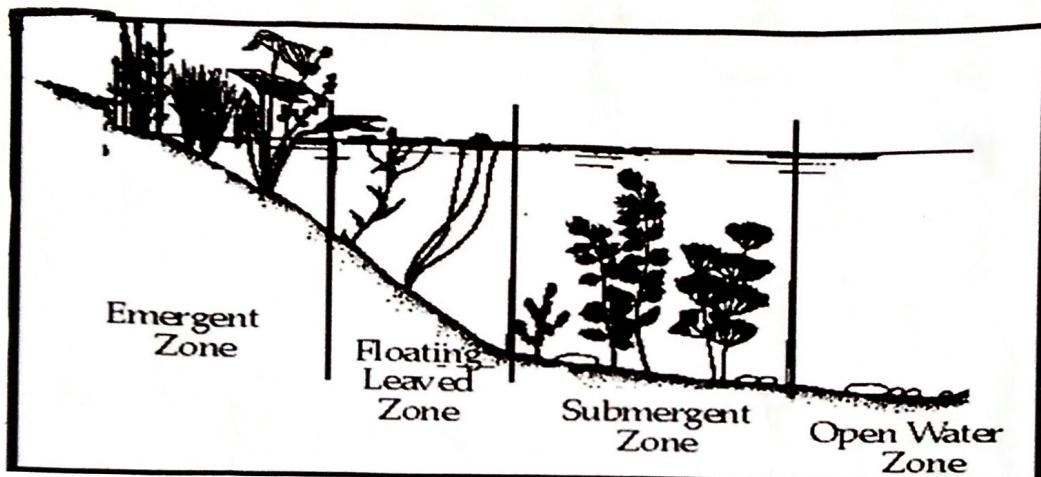
1. Littoral zone: Emergent plants are those producing biomass above and below water level.



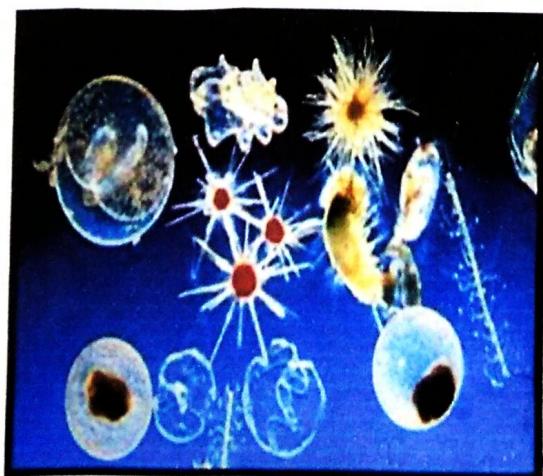
Floating plants are those producing biomass at and below water level.



Submergent plants are those producing biomass slowly below the water level.



2. Limnetic Zone: Limnetic zone is an open water area where light penetrates and floating algae and plankton dominant.



3. Profundal zone: Area of open water where light can't penetrate. The profundal zone lacks producers but contains mobile higher level consumers that are dependent on the littoral and limnetic zones.



4. Benthic Zone: Area on the bottom of the pond where light can't penetrate. The benthic zone lacks both producers and consumers. This zone is dominated by decomposing organisms from microscopic bacteria to macroinvertebrates like the crayfish.



Abiotic factors:

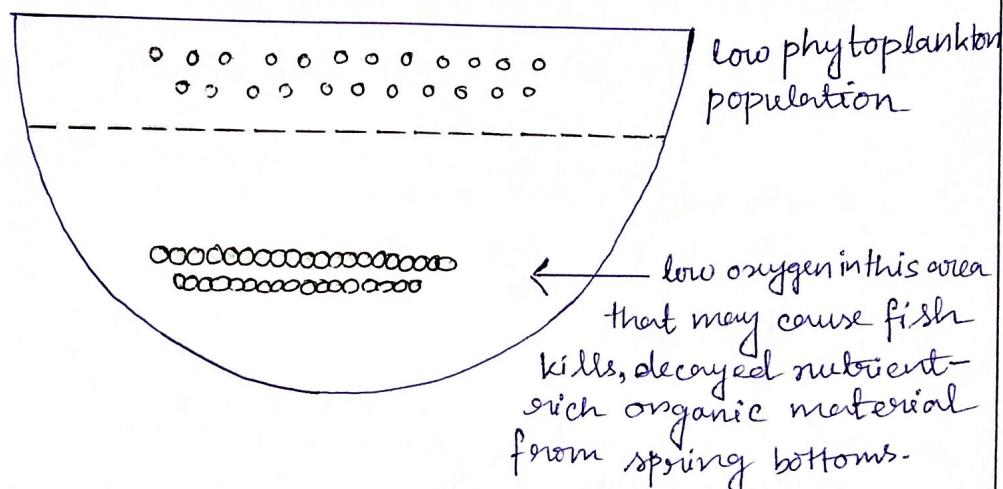
Seasonal changes in water temperature in a mid-latitude ponds is critical to the ecology of the pond. The changes in temperatures are associated with important physical properties of water.

Summer stratification: As summer peaks, the difference between the water temperature at the surface and the bottom of the pond increases.

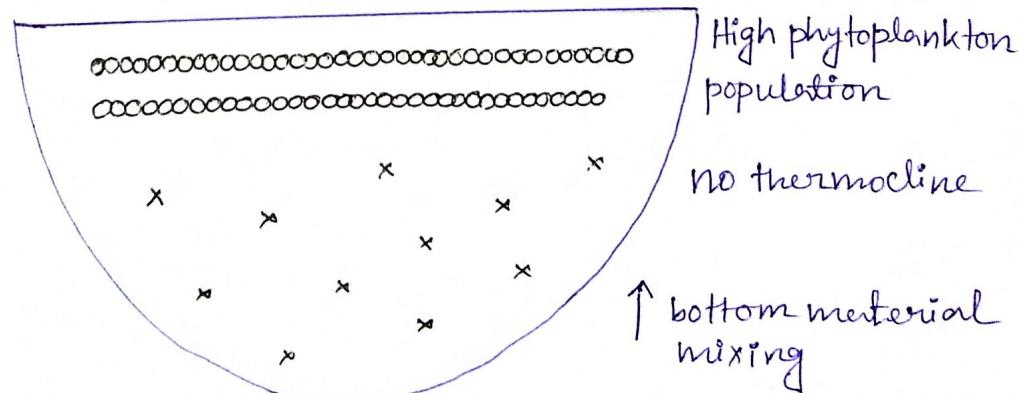
The warm water at the surface is less dense and sits above the colder denser water at the bottom. The ~~is~~ stratified water

water reduces mixing between layers, epilimnion and hypolimnion.

The epilimnion develops relatively high levels of oxygen through photosynthesis while the hypolimnion develops high levels of nutrients from decomposition.



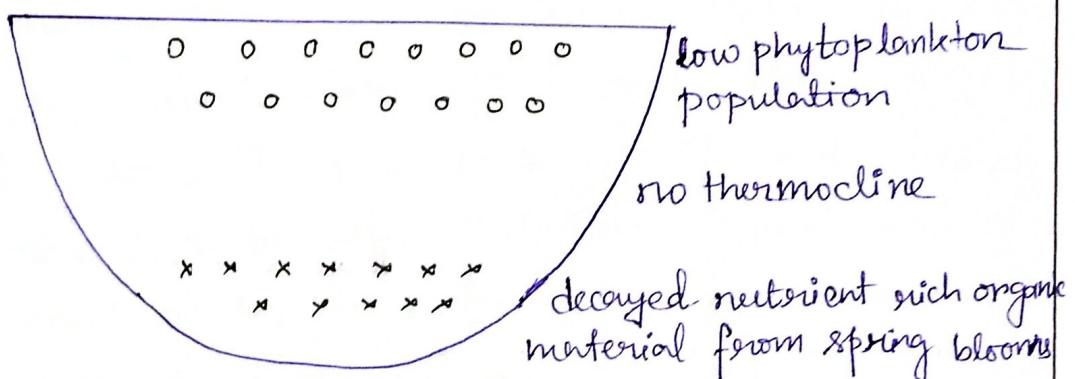
Fall Overturn: As summer is replaced by fall the surface waters cool and stratified layers start to disappear. At some point the water temperature reaches a common value. Now, when the wind blows, water circulates within the entire pond, allowing surface and bottom water to mix. Oxygen replenishes the hypolimnion while nutrients replenish the epilimnion.



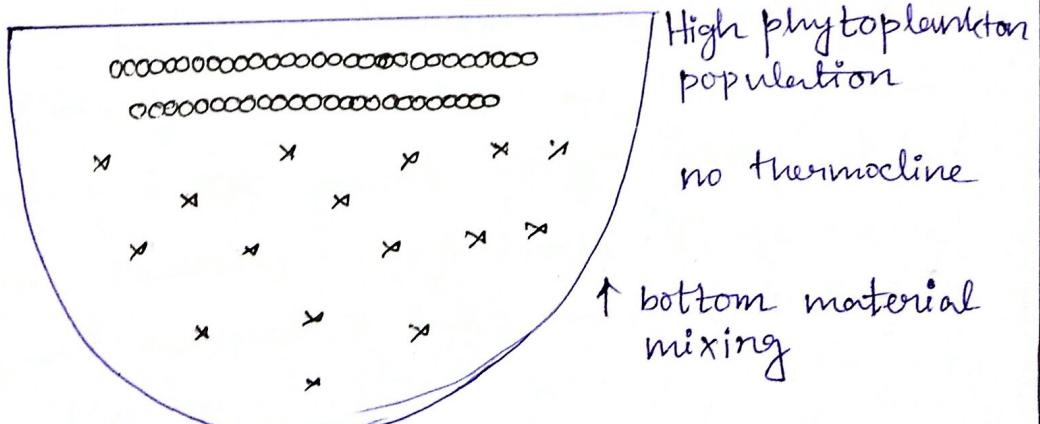
Winter stratification: As winter peaks, the difference between the water temperature at the surface and bottom of the pond increases.

In contrast to summer stratification, the surface temperature becomes colder than the bottom temperature.

As water freezes, it becomes less dense, floats, and insulates the water below, protecting the aquatic life from freezing.



Spring overturn: As winter is replaced by spring, the surface waters warm. At some point the water temperature reaches a common value. As the wind blows, the water circulates within the entire pond again allowing surface and bottom water to mix oxygen and nutrients.



Characteristics of Pond Ecosystem:

Pond ecosystem are the balance of fish, bacteria and plants which together support each other. Pond ecosystem works on ponds which are shallow enough for the sunlight to pass through it. It is a living ecosystem itself. Ponds do not have universally accepted standard of its maximum size. Ponds are wet and are surrounded by artificial and natural banks. The ponds provide inhabitation to wetland plant and animals. Pond works with a combination of three food webs at a time. There exist a type of pond where no trace of fishes is to be seen. This type of ponds are known as vernal ponds. These type of ponds inhabit rare and endangered plant species.

Food Chains in a pond ecosystem:

A food chain shows how many animals and plants are connected in many ways to find or produce their food. For example, plants become food for plant-eating (herbivorous) animals, such as small crustaceans. They are preyed upon by small flesh-eating (carnivorous) animals including fishes, dragonfly, birds and other animals. Larger fishes eat the smaller fishes, crustaceans, and insects. If not eaten, plants and animal reduced to basic materials that green plants need for growth.

- The organisms inhabiting a pond ecosystem include algae, fungi, microorganisms, plants and fishes. Organisms can be classified as producers, consumers and decomposers based on feeding habit.

producers — Producers in a pond food chain are organisms that through photosynthesis, manufacture their own food from sunlight. Examples range from microscopic phytoplankton to larger plants like cattails.

primary consumers — Primary consumers essentially herbivores are organism that feed directly upon the producers. Examples are tadpoles and crustaceans.

Secondary Consumers — The secondary consumers in a pond, such as a small fish for example, are organisms that feed upon or consume, the primary consumers.

Top consumers — Ecologists often refer to the top consumer group as the apex predators and examples would include the osprey and humans.

Decomposers — The decomposers like bacteria and fungi, break down the dead and decaying bodies of any of the other organisms in the pond and recycle their nutrients.

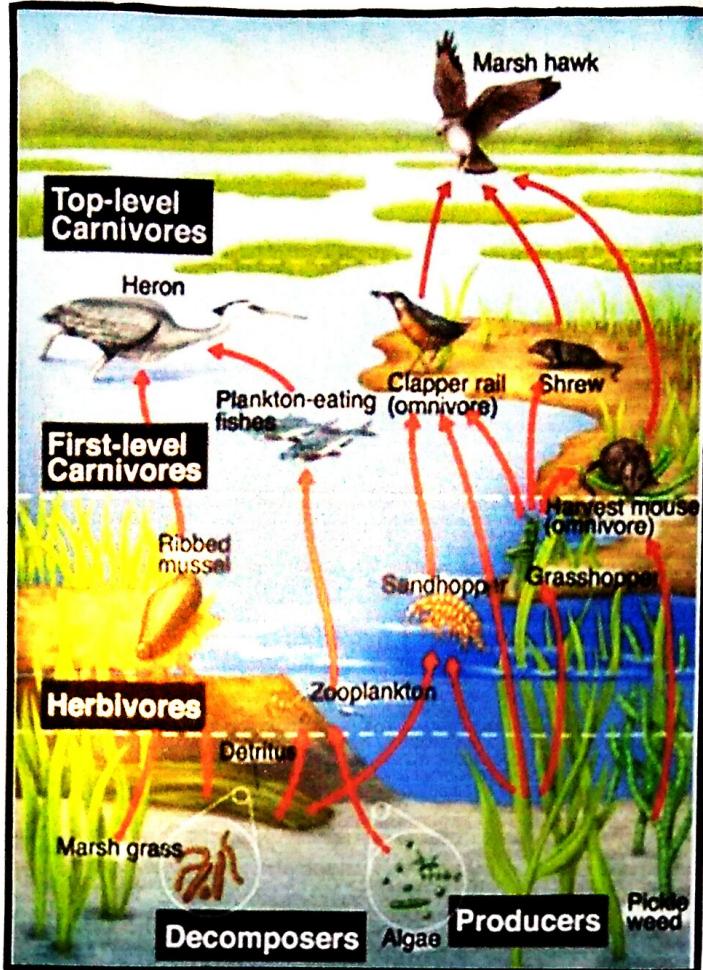


Fig: Food chain in Pond Ecosystem

There are four habitats in a pond ecosystem —

- Shore Habitats: Organisms in this habitat vary depending upon whether the shore is rocky, sandy or muddy.

In case of rocky shores, plants might be able to grow. Whereas, in muddy or sandy shores or mixed type, plants like grasses, algae, and rushes can be present along with organisms such as earthworms, protozoa, snails, insects, small fishes and microorganisms.

- Surface film habitats: In general, insects like water striders and marsh treaders, organisms that are free-floating and those that can walk on the surface of the water inhabit the surface of the pond. They nourish on the floating plants,

dead insects and sometimes feed upon each other.

- Open water habitats: Inhabited by fishes and the planktons. Fishes feed on plankton.
- Bottom water habitats: Depending upon whether the pond is shallow or deep, the habitat varies.
 - If a pond is shallow and has sandy bottom, organisms like earthworms, snails and insects inhabit the bottom.
 - whereas, if the pond is deep and has a muddy bottom, microorganisms, flatworm, eel-tailed maggot mostly inhabit the bottom.

Importance of Pond Ecosystem:

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

quenching thirst or providing inhibition but also ~~to~~ to add beauty to the mother nature. It touches our heart and we feel calm and close to nature.

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

Acknowledgement :

I would like to express my special thanks of gratitude to our environmental science teachers for their guidance and support in completing my project. I came to know about so many new things. I am really thankful to them.

Reference :

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RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NAME : BARNADEEP GHOSH
COLLEGE ROLL NO : HIUGI/037/19
DEPARTMENT : HISTORY
YEAR : 2020
SIGNATURE : Barnadeep Ghosh.

ACKNOWLEDGEMENT

First of all I would like to convey my sincere gratitude to the E.N.V.S Department to give us an opportunity to do project on this important topic. I would also like to thank our College management for their support in this pandemic situation. This project has played a crucial role in shaping our mind to deal with water problem. It deals with the crux of the problem of water management and its nuances.

Introduction of water pollution:- Water is typically referred to as polluted when it is impaired by anthropogenic contaminants. Due to these contaminants it either does not support a human use, such as drinking water or undergoes a marked shift in its ability to support its biotic communities, such as fish. Natural phenomena such as volcanoes, algae blooms, storms and earthquakes also status of water in water bodies and ecological status water.

Water pollution is a major global problem. It requires ongoing evaluation and revision of water resource policy at all levels. It has been suggested that water pollution is the leading worldwide cause of death and diseases, water pollution accounted for death of 1.8 million people in 2015.

India and China are two countries with high levels of water, India and China are also very big countries with water pollution. In addition to the acute problems of water pollution in developing countries, developed countries also continue to struggle with pollution problems.

Water pollution:- Water pollution is the contamination of water bodies, usually as a result of human activities, water bodies include for example lakes, rivers, oceans, aquifers and groundwater. Water pollution results when contaminants are introduced into the natural environment. For eg. releasing inadequately treated wastewater into natural water bodies can lead to degradation of aquatic ecosystems. In turn, this can lead to public health problems for people living downstream.

They may use the same polluted river water for drinking or bathing or irrigation. Water pollution is the leading worldwide cause of death and disease e.g. due to water borne diseases.

Water pollution can be classified as surface water or groundwater pollution. Marine pollution and nutrient pollution are subsets of water pollution. Sources of water pollution are either point sources or non-point sources.

The causes of water pollution include a wide range of chemicals and pathogens as well as physical parameters.

Types of water pollution:-

■ Surface water pollution:- Surface water pollution includes pollution of rivers, lakes, oceans. A subset of surface pollution is marine pollution.

■ Marine pollution:- One common path of entry by contaminants to the sea are rivers. An example is directly discharging sewage and industrial waste into the ocean. Pollution such as this occurs particularly in developing nations. Large gyres (vortexes) in the ocean trap floating plastic debris, plastic debris can absorb toxic chemicals from ocean pollution, potentially poisoning any creature that eats it.

■ Ground water pollution:- Interactions system between groundwater and surface water are complex. Consequently groundwater pollution, also referred to as groundwater contamination, is not as easily classified as surface water pollution. By its very nature, groundwater aquifers are susceptible to contamination from sources that may

not directly affect surface water bodies. Analysis of ground water contamination may focus on soil characteristics and site geology, hydrology and the nature of the contamination.

Categories of pollution sources :- Surface water and ground water have often been studied and managed as separate resources even though they are interrelated. Surface water seeps through the soil and becomes groundwater can also feed surface water pollution are generally grouped into two categories based on their origin.

⦿ Point Sources :- Point source water pollution refers to understand / contaminants that enters a water-way from a single, identifiable source, such as a pipe or ditch. Example of sources in this category include discharges from a sewage treatment plant, a factory or a city storm drain. The U.S. clean water act (CWA) defines source for regulating enforcement purposes.

⦿ Non-point sources :- Non-point sources pollution refers to diffuse contamination that does not originate from a single discrete source. This type of pollution is often the cumulative effect of small amounts of contaminants gathered from a large area. A common example is the leaching out of nitrogen compounds from fertilized agriculture lands. Nutrient runoff in storm water from "sheet flow" over an agriculture field as a forest are cited an example of non-point source pollution.

Contaminants and their sources :- The specific contaminants leading to pollution in water include a wide spectrum leading to pollution in water

include a wide range of chemicals, pathogens and physical changes such as elevated temperature and discoloration. While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese, etc.) the concentration usually determines what is a natural component of water and what is a contaminant. High concentrations of naturally occurring substances can have negative impacts on aquatic flora and fauna.

• Pathogens → Disease causing microorganisms are referred to as pathogens. Pathogens can produce waterborne diseases in either human or animal hosts, coliform bacteria which are not an actual cause of disease, are commonly used as a bacterial indicator of water pollution other microorganisms, sometimes found in contaminated surface waters that have caused human health problems include:

- *Burkholderia pseudomallei*.
- *Cryptosporidium possum*.
- *Giardia lamblia*.
- *Salmonella*.
- Norovirus and other viruses.
- Parasitic worms including the schistosoma type

High levels of pathogens may result from on-site sanitation systems (septic tanks, pit latrines) or inadequately treated sewage discharges.

Organic, inorganic and macroscopic contaminants:-

Contaminants may include organic and inorganic substances. Many of the chemical substances are toxic.

Organic water pollutants include:

- * Detergents.
- * Disinfection by-products found in chemically disinfected drinking water, such as chloroform.
- * Insecticides and herbicides, a huge range of organochlorides and other chemical compounds.
- * Ammonia from food processing waste.
- * Chemical waste as industrial by products.
- * Heavy metals from motor vehicles and acid mine drainage.
- * Trash or garbage (e.g paper, plastic or food waste) discarded by people on the ground, along with accidental or intentional dumping of rubbish, that are washed by rainfall into storm drains and eventually discharged into surface waters.
- Needles, small ubiquitous waterborne plastic pellets.
- Shipwrecks, large derelict ships.

Change in temperature :- Thermal pollution is the rise or fall in the temperature of a natural body of water caused by human influence. Thermal pollution, unlike chemical pollution, results in the change of physical properties of water. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacturers. Elevated water temperatures decrease oxygen levels, which can kill fish and alter food chain composition, reduce species

biodiversity and foster invasion by new thermophile species. Urban runoff may also elevate temperatures in surface waters.

Measurement:- Water pollution may be analyzed through several broad categories of methods: physical, chemical and biological. Most involve collection of samples, followed by specialized analytical tests. Some methods may be conducted *in situ*, without sampling, such as temperature. Government agencies and research organizations have published standardized, validated analytical test methods to facilitate the comparability of results from disparate testing events.

❖ Sampling:- Sampling of water for physical or chemical testing can be done by several methods, depending on the accuracy method and the characteristics of the contaminant. Many contamination events are sharply restricted in time, most commonly in association with rain events. For this reason "grab" samples are often inadequate for fully quantifying contaminant loads. Scientists gathering this type of data often employ auto sampler devices that pump instruments of water at either time or discharge intervals.

Sampling for biological testing involves collection of plants and animals from the system water body. Depending on the type of assessment, the organisms may be identified for bioassays (population counts) and returned to the water body, or they may be dissected for bioassays to determine toxicity.

■ Physical Testing:- Common physical tests of water include temperature, solids, concentration (e.g. total suspended solids (TSS) and turbidity).

■ Chemical Testing:- Water samples may be examined using the principles of analytical chemistry. Many published test methods are available for both organic and inorganic compounds. Frequently used methods include pH, biochemical oxygen demand (BOD), chemical oxygen demand (COD), nutrients (nitrate and phosphorus compounds), metals (including copper, zinc, cadmium, lead and mercury) oil and grease, total petroleum, hydrocarbon (TPH) and pesticides.

■ Biological Testing:- Biological Testing involves the use of plant, animal or microbial indicators to monitor the health of an aquatic ecosystem. They are any biological species or group of species whose function, population, or status can reveal what degree of ecosystem or environmental integrity is present. One example of a group of bio-indicators are the small water invertebrates that are present in many water bodies such as organisms can be monitored for changes (bio-chemical), physiological or behavioral that may indicate a problem within their ecosystem.

Control of pollution :-

Municipal wastewater Treatment:- In urban areas of developed countries, municipal wastewater (or sewage) is typically treated by centralized sewage treatment plants. Well-designed and operated systems can remove 90% or more of the pollutant load in sewage. Some plants have additional systems to remove nutrients and pathogens, but these more advanced treatment steps progressively more expensive.

Nature based solutions are also used in place of centralized treatment plants. well designed and operated systems can remove 90% pollution. Cities with sanitary sewer overflows or combined sewer overflows employ one or more engineering approaches to reduce discharges of untreated sewage including :

- utilizing a green infrastructure approach to improve storm water management capacity throughout the system and reduce the hydraulic overloading the Treatment plant.
- Repair and replacement of leaking and malfunctioning equipment.
- increasing overall hydrocaulic capacity of the sewage collection system (often a very expensive option).

On-site situation and safely managed sanitation.

Households or business not served by a municipal treatment plant may have an individual of septic tank, which pre-treats the wastewater on site and infiltrates it into the soil. Improperly designed or installed septic systems can cause ground water pollution.

Globally, about 4.5 billion people do not have safely managed situation as of 2017, according to an estimate by the joint monitoring programme of water supply and sanitation. Lack of access to open defecation : during rain events or floods, the human faces are moved from the ground where they were deposited into surface waters. Simple pit latrines may also get flooded during rain events. The use of safety managed sanitation services would prevent this type of water pollution.

■ Industrial wastewater Treatment :→ Some industrial facilities generate wastewater that is similar to domestic sewage and can be treated by sewage treatment

plants. Industries that generate wastewater with high concentrations of organic matter (e.g. oil and grease), toxic pollutants (e.g. heavy metals, volatile organic compounds) or nutrients such as ammonia, need specialized treatment systems. Some industries install a pre-treatment system. Some pollutants are then discharged to the partially treated wastewater to the municipal sewer system. Industries generating large volumes of wastewater typically operate their own treatment systems. Some industries have been successful at redesigning their manufacturing processes to reduce or eliminate pollutants, through a process called pollution prevention.

To remove heat from wastewater generated by power plants or manufacturing plants the following Technologies are used:

- ⦿ Cooling ponds, man-made bodies of water designed for cooling by evaporation, convection and radiation.
- ⦿ Cooling Tower, which transfer waste heat to the atmosphere through evaporation or heat transfer.
- ⦿ Cogeneration, a process where waste heat is recycled for domestic or industrial heating purposes.

■ Agricultural wastewater Treatment :-

- ⦿ Non point source controls:- Sediment (loose solid) washed off fields is the largest source of agricultural pollution in the United States. Farmers may utilize erosion controls to reduce runoff flows and retain soil on their fields. Common techniques include contour plowing, crop mulching, crop rotation, planting perennial crops and installing riparian buffers.

Nutrients (nitrogen and phosphorus) are typically applied to farmland as commercial fertilizers, animal manure, or spraying of municipal or industrial

wastewater effluent) or sludge. Nutrients may also enter runoff from crop residues, irrigation water, wildlife and atmosphere deposition. Farmers can develop and implement nutrients management plans to reduce nutrient management plans to reduce excess application of nutrients and reduce the potential for nutrient pollution.

To minimize pesticide impacts, farmers may use integrated pest management (IPM) techniques (which can include biological pest control) to maintain control over pests, reduce reliance on chemical pesticides and protect water quality.

Point Source wastewater Treatment :- Farms with large livestock and poultry operations, such as factory farms, are called concentrated animal feeding operations or feedlots in the US and are giving subject to increasing government regulation. Animal slurries are usually treated by contaminant in anaerobic lagoons before disposal by spray or trickle application to grassland. Constructed ponds are sometimes used to facilitate treatment of animal wastes. Some animal slurries are treated by mixing with straw and composted at high temperature to produce a bacteriologically sterile and friable manure for soil improvement.

④ Erosion and sediment control from construction sites.

Sediment from construction sites is managed by installation of:

- erosion controls, such as mulching and hydrosowing and
- spill prevention and control plans and etc
- specially designed containers (e.g. for concrete washout) and structures such as overflow controls and diversions.

- Control of urban runoff (storm water) \Rightarrow (Effective control of urban runoff involves reducing the velocity)

Flow of storm water, as well as reducing pollutant discharge. Local governments use a variety of storm water management techniques to reduce the effects of urban runoff. These techniques, called best management practices of water pollution (BMPs) in the U.S., may focus on water quality and some perform both functions.

Pollution prevention practices include low-impact development techniques installation of green roofs and improved chemical handling (e.g. management of motor fuels & oil, fertilizers and pesticides). Runoff mitigation system include infiltration basins, bioRetention systems, constructed wetlands, retention basins and similar devices.

Thermal pollution from runoff can be controlled by storm water management facilities that absorb the runoff or direct it into groundwater, such as bioRetention systems and infiltration basins. Retention basins tend to be less effective at reducing temperature, so the water may be heated by the sun before being discharged to a receiving stream.

Data collection:- All the data of this project have been collected from Google and ~~to~~ my friends.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NAME : BIJOY DIGAR
COLLEGE ROLL NO : CHUG/159/19
DEPARTMENT : Chemistry
YEAR : 2020
SIGNATURE : Bijoy Dgar

AIR POLLUTION IN CITIES AND MEASURES 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 known to as Air Pollution.

Most cities world-wide suffer from serious air-quality problem, which has received increasing attention in the past decade. Air pollution in cities is a serious environmental Problem especially in the developing Countries. To prevent air pollution in cities, some measures would be taken.

■ Definition :-

Air pollution means the presence in the atmosphere, or injection into it of substances that are not present naturally, or present naturally but are in much lesser Concentration, and that may be harm living organisms directly (Allen by 1995)

Sources of Air Pollution:

Various gaseous emissions are responsible for air pollution which are injected continually into atmosphere from different sources. The probable sources are given below:

Emissions from Industrial Chimney:

There are many industries which act as major sources of air pollution. Of those petroleum refinery, cement factories, stone crusher, food processing etc. emit gases through the chimney of the factories. Among those, petroleum refineries are the major sources of SO_2 & NO_x . Methane-based petroleum refineries have been accused to aggravate the pollution-related decay of Taj Mahal in Agra & as well on the monuments of Fatehpur Sikri. Similarly, dust releasing from cement factories, cause health hazard. Stone crusher and hot-mix plants also create a menace, the SPM [Suspended Particulate Matter] in five times more than the safety limit. Smokes of fertilizer and food factories emit various poisonous gases. Acid vapors incoming continuously from the chemical factories.



Air pollution by industries



Air pollution by cars

2. Thermal Power Stations:

Both normal & super-thermal plants are present in our country and coals are used as fuels in these plants. The fly-ash, SO_2 & other gases and hydrocarbons are regularly released in the air & these make the air polluted and unhealthy.

3. Automobile Exhaust:

Toxic exhaust of automobiles is a source of considerable air pollution (60%). Contains CO , SO_2 , NO_x , CO_2 and other toxic substances.

4. Agriculture Practice:

Such types of air pollution are not in massive quantities but bear significance due to the harmful substances they release. This is agriculture, which is responsible for pollution through pesticides, insecticides, herbicides & dust from agricultural practices.

5. Domestic Combustion:

In rural area fire-woods and coals are used as fuels. Combustion of these fuels produces CO_2 , NO_x , SO_2 hydrocarbons which, though in lesser amount, still pollute the air.

6. Radioactive Elements:

Radioactive elements like U^{235} , Ra^{226} etc. are now being used in research and medical science.

After their use, the residues are not always disposed off with care. All these radioactive elements pollute the environment.

Classification of Air pollutants :-

Air pollutant may be classified into 2 broad categories:

A) Natural Contaminants :-

- 1) plants: Decomposed plant bodies emit methane (CH_4), hydrogen sulphide (H_2S), carbon monoxide (CO) and other than that plant spores also create air pollution.
- 2) Aeronol: Minute molecules of solid & liquid substance, e.g. dust, smoke, mist, fog & fuchs.
- 3) Soil: Dry soil dust with bacteria, viruses, fungus.
- 4) Ocean: Different types of oceanic salt.
- 5) Volcanoes: Sulphur Compounds, fly-ash, SO_2 , SO_3 - fumes and other gaseous substances.
- 6) Cosmic substances: Cosmic rays, meteor, aerolite, comet dust etc.

B) Man-made Contaminants :-

- 1) Gaseous substances: Combustion products of coal, petroleum & fossil fuel, emissions from industries, automobile exhausts, e.g., CO , CO_2 , SO_2 , SO_3 , PAN etc.
- 2) Solid Wastes: Minute dust, SPM from different factories, industries etc.
- 3) Radioactive substance: Atomic power station, radioactive fuel, atomic explosion, atomic war etc.

Types of Air pollutants :-

The air pollutants released from different sources may be—

- A) primary Air pollutants
- B) Secondary Air pollutants

A) primary Air pollutants and their Effects:-

The main primary air pollutants are:

1) Suspended particulate Matter(SPM): Except pure water, any particle having the dimensions ranging from 0.001um to 100um are called as suspended particles. It may include dusts of various types, soot, flyash, smoke or even natural substances like fur, hair, spores, volcanic smoke, rock dust, ash from forest fire etc. Smoke contains suspension of carbon & other particles given off due to burning of organic matter. Some of their effects are —

- a) The smoke and dust particles deposit on plants and clog stomata & also enter our respiratory tract and produces allergies, asthma.
- b) Emissions from iron mill, flour mill, mines, cement cause emphysema, pneumoconiosis etc.
- c) Sometimes pollen spores cause severe allergies in human.
- d) Tolerable SPM standards in industrial area is 500 $\mu\text{g}/\text{m}^3$ but has increased to 1200 $\mu\text{g}/\text{m}^3$ & that of domestic area is 100 $\mu\text{g}/\text{m}^3$ which has also increased to 800 $\mu\text{g}/\text{m}^3$ causing severe effects on human.

2) Carbon Monoxide(CO): Incomplete combustion of organic matter & metallurgical activities are main producer of carbon monoxide. Automobile & cokeoven CO at a high rate. In closed rooms or congested area if coal or any fuel is burned, CO is produced which is extremely harmful as it may be diffuse into blood and react with haemoglobin to form carboxy haemoglobin. CO can convert 7.5% of haemoglobin into carboxy haemoglobin (COHb) within 8 hours at 50 ppm. COHb hinders oxygen transport causing headache, dizziness, cardiovascular malfunction etc.

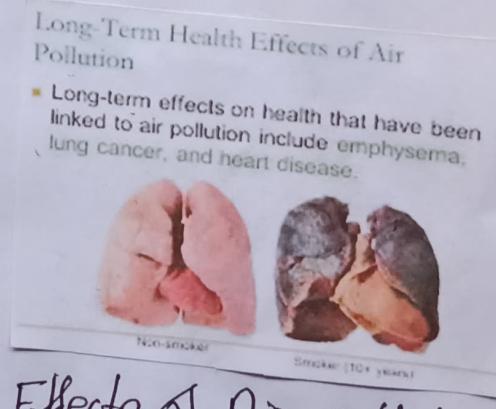
3. Carbon dioxide: The major green house gas. Increasing concentration of CO_2 is posing a great problem of global warming.

4. H_2S : Main source of H_2S gas in the treatment plants of sulphur ore, refineries etc. It can affect the plants by causing chlorosis & defoliation. While in humans it can cause eye irritation, throat irritation and ~~respiratory~~.

5) Sulphur Oxides: The main form of oxides of sulphur is SO_2 . It is produced during smelting of metallic ores & burning of fossil fuels. SO_2 when present in excess amount in the air, combines with rain water & forms acid H_2SO_4 , causing acid rain (discussed later).

Some Harmful effects are -

- It can cause chlorosis & necrosis on plants even at low concentrations as 0.032 ppm.
- Lichen like paramelia turns due die in presence of SO_2 , so are very good indicators of SO_2 pollution.
- It causes high death rate in fishes.
- It also causes deterioration of built structures through discolouration & corrosion of paints & sculptures. The wonder of world Taj Mahal, made up of white marble, is facing threat of corrosion & yellowing due to SO_2 emission from the nearby refinery at Mathura.
- SO_2 can even corrode metals like iron & zinc, thus posing threat to the metallic structures like bridge girders.



Effects of Air pollution
on Lung

Nitrogen Oxides [N₂O, NO, NO₂, N₂O₄] :-

Several sources are there which emit nitrogen oxides viz, electric discharges, high energy radiations, nuclear fission, Combustion in industries, automobiles, incinerators & nitrogen fertilizer plants. Effects include:

- a) Chief constituent forming primary organic nitrates or PAN.
- b) Can cause photochemical smog.
- c) Can corrode metals in presence of moisture.
- d) Can cause discolouration of textiles.
- e) In plants, cause necrosis, lesions, defoliation & finally death.
- f) Can cause lung edema, blood congestion, dilation of arteries in human, also has some mutagenic properties.

Fluorides :-

Refineries are the main source of emissions of fluorides. Fluorides can cause chlorosis and necrosis in plants & finally abscission. In animals, causes abnormal calcification of bones & teeth, weak bones, epiphysiolysis & necromucular disorders.

Volatile organic carbons (VOC) :-

These are produced naturally like mosses etc. or by man made products like paints, emulsions (PAH) and formaldehyde causing severe lung disorders, respiratory congestion and even cancer.

Chlorofluorocarbons :-

They are used in coolants in refrigeration, propellants, air conditioners etc. It is released by jet aircrafts as aerosols while flying at great heights. It is the main cause of ozone depletion. By reacting with nitrogen oxide,

it causes hole in the ozone layer of our atmosphere. UV rays penetrate through this hole & cause harm to human, animals & even plants.

10) Other pollutants :=>

Mercury through burning of coal, phosgene through pesticide & dye manufacturing industries, methyl isocyanate from pesticide manufacturing plants & lead through burning of commercial petroleum are added to atmosphere hazards causing huge to the nature & all beings.

⇒ pollens and Microbes ⇒

These are natural attributes to the atmosphere. But excess amounts of these cause severe disorders. Microbes can cause several diseases in both plants & animals while pollen cause severe allergic responses in human, e.g. hay fever. Pollens of Amaranthus, Cynodon dactylon, Ricinus communis etc.

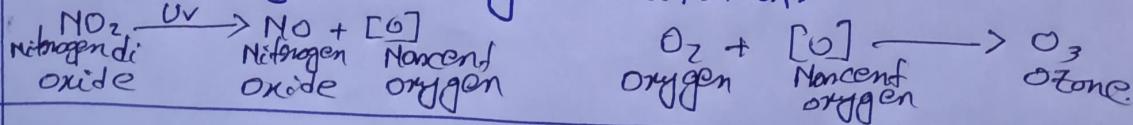
B) Secondary Pollutants and their Effects :-

These are Pollutants that are produced due to Photochemical reaction b/w nitrogen oxides & unburntated hydrocarbons.

i) Ozone \Rightarrow

Zone 3

It is an extremely strong oxidant & has the ability to destroy the chlorophyll & produce necrosis on plants. It can damage textiles & cause severe corrosion of marble statues and buildings. In human, it can cause haemorrhages and eye irritation.



2) Peroxy acyl Nitrite = (PAN) \Rightarrow

They are formed when hydrocarbons react with nitrogen oxides present in the atmosphere.

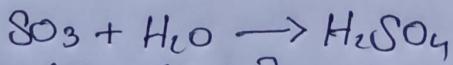
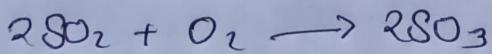
It can cause nitration, bronzing and necrosis of leaves of plants by damaging chloroplasts, inhibiting electron transport system and cellular metabolic enzymes.



These secondary pollutants aggregate and form an opaque dark fog condensed with water vapour, dust, smoke & gases called smog. Some famous smogs occurred over world air Los Angeles smog (1946), London smog (1952), New York smog (1970). Main types of smog are:

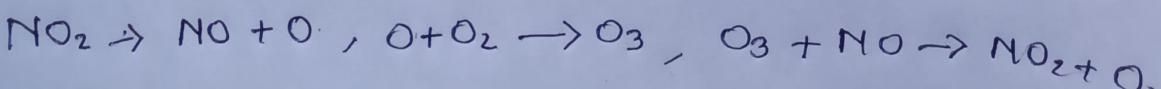
a) Classical smog (London) \Rightarrow

It contains gases like sulphur dioxide (SO_2), hydrogen sulphide (H_2S), smoke & dust particles. It is dark brown then opaque and non reducing environment. Such fog is formed when water vapour condense along with these harmful gases. But secondary pollutants are not present. It occurred in London in December 1952, where it affected 50% of population and killed 4000 people.



b) photochemical smog (Los Angeles) \Rightarrow

It contains secondary pollutants or grey or yellowish brown opaque smog having oxidising environment. It occurred in Los Angeles in 1940. Photochemical



Control of Air Pollution :-

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

i) Combustion Techniques:-

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

ii) Absorption Techniques:-

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

iii) Adsorption Techniques:-

Activated charcoal, a chief adsorption material, is employed in this technique. It can adsorb toxic vapours, gases and other harmful matter.

Following steps have to be taken to control pollution at source or well as after the release of pollutants in the atmosphere.

i) Prevention and Control of Vehicular Pollution:-

For preventing and controlling air pollution created by vehicles, the following measures are to be adopted:

i) Curbing the pollutant emission from vehicular exhaust by using various devices, such as positive crankcase, ventilation valve and catalytic converter. Catalytic converters consist of metals like palladium, platinum and rhodium on catalyst. The exhaust gases, when passed through unburnt hydrocarbons are oxidised to produce CO_2 & water. NO_x is converted to CO_2 and nitrogen oxides are converted to N_2 .

- $2\text{NO}_x \rightarrow \text{N}_2 + 2\text{O}_2$, $\text{XCO} + \text{O}_x \rightarrow \text{XCO}_2$, $\text{HC} + \text{O}_x \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- i) Control of evaporation from fuel tank & carburetor by several mechanical and chemical process.
 - ii) Filter can be used to capture and recycle the hydrocarbons from the engine.
 - iii) Leaded petrol should be avoided instead, unleaded petrol and low-sulphur diesel should be used.
 - v) periodic checking of vehicles for pollution control.
 - vi) Increased use of CNG can lower the amount of pollutants.

Case study of Delhi :-

Delhi ranks highest in the number of vehicles in India. According to the record of 1990, the number of cars in Delhi were more than the total of West Bengal and Gujarat. Due to this, Delhi ranked fourth in the 41 most polluted cities in the world. Residents of Delhi were mostly suffering from burning eyes and respiratory problems. A public interest litigation (PIL) was filed in the Supreme Court. Supreme Court ordered the government to take measures against pollution by:

- iv) Using CNG in public transport instead of petrol or CNG.
- ii) Replacing old vehicles.
- iii) Using unleaded petrol and diesel with reduced sulphur content.
- v) Making emission check up compulsory for all vehicles.
- vi) Enforcing fitting of catalytic converter.

page-12

Delhi first introduced usage of CNG for autorickshaws by 2002. In case -
a) cheaper
b) burns completely
c) does not cause smoke
d) can not be adulterated like petrol & diesel.



Air pollution in Delhi

By taking up these measures officially by the Govt. the level of pollution caused by gases like SO_2 , NO_x , CO_2 decreased substantially.

3) prevention and control of Industrial pollution :-

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

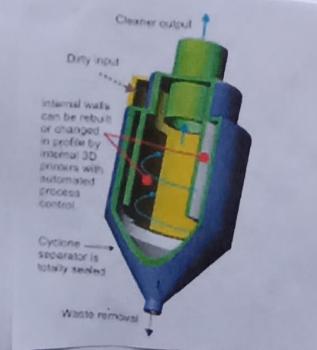
i) Removal of Particulate Matter =>

It involves the use of following

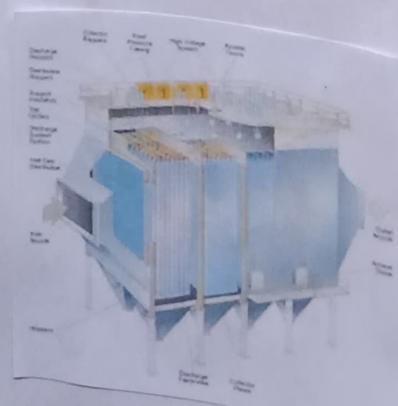
o) Cyclone Collector: This is used for centrifugation of waste gas containing particles. Cyclone collector can remove upto 70% of the particles.



Catalytic Converter



Scrubber



Electrostatic precipitator

b) Electrostatic Precipitation: To remove the suspended particles from gas stream. The electrical forces the chimney exhaust. ESPs work very efficiently in power plants, paper mills, carbon black plants cement mills etc. Sometimes bag filters or fabric filters are used for better result. Further, tall chimneys are used for vertical dispersion of air pollutants.

ii) Removal of Gaseous Pollutants :-

This uses the following three methods:

a) Wet Systems: There are two working towers in which alkali fluid circulates continuously. This liquid reacts with SO_2 to produce a precipitate.

b) Dry Systems: Here, the gas pollutants are allowed to react with an absorbent under a dry phone. Lime (CaO) Limestone (CaCO_3) are placed in the way of the flowing gas (SO_2 , SO_3). This process is very less expensive and effective.

c) Wet-dry System:-

Here water in the absorbent reacts with the acid components. The absorbent Ca(OH)_2 is sprayed onto the hot gas stream in the form of small droplets. Calcium hydroxide reacts with SO_2 and the hot gases cause the water to evaporate simultaneously.

The end product is a dry powder containing mostly fly ash & salts.

Control of Air Pollution through Law :-

In our Country there have been several legislative measures both at State & Central Government levels to prevent and control different types of air pollution:

- 1) Bengal Smoke Nuisance Act, 1905;
- 2) The Motor & Vehicle Act, 1938
- 3) The Gujarat Smoke Nuisance Act, 1953
- 4) The Air Prevention & Control of Pollution Act, 1981
- 5) The Environment (Protection) Act, 1986
- 6) The Motor Vehicles Act, 1988 [This act came into force from 01.07.1989].

Acknowledgement

I would like to express my special thanks of gratitude to my environmental science teacher Mr. Narayan Maiti and Mr. Souvik Banerjee for their enormous help and support in completing my project.

— Bijoy Dugar

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Air Pollution in Cities and Measures to
Control it

NAME : CHAYAN SARKAR
COLLEGE ROLL NO : STUG / 215 / 19
DEPARTMENT : STATISTICS
YEAR : 2020
SIGNATURE : Chayan Sarkar

SL NO	TOPIC NAME	PAGE NO.
1.	WHAT IS PROJECT?	01
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WHAT IS A PROJECT?

A project is a planned undertaking which helps the students to improve their writing skill and enhance their creativity on the whole. According to "Oxford Advanced Learner's Dictionary" a school project work is "a piece of work involving careful study of a subject over a period of time, done by school students". So, from this definition we can conclude that project is a long-term process in which a student has to study a particular subject or piece of writing and has to produce something new based on that.

WHAT IS THE PURPOSE OF A PROJECT?

Nowadays, the schools and colleges are emphasizing on project works. The following are the main reasons behind this:

- (1) A Project work helps the students to hone their writing skill.
- (2) It also gives them the scope to incorporate their personal experiences, and imaginative ideas into the subject matter.
- (3) As project work provides ample opportunities to demonstrate one's creativity, the students enjoy doing this work and it makes them take interest in other school or college activities.
- (4) A project work involves special attention and care on the part of the one who does it. So, he/she needs to chalk out a plan first and then work accordingly. This teaches him/her to become organised and work systematically.

MY PROJECT AND ITS OBJECTIVE

I have chose 'Air pollution in cities and Measures to control it' as ENVS Project.

The objective of the project is to know how the cities worldwide are getting polluted and the decreasing of air quality and its harmful effect on Environment. It would be also provided us to know the ways to get rid of this situation.

(5) USE OF CHEMICAL AND SYNTHETIC PROCESS

Taking about air pollution in cities, we 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 compound (VOCs) found in paints, cleaners and personal care products such as perfume and deodorants, are a reason for common health issues. Risks like Asthma, or other issues cause by inhaling poor house air quality.

Mathra-based petroleum refinery has been accused to aggravate the pollution-related decay of the Tajmahal in Agra and as well as monuments of Fatehpur Sikri.

(2) THERMAL POWER STATIONS

Both normal and superthermal plants are present in or near the cities and coal are used as fuels in most of these plants. The fly-ash, SO_2 and other gases and hydrocarbons are regularly in air and these make the air polluted and unhealthy.

(3) AUTOMOBILE EXHAUST

Toxic exhaust of automobile is a source of considerable air pollution in cities. It contains CO_2 , CO , NO_2 , SO_2 and other toxic substances.

(4) CONSTRUCTION AND DEMOLITION

With rise of population in the city, construction and demolition is a part of the ever going development phase of the cities. Several construction sites and raw materials such as bricks and concrete cause haze and foul air which is hazardous for the people especially children and elderly citizens.

SOURCES OF AIR POLLUTION IN CITIES

Various gaseous emissions are responsible for air pollution which are injected continuously into the atmosphere from different sources.

The probable sources are given below:

(i) EMISSIONS FROM INDUSTRIAL CHIMNEY

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 source's of SO_2 and NO_2 . Similarly dusts releasing from cement factories cause health hazards. Stone crushers and hot mix plants also create a menace, the SPM (suspended Particulate Matters) is five times more than the safety limits. Smokes of fertilizer and food factories emit various poisonous gases. And vapour is coming continuously from the chemical factories.

AIR POLLUTION IN CITIES AND MEASURES 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 world-wide suffer from serious air quality problems, which have received increasing attention in the past decade. Air pollution in cities is a 'serious' environmental problem especially in the developing countries. To prevent air pollution in cities, some measures would be taken.

DEFINITIONS BY AIR POLLUTION

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

(c) RAPID POPULATION GROWTH AND CUTTING 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 direct to the cities and excess of births over deaths in cities.

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

(7) SMOKING

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

MAJOR AIR POLLUTANTS AND THEIR EFFECTS

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

(a) CARBON MONOXIDE (CO)

SOURCE: Smoke of automobile and burning of fuels 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 amount.

(b) UNBURNED HYDROCARBONS (3,4 BENZOPYRINE, BENZENE)

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

EFFECT: Hydrocarbon causes lung cancer.

(c) NITROGEN OXIDE (NO, NO₂)

SOURCE: Burning (combustion) of fossil fuel in automobile, aromatic products etc.

EFFECT: These nitrogen oxides from photochemical 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.

(d) SULPHUR OXIDE (SO_2, SO_3) AMONGST GASES

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

EFFECT: These causes chlorophyll destruction and also responsible for acid rains and global warming gases.

(e) CARBON DI OXIDE (CO_2)

SOURCE: Industrial fuel air, thermal plants, automobile exhaust, smoking.

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

SOME SECONDARY POLLUTANTS

A. SMOG [smog = smoke + fog]

Smog is two types of —

(a) PHOTO CHEMICAL SMOG

It was first observed in Los Angeles. In this process smog, fog, nitrogen oxide, oxygen, uv light, hydrocarbons and high temperature are essential. These components react with each other and form reddish brown smog (PAN + O₃, Nitrogen oxides) or brown haze.

(b) LONDON SMOG OR SULPHUR SMOG

It was first observed in London. In these process coal, smoke, fog, sulphur oxide, and low temperature essential. These components react with each other and form vapour of H₂SO₄ which is known as London smog.

EFFECT

- (i) Photochemical smog causes irritation in eyes and harms the lungs. Due to smog elastic substances (rubber/tyres) also effected.
- (ii) 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 atmospheric water vapour to form acid ($H_2SO_4 + HNO_3$). These acids come down on earth with rain water, this is called Acid Rain.

EFFECT

- (i) Due to acid rain acidity of soil and water increases.
- (ii) Acid rain also causes damages historical monuments, e.g. Taj Mahal, Red Fort.

ONE OF THE MOST HARMFUL EFFECTS OF AIR POLLUTION

GLOBAL WARMING

The green house effect is a natural phenomenon and the basis of substance of life on Earth as it maintains a uniform temperature throughout but due to recent advancement of human civilization like industrialisation, population explosions, modernisation, deforestation, pollutions, the level of green house gases and their contribution percentage given in the picture below:

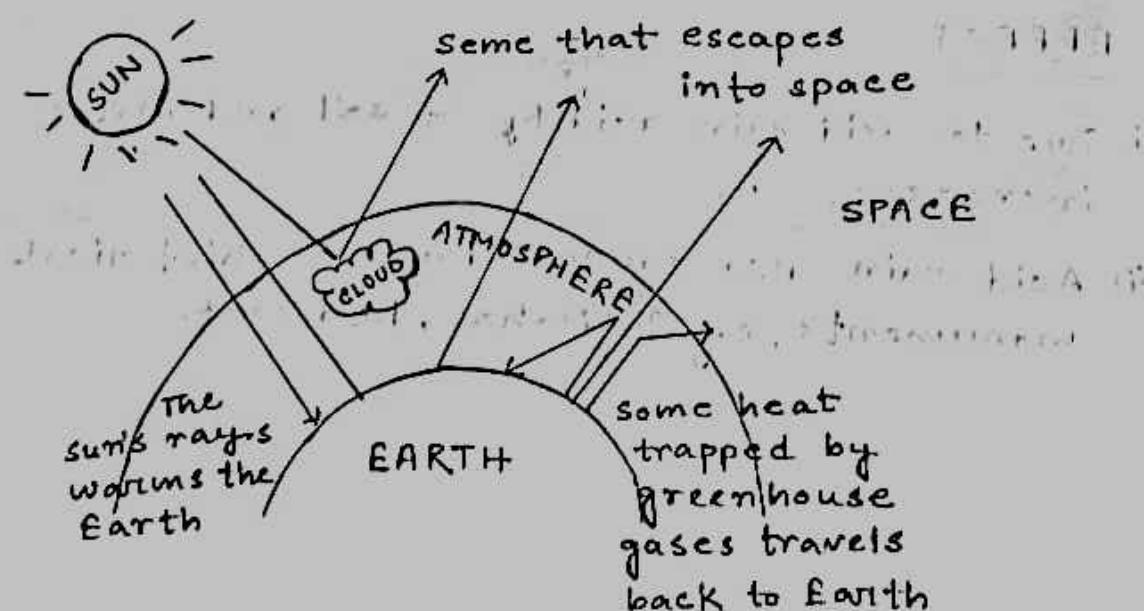


Fig: THE GREEN HOUSE EFFECT

EFFECTS

Due to global warming, climate changes are more evident. As the temperature increasing, the moisture carrying capacity of air is also increasing. Temperature rises causes thermal expansion of sea waters. The flora & fauna sensitive to temperature will die out crop productivity also is affected.

AIR POLLUTION IN CITIES: CASE STUDY

CASE STUDY OF DELHI

Delhi ranks highest in number of vehicles in India. According to the record of 1990, the number of cars in Delhi were more than the total of WB and Gujrat. Due to this Delhi now become one of most polluted cities in World. Residents of Delhi were suffering from blinding eyes and respiratory problem. Using CNG as transport, replacing old vehicles, making emission check up are the taken to prevent the air pollution. The Govt. use to imply norms to stipulate that Sulpher be controlled at 350 ppm in diesel and 150 ppm in petrol. Aromated hydrocarbons should be contained at max 42 percent of fuel and not more than that. Every

year in Delhi, low wind speed, low temperature, inversion decrease the air quality poor, very poor and severe.

AIR POLLUTION IN KOLKATA

- ◆ Kolkata is in the grip of rising air pollution and multipollutant crisis. Official ambient air quality monitoring has shown 61 percent increase in particulate matter in just 4 years 2010 - 2013. NO₂ levels exceed by close to two times.
- ◆ With growing vehicle numbers and resultant congestion and dieselisation air pollution is a growing concern in the City.
- ◆ Like Delhi, in Kolkata the air quality become very much poor in winter, and, this enhances public health risk.
- ◆ Some effective steps, like banning of old vehicles, decreasing the use of diesel, petrol and increasing CNG, using public Transportation rather than private Transportation like Bike, Car would be taken to prevent to falling of air quality.

MEASURES TO CONTROL AIR POLLUTION

Different kinds of Air Pollution cannot be controlled by Modern Technology. Emissions from factories and power plants can be made free from gaseous pollutants by three methods:

(1) COMBUSTION TECHNIQUE

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

(2) ABSORPTION TECHNIQUE

Here scrubbers with packing materials are used to absorb gaseous pollutants. A fine spray of water is 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 pollution of source as well as after the release of pollutants in the atmosphere.

1. PREVENTION AND CONTROL OF VEHICULAR POLLUTION

(i) curbing the pollutant emission from vehicular exhaust by using various devices, such as positive crankcase ventilation valve and catalytic converter. Catalytic converters consist of metals like Palladium, Platinum, and Rhodium as catalyst. The exhaust gases when passed through the following conversions happen.



(ii) control of evaporation from fuel tank and carburettor by several mechanical and chemical process.

(iii) Filters can be used to capture and recycle the hydrocarbons from the engine.

(iv) Leaded petrol should be avoided, instead, unleaded petrol and low-sulphur diesel should be used.

(v) Periodic checking of vehicles for pollution control.

(vi) Increased uses of CNG can lower the amount of pollutants.

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 MATTER:

(a) CYCLONE COLLECTOR

This is used for centrifugation of waste gas containing particles. Cyclone collector's can remove upto 70% of the particles.

(b) ELECTROSTATIC PRECIPITATION (ESPs)

To remove the suspended particles from gas stream, the electrical forces are applied within the chamber in precipitator. ESPs can remove 99% of the particulate pollutants from the chimney exhaust. ESPs work very efficiently in power plants, paper mills, carbon black plants, cement mills etc.

(ii) REMOVAL OF GASEOUS POLLUTANTS:

- (a) WET SYSTEMS — These are used in washing towers in which alkali fluid circulate continuously. This liquid reacts with SO_2 to produce a precipitate.
- (b) DRY SYSTEMS — Here the gas pollutants are allowed to react with an absorbant under a dry phase. Lime, CaO ; limestone $[\text{CaCO}_3]$ are placed in the way of the following gas (SO_2 , SO_3). This process is very less expensive and effective.
- (c) WET DRY SYSTEMS — Here water is absorbent react with acid components. The absorbent Ca(OH)_2 slurry is spread into hot stream in the form of small droplets. Ca(OH)_2 reacts with SO_2 and the hot gases cause the water to evaporate simultaneously. The end dry powder contains fly and ash.

(iii) CONTROL AIR POLLUTION THROUGH LAW:

There have been several legislative measures to prevent and control different type of air pollution.

Example — Bengal Smoke Nuisance act (1905),
The Motor Vehicle Act (1938);
The Environmental Act (1981).

(iv) RECYCLE AND BUY 'RECYCLED PRODUCTS':

Each stage of manufacture from raw material is accompanied by emissions of polluting particles, chemicals and harmful gases. Since recycled products have already been extracted and processed once, the manufacturing the same products the second time is much less-energy intensive and polluting.

(v) TREE POLLUTION:

These trees help reduced the air pollutants significantly. Trees remove the particulate matter a large amount. Trees also decrease levels of CO_2 , Benzene, Dioxin etc. Trees planted alongside road or on the boundaries of houses also slow down polluted air from being carried by wind.

(vi) RAISE AWARENESS:

Awareness raising can be the most effective step to increase the knowledge of people and start the change in their attitudes towards mitigating the problem of poor air quality in affected areas.

(vii) USE NATURAL PRODUCTS & NON-TOXIC CLEANERS:

The majority of air fresh ness, detergents, paints and cleaners in the market contain VOCs or volatile organic compounds. People should buy the

cleanest and greatest products that contain no harmful polluting chemicals.

(viii) NO SMOKING:

cigarette smoke contains up to 70 carcinogenic substances and toxins. Active and Passive exposures to the cigarette smoke face serious health problems. So, people should not smoke. Some legislative measures should be taken for this.

CONCLUSION:

By doing this project, I came to know how the cities are air-polluted and the main reasons for this pollution. I also gain knowledge about the ways to control this pollution. Raising awareness and tree plantation would be two best ways to prevent the air pollution in cities.

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- (i) Guide to Environmental Sciences : Dr. B.B. Singh
- (ii) A Textbook of Environmental Sciences : Dr. D.K. Asthana & Dr. M. Asthana
- (iii) Santra Essential Biology : Santra Publication

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my environmental science teachers Mr. Souvik Banerjee and Mr. Narayan Maity for their enormous help and support in completing my Project.

chayan sarkar

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Water pollution and
measures to control it.

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COLLEGE ROLL NO : PHUG/133/19
DEPARTMENT : PHYSICS
YEAR : 2020
SIGNATURE : Debabrata Patra.

WATER POLLUTION AND MEASURES TO CONTROL IT

WATER POLLUTION

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

Sources

Types of sources

1. Point Sources

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

2. Diffuse or non-point sources

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

The main sources of water pollution are as follows:

1. Community waste water

It includes discharges from houses, commercial and industrial establishments connected to public sewerage system. The sewage contains human and animal excreta, food residues, cleaning agents, detergents and other wastes.

2. Industrial wastes

The industries discharge several inorganic and organic pollutants, which may prove highly toxic to the living beings.

3. Agricultural sources

- i. Fertilizers contain major plant nutrients such as nitrogen, phosphorus and potassium.
- ii. Excess fertilizers may reach the ground water by leaching or may be mixed with surface water of rivers, lakes and ponds by runoff and drainage.
- iii. Pesticides include insecticides, fungicides, herbicides, nematicides, rodenticides and soil fumigants.
- iv. They contain a wide range of chemicals such as chlorinated hydrocarbons, organophosphates, metallic salts, carbonates, thiocarbonates, derivatives of acetic acid etc. Many of the pesticides are non-degradable and their residues have long life.
- v. The animal excreta such as dung, wastes from poultry farms, piggeries and slaughter houses etc. reach the water through runoff and surface leaching during rainy season.

4. Thermal Pollution

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

5. Underground water pollution

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

6. Marine pollution

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

Effects of Water Pollution

1. Effects on aquatic ecosystem

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

2. Effects on human health

- Polluted water usually contains pathogens like virus, bacteria, parasitic protozoa and worms, therefore, it is a source of water borne diseases like jaundice, cholera, typhoid, amoebiasis etc.
- Mercury compounds in waste water are converted by bacterial action into extremely toxic methyl mercury, which can cause numbness of limbs, lips and tongue, deafness, blurring of vision and mental derangement.
- Water contaminated with cadmium can cause itai itai disease also called ouch-ouch disease (a painful disease of bones and joints) and cancer of lungs and liver.

3. Hazards of ground water pollution

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

Consequences

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

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

Consequence

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

(iii) Over exploitation of ground water may lead to leaching of arsenic from soil and rock sources and contaminate ground water. Chronic exposure to arsenic causes black foot disease. It also causes ~~die~~ diarrhoea, peripheral neuritis, hyperkeratosis and also lung and skin cancer.

Control Measures :-

- i. Treatment of sewage water and the industrial effluents should be done before releasing it into water bodies.
- ii. ~~Hot~~ Hot water should be cooled before release from the power plants.
- iii. Domestic cleaning in tanks, streams and rivers which supply drinking water, should be prohibited.
- iv. Excessive use of fertilizers and pesticides should be avoided.
- v. Organic farming and efficient use of animal residues as fertilizers.
- vi. Water hyacinth (an aquatic weed) can purify water by taking some toxic materials and a number of heavy metals from water.
- vii. Oil spills in water can be cleaned with the help of bregoli - a by-product of paper industry resembling saw dust, oil zapper, micro-organisms.

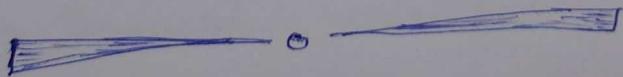
Measures taken by Govt. of India

The steps taken by the Government to address the issues of water pollution include the following —

- ① Preparation of action plan for sewage management and restoration of water quality in aquatic resources by State Governments.
- ② Installation of Online Effluent Monitoring System to check the discharge of effluent directly into the rivers.
- ③ Setting up of monitoring network for assessment of water quality.
- ④ Action to comply with effluent standards is taken by SPCBs/PCCs to improve the water quality of the rivers.
- ⑤ Financial assistance for installation of Common Effluent Treatment Plants for cluster of Small Scale Industrial units.
- ⑥ Issuance of directions for implementation of Zero Liquid Discharge.
- ⑦ Issuance of directions under section 5 of Environment (Protection) Act, 1986 to industries

and under Section 18(1)(b) of Water (Prevention and Control of Pollution) Act, 1974.

- (viii) Implementation of National Lake Conservation Plan (NLCP) and National Wetland Conservation Programme (NWCP) for conservation and management of identified Lakes and wetlands in the country which have been merged in February, 2013 into an integrated scheme of National Plan for Conservation of Aquatic Eco-Systems (NPcA) to undertake various conservation activities including interception, diversion and treatment of waste water, pollution abatement, lake beautification, biodiversity conservation, education and awareness creation, community participation etc.



RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Nitrogen cycle and its importance for living beings

NAME : Debayan Paul
COLLEGE ROLL NO : ECUG/149/19
DEPARTMENT : Economics
YEAR : 2020
SIGNATURE : Debayan Paul

Introduction :

The nitrogen cycle is a bio-geochemical cycle by which nitrogen is converted into multiple chemical forms as it circulates among atmosphere, terrestrial and marine ecosystem. The conversion of nitrogen 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 composed of nitrogen (78%) making it the largest source of nitrogen. However atmospheric nitrogen has limited availability for biological use leading to the scarcity of useable nitrogen in many type of ecosystem.

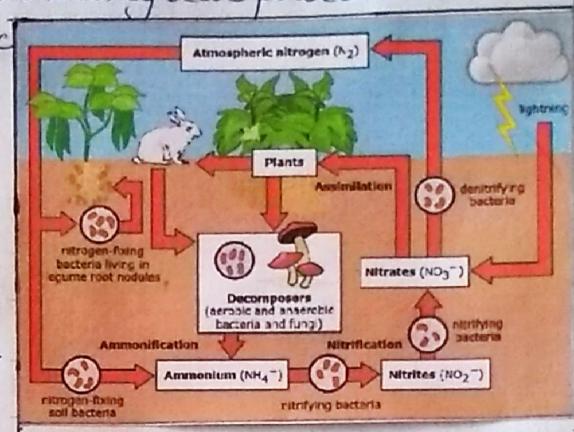
The nitrogen cycle is of particular interest to ecologists because nitrogen availability can affect the rate of key ecosystem processes including primary production and decomposition. Human activities such as fossil fuels combustion, use of artificial N_2 fertilizers and release of N_2 in waste water have dramatically altered the global nitrogen cycle which also calls upon human health.

Processes :

Nitrogen (N_2) is present in the atmosphere in a wide variety of chemical forms including organic nitrogen, ammonium (NH_4^+), nitrite (NO_2^-) nitrate (NO_3^-), nitric oxide (NO) or in organic nitrogen (N_2). Organic nitrogen may be in the form of living organisms, humus, or in the intermediate products of organic matter decomposition. The process in the nitrogen cycle are mostly carried out by either in the effort to harvest energy or to accumulated N_2 for their growth. The various processes of nitrogen cycle are as follows.

(a) N₂ fixation:

The conversion of nitrogen gas (N₂) into nitrates and nitrites through atmospheric, industrial and biological processes is called nitrogen fixation. Atmospheric nitrogen must be fixed into a useable form to be taken up by plants. Nitrogen (N₂) is fixed by lightning strikes but mostly it is done by free living bacteria or symbiotic bacteria. These bacteria have the nitrogenase enzyme that combines gaseous nitrogen with hydrogen to produce ammonia which is converted by the bacteria into organic compounds. Most biological nitrogen fixation occur by the activity of Mo-nitrogenase found in a wide variety of bacteria and Archaea. Mo-nitrogenase is a complex of two component enzyme that has multiple metal containing prosthetic groups. An example of free living bacteria is Azotobacter whereas symbiotic bacteria is Rhizobium which live in the root of leguminous plants.



Flow of N₂ through the ecosystem

(b) Assimilation:

Plants can absorb nitrate or ammonium by their root hairs. If nitrate is absorbed it is first reduced to nitrite ions and then ammonium ions for incorporation into amino acids, nucleic acids and chlorophyll. In plants they have a symbiotic relation with Rhizobia. Some nitrogen is assimilated in the form of ammonium ions directly from the nodules. The plants provide amino acids to the bacteroids so ammonia assimilation is not required and the bacteroids pass amino acid back to the plant thus forming an interdependent relationship.

(c) Ammonification:

When plant or animal dies or excretes waste the initial form of nitrogen is organic. Bacteria and fungi convert the organic nitrogen within the remains back into ammonium (NH_4^+) by a process called ammonification or mineralization.

Enzymes involved are :

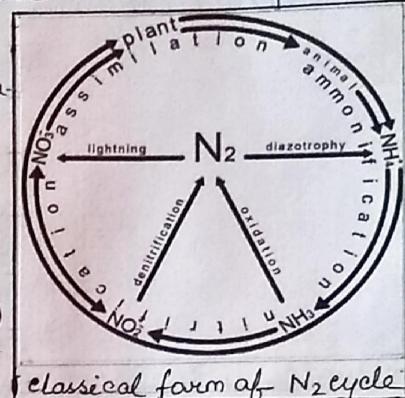
(a) GS: Glutamine synthetase (cytosolic and plastid)

(b) GOGAT: Glutamate synthase (Ferredoxin and NADH dependent)

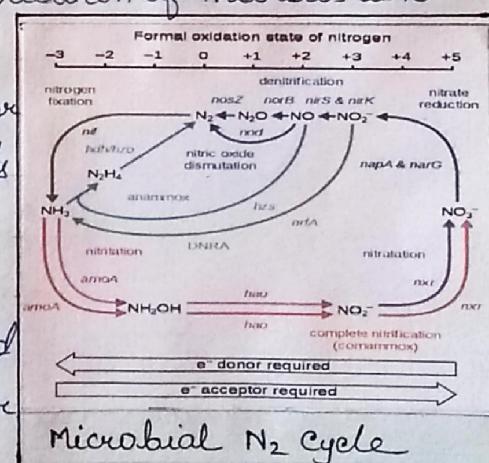
(c) GDH: Glutamate Dehydrogenase

(d) Nitritification:

The conversion of ammonium to nitrate is performed primarily by soil living bacteria such as the Nitrosomonas sp which converts ammonia to nitrites (NO_2^-). Other bacterial species such as Nitrobacter are responsible for the oxidation of nitrites into nitrates (NO_3^-). It is important for the ammonia (NH_3) to be converted to nitrites for nitrates because NH_3 is harmful for plants. Due to very high solubility and because soils are highly unable to retain anions nitrates can enter groundwater. Elevated nitrate in ground water is a concern for drinking water use because nitrate can interfere with the blood oxygen level in infants and can cause blue baby syndrome. Nitrate enriched ground water can contribute to eutrophication, a process that leads to high algal growth.



classical form of N_2 cycle



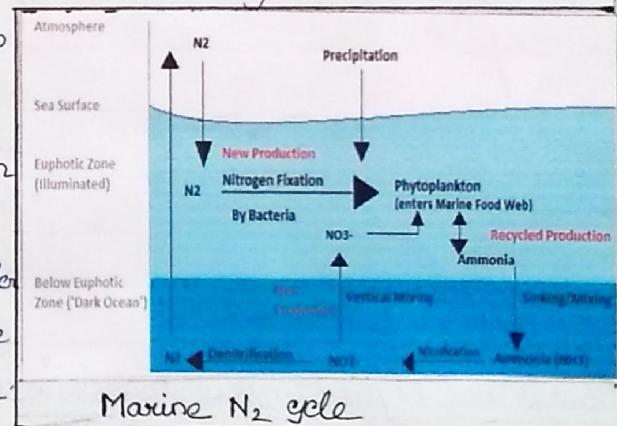
Microbial N_2 cycle

Denitrification:

Denitrification is the reduction of nitrates into nitrogen gas completing the nitrogen cycle. This process is performed by bacterial species such as ~~Pseudomonas~~ Pseudomonas and Paracoccus under anaerobic condition. They use nitrate as an electron acceptor in the place of oxygen respiration. This facultatively anaerobic bacteria can also live in aerobic condition. Denitrification happens in anaerobic condition. The denitrifying bacteria uses nitrates in the soil to carry out respiration and consequently produce N_2 which is inert and unavailable to plants.

Marine nitrogen cycle:

The nitrogen cycle is an important process in the oceans as well; while the overall cycle is similar there are different players and mode of transfers for nitrogen in the ocean. Nitrogen enters the water through the precipitation run off or as N_2 from atmosphere. Nitrogen cannot be utilised by plankton as N_2 so it must undergo fixation which is performed by cyanobacteria. Phytoplankton need nitrogen in biologically available forms for the initial synthesis of organic matter. Ammonia and urea are released into the water by the excretion of the plankton.



Nitrogen sources are removed from the euphotic zone by the downward movement of organic matter. Bacteria are able to convert ammonia to nitrite and nitrate but they are inhibited by light so this must occur below euphotic zone. Ammonification is performed by bacteria to convert organic nitrogen to ammonia. Nitrification can then occur to convert ammonium to nitrite and nitrate. Nitrate can be returned to euphotic

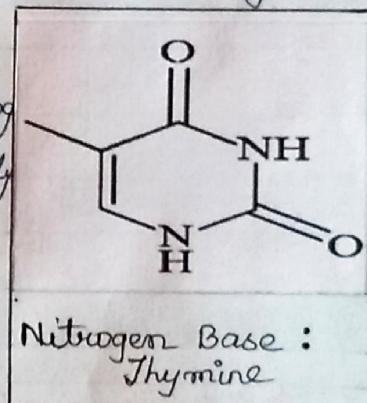
zone by vertical mixing and can be taken up by plankton to continue the cycle. N_2 can be returned to the atmosphere through denitrification.

Importance of N_2 cycle:

Nitrogen is the crucially important component of all life. It is an important part of many cells and processes such as amino acids, proteins and even our DNA.

The importances are as follows:

- The cycle helps to bring the inert nitrogen from the air into the biochemical processes in plants and animals.
- Plants need nitrogen to synthesize chlorophyll and so the nitrogen cycle is absolutely essential for them.
- During ammonification, the bacteria help degrading the animal and plant matter. This helps in naturally cleaning up the environment.
- Due to nitrogen cycle nitrate and nitrates are released into the soil which help in enriching the soil with nutrients needed for cultivation.
- In animals, DNA uses nitrogen bases as an essential part of its coding system. It is an integral part of cell composition. Synthesis of DNA requires nitrogen bases (adenine, thymine, guanine, cytosine) bonded by hydrogen bonds to form the double helix structure. In a word existence of life is impossible without N_2 cycle.



Human influences on the N_2 cycle:

As a result of extensive cultivation of legumes, growing use of Haber-Bosch process in the creation of chemical fertilizers and pollution

emitted by vehicles human beings have more than doubled the annual transfer of af nitrogen into biologically available forms. Generation of reactive nitrogen ('Nr') has increased due to industrialization.

Nitrous oxide (N_2O) has risen in the atmosphere as a result of agricultural fertilization, biomass burning etc.

N_2O has detrimental effects on stratosphere where it breaks down and act as catalyst for the destruction of atmospheric ozone (O_3). N_2O is a green house gas and currently the third the contributor of global warming. Ammonia in the atmosphere act as

acts as aerosols, decreasing air quality and mixing to water droplets eventually forming nitric acid (HNO_3) causing acid rain. It also damages human respiratory system.

Global Nitrogen in Manure Production

Global Fertilizer and Manure, Version 1



Nitrogen in manure Production

Consequences :

Increasing levels of nitrogen deposition are shown to have a number of negative effect on both terrestrial and aquatic ecosystem. Nitrogen gases and aerosols can be directly toxic to certain plant species affecting the above ground physiology and growth of plants near large point source of nitrogen Pollution

Ammonia and Ammonium (two reduced form of nitrogen) is detrimental to sensitive plants particularly those which are accustomed to using nitrate as the nitrogen source causing poor root and shoot development and if above the perceptible limit causes soil acidification which increases base cation leaching in the soil and amounts of aluminium and other potentially toxic metals along with decreasing amount of nitrification occurring and increasing plant-derived litter. Due to the

ongoing changes caused by high nitrogen deposition the environment is continually becoming vulnerable to ecological stress. Additional risks posed by increasing availability of inorganic nitrogen in marine system include water acidification, eutrophication of fresh water etc.



Eutrophication

Leakage of 'N_x' from human activities can cause nitrate accumulation in the water. Excess use of N-fertilizers in agriculture has been one of the major sources of nitrate pollution in ground water. Due to its high solubility and low retainability by soil, nitrate can easily seep through subsoil layer to the groundwater causing pollution. Human activities have also altered dramatically the global nitrogen cycle via production of nitrogenous gas associated with the global atmospheric N₂ pollution. Combustion process in energy production and others can form NO_x which induce the formation of smog, photochemical smog, particulate matter etc.

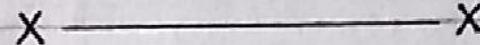


Death of Aquatic life due to eutrophication

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RAMAKRISHNA MISSION RESIDENTIAL
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ENVS PROJECT WORK

NAME: DEBOTTAM DAS

COLLEGE ROLL NO: HIUG/192/19

SUBJECT: AECC02 (ENVS)

PROJECT SUBJECT: CORONA PANDEMIC
AND ROLE OF COMMON
PEOPLE TO CONTROL IT

সুচিপত্র

- বৃত্তিশীল স্থিকার ①
- একজনের বিষয় ②
- মহামরি এবং তেজিমরি ③
- COVID-19 তেজিমরি হিসেবে
কৃতী সুস্থুরণ ④
- COVID-19 সাথকে ⑤
- COVID-19-এর ইতিহাস ⑥-⑦
- পৃথিবীতে করোনা সংক্রমণ ⑧
- করোনা সংক্রমণ ও তারতের উৎসান ⑨
- তারতে করোনা বা COVID-19
সংক্রমনের কারণ ⑩
- COVID-19 নিয়ন্ত্রণে মারুচের
সচেতনতা ⑪-⑬

সূচিপত্র

- চেতনামুগ্ধ
- কীর্তনাশক্তি
- অ্যুনুত্তি

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କୃତ୍ତବ୍ୟା ଶିଳ୍ପୀ

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ମୁଣ୍ଡଲ୍ ରାମକୃଷ୍ଣ ମିଶନ ଆଧ୍ୟାତ୍ମିକ କୁଳଚ (ଶ୍ରୋଦିତ)
ଏବଂ ପରିପ୍ରେକ୍ଷଣ ବିଭାଗରେ କର୍ମଚାରୀ ହାତରେ
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ବନ୍ଧୁମନ୍ଦିରରେ ଯାଇ ଆମା ସାଥେଟିଶେ କରାଯାଇଛି

ଆମଙ୍କେତେ କୃତ୍ତବ୍ୟା ଜୀବନୀ ଆମର ବାପରେ,

প্রকল্পের
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বিষয়
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করোনা জীতামারি এবং তা নিয়ন্ত্রণে
মানুষের শীমিকা

মহাময়ী এবং তৃতীয়ময়ী

মহাময়ী:- মূলত একটি নির্দিষ্ট উপরে কোনো জীবাণু বা কোনো দূষণ জীবিত করার প্রক্রিয়া, মানবসম্পদপ্রাপ্ত এবং এই নির্দিষ্ট উপরের অবস্থানিতিতে ঝুঁতির প্রতিব ঘোলে জীবিয় বিষয় দেখে আসলে, তখন কেই অবস্থাকে এই উপরের মহাময়ী বলে হিসেব করা হয়,

উদাহরণ:- পশ্চিম-বোড়েজ কাতকে ইউরোপে প্লেন মহাময়ী, উনিবিংশ-বিংশ কাতকে প্রথমার্দে কোকাশতার প্লেন মহাময়ী,

তৃতীয়ময়ী:- যখন মহাময়ী কোনো বিষে হ্রানে না থেকে একই সময় ফাগণ বিষে প্রতিব বিজ্ঞাব করে, অর্থাৎ কোনো জীবাণু-জীবিত বা কোনো দূষণ জীবিত করার নির্দিষ্ট সময়ে কমপ্রতিবিষ্ঠের প্রতিটি হেচে প্রক্রিয়া, মানবসম্পদপ্রাপ্ত এবং বিষ অবস্থানিতিতে ঝুঁতির প্রতিব ঘোলে বিষের সাবক্সিন বিকিষ্টজ্ঞান বিষয় দেখে আসলে, তখন কেই অবস্থাকে তৃতীয়ময়ী হিসেবে হিসেব করা হয়,

উদাহরণ:- এই বাস্তুর উদাহরণ ছিল ন, তবে বর্তমানে এবং অতীব বাস্তুর উদাহরণ হল COVID-19 তৃতীয়ময়ী,

COVID-19 ତାତ୍ତ୍ଵମାରୀ ହିମାଣ୍ଡ କଣ୍ଟାଇନ୍ମେଣ୍ଟ

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COVID-19 ତାତ୍ତ୍ଵମାରୀ ହିମାଣ୍ଡ କଣ୍ଟାଇନ୍ମେଣ୍ଟ କରାଯାଇଥାଏ ଆବଶ୍ୟକ ହେଲେ, ତାତ୍ତ୍ଵମାରୀ ବିକିଂଟି ଏବଂ ତାର ସାଥେ COVID-19-ଏର ବିଚାର କରା ଯାଏ,

» ତାତ୍ତ୍ଵମାରୀ ବିଷ ଉଥନିତିରେ ଦୁଃଖର ନେତ୍ରାକେ ପ୍ରତ୍ୟେବ ହେଲେ, COVID-19 ଏହି ଦୁଃଖର ବିକିଂଟିରେ ବ୍ୟାଧିଟିଓ ବିଷ ଉଥନିତିର GDP କେ ଆବେଳେ ନାହିଁ ନାମିଯେ ଦିଅଯାଇଛେ,

» ଯେବେଳେ ତାତ୍ତ୍ଵମାରୀ ବିଷ ଉଥନିତିରେ ମାନ୍ୟମାନ୍ୟ ବିଭିନ୍ନ ଦେଶେ-ପାରମ୍ପରାକ୍ରମ କରୁଥିଲେ ଏବଂ ମାନ୍ୟଦେଶେ ତାର ଦୁଃଖ ପ୍ରତ୍ୟେବ ହେଲେ, COVID-19 ଓ ତାର ବ୍ୟାକ୍ତିଗତ ବ୍ୟାଧି ନି, ବ୍ୟାଧିବିଭିନ୍ନ ଦେଶେ ପ୍ରତିଷେଣିତ ଏବଂ ସାହ୍ୟଦିତ ବ୍ୟାଧି ହେଲେ, ଆଧାର ଦେଶରେ ଏବେଳେ ଦୁଃଖ ହୁଏ ଥିଲେ, ଆଧାର ଦେଶରେ ଏବେଳେ ଦୁଃଖ ହୁଏ ଥିଲେ,

» ତାତ୍ତ୍ଵମାରୀ ଆବେଳେ ବିକିଂଟି ୨୮ ବିଶ୍ୱର ଲକ୍ଷ୍ୟାଧିକ ମାୟାଦିତ କ୍ରମନାମ୍ବିତ ଆକ୍ରମଣ ଥିଲେ, COVID-19 ବଂକ୍ରମନ ବିଶ୍ୱର କୋଟି ହାଜିଯେଇଛେ, ସର୍ତ୍ତମାନେ ଆକ୍ରମଣର କଂଠା- ୫୨୫୪୫୬୬ ହନ,

» ବିଶ୍ୱର ତାତ୍ତ୍ଵମାରୀ ବ୍ୟାଧା-ବାନିଙ୍ଗ ଏବଂ କିମ୍ବେଳ ଜ୍ଞାନରେ ସହାୟ ପ୍ରତ୍ୟେବିକ୍ତିରେ କରେ, COVID-19 ବିଶ୍ୱର ବ୍ୟାଧା-ବାନିଙ୍ଗ ଏବଂ କିମ୍ବେଳ ଥାର ଡେଜାନ୍ତା କରିଯେ ଦିଅଯାଇଛେ ଏବଂ ପ୍ରାୟ ୩୦ ମାତ୍ରକେ ତାତ୍ତ୍ଵିକ ଘେରେ ମରାର ମୁଣ୍ଡ ପାଇଯେ,

» ତାତ୍ତ୍ଵମାରୀ ଆବେଳେ ବିକିଂଟି ୨୮ ବିଷ-ରାଜନାଟି ଏବଂ ରାଷ୍ଟ୍ରପରିଷାଯ ପ୍ରତ୍ୟେବ, ଏହୁଏବେ ଏବଂ COVID-19 ସହେଲେ ପ୍ରତ୍ୟେବିକ୍ତିରେ ଏବେଳେ,

COVID-19 সম্পর্ক:-

Sever Acute Respiratory Syndrome - Corona Virus-2
 (SARS-CoV-2) অস্থায়ী সংক্রান্তে হলে বিশ্বজুড়ে এ
 অভিযানির সৃষ্টি হয়েছে তা করোনা অভিযান বা Corona
 Pandemic,

COVID-19-এর মদ্দিবিজ্ঞেচনের মাধ্যমে এবং
 সম্ভূত নাম হল Coronavirus-

'CO' → Corona

'VI' → Virus

'D' → Disease

'19' → ২০১৯-এর ডিসেপ্টে এই অভিযানির সূচনাত,

অর্থাৎ, Corona Virus Disease - 2019 ,

এটি মূলত একটি সাংগ্রামক অস্থায়ী, ঝুঁঁ মগ্নেশী ফজনের
 দেহ থেকে প্রজনন দেহে সংগ্রামিত হয়, মূলত কানী, ইাচি,
 মুচু ইত্যাদি হলকণা বা droplet -এর মাধ্যমে এই জীবাণুর সংগ্রাম
 পূর্ণ হওয়ায়, এবং এই হলকণা বা droplet ঝুঁঁ, নাক, কান ইত্যাদি
 স্থানে প্রত্যেক করলে সেজেসেও এই অস্থায়ী সংগ্রাম হচ্ছে,

মুক্তজুম্বে প্রথম, দ্বয়, ফর্মি-কানী, স্লেষ্যাজ্বা ইত্যাদি
 এই জীবাণুর বাটি থেকে প্রধানত বৈশিষ্ট্য, এবং এই
 অস্থায়ীটি নতুন আই এন্থেকে এন্থেকি নির্দিষ্ট কিছু এলা পরিস্থ,

COVID-19 এবং ইতিহাস:

২০১৭ সালের ডিসেম্বর মাসে মূলত চীন রাষ্ট্রনামার থেকে
মত্তেরে চীন মাছের বাজার থেকে এই অভিযানীয় সূত্রনাম হচ্ছে,

মূলত এটি একটি পুরুষ প্রাণীয় সংক্রমণ হিসেবে একটি
প্রাকৃতিক আইরিজা, এখন চীনের ইয়েই প্রদেশের দুর্ঘাতে এই
আইরিজের দেহে দেখা গেলে, এছের নমুনা পরিষ্কা করে ২০১৭ সালের
। ডিসেম্বর Corona Virus -এর উপস্থিতি করা হয়, যা ২০২০
সালের 'The Lancet' বইতে প্রথম উল্লিখিত হয়, বইটি
চীনের আইরিজা মাসে প্রকাশিত হয়, ৪ ডিসেম্বর ২০১৭ সালে WHO থেকে
একটি নতুন আইরিজের অভিযানের কথা স্বীকার করা হয়,

প্রকাশিত উপস্থিতি ২০০১-'০২ সালে চীনে বর্ণিত Corona
Virus -এর পূর্বজুড়ী SARS-CoV-1 নামক মানব সংক্রমণে
সংজ্ঞা Corona Virus -এর অভিযান হচ্ছে, এর প্রবর্তীকালে
২০১২-'১৩ সালে চিনওজাপ্তানের কিছু স্থানে SARS-CoV-1 এবং
সংক্রমণ ঘটে করা গিয়েছিল, যাদিও আ মহামারী নিংশে অভিযান
ক্ষেত্রে আঙ্কারাহী প্রচলিষ্যে পড়েন,

প্রথমে WHO এবং তার প্রবর্তীকালে ২০২০ সালের
২০ জানুয়ারী চীন কতৃপক্ষের দ্বারা ঘোষিত হয় যে, মূলত
মানুষের মানুষের অবস্থায়ক বা স্টেটিক নেটওর্ক এই আইরিজের
সংক্রমণে সাহায্য করে,

চীনে স্বীকৃতিপ্রাপ্তে ইন্দোনেশিয়া মাছের বাজার থেকে এই
আইরিজের সংক্রমণ বলে উপস্থিতি করা হয়,

(7)

২০১৯ সালের 18 ডিসেম্বর ইতালির পিলান এবং ফ্রান্সের
লাক্ষ্য বক্তা যায়। ২০১৯ সালের ডিসেম্বর মাসে মূলত মানুষের জাহানে
মানুষের আন্তর্জাতিক কাহাবস্থান এই জীবাণুর দ্রুত সংগ্রহ বৃদ্ধির
কাহান্ত্য করে, ২০ ডিসেম্বর চনের ইতেই এদেশে Corona Virus
এর প্রথম সংক্রমণ হচ্ছায়, সংক্রমণের সংখ্যা ৬০-এ গৌড়ায়,
৩১ ডিসেম্বর এই সংখ্যা ধেয়ে হয় ২৬৬।

২৭ এবং ২৮ ডিসেম্বর Wuhan Central Hospital এবং
Chinese CDC কে Vision Medicals একটি নতুন virus-এর কথা
জানায়, উর্ধ্বস্তুতাহোর মধ্যে এই সংক্রমণ প্রায় দ্বিতীয় হাবে-বাহু
ভুক্ত করে, চীনুয়ারীর প্রথমাংকে এবং মাসামাসি জন্ময় এই
Virusটি উচ্চিয়ে নয়ে চীন পরিবাহনের ক্ষেত্রে ক্রিয়া করে, ৩০
চীনুয়ারী WHO এই Virusকে Public Health Emergency
of International Concern হিসেবে ঘোষণা করে,

২০২০ সালের ৩১ চীনুয়ারী চনের ইতিবাচকের দেহ
এই virus-এর ক্রিয়াত ইতালির নরিষ্ঠাক্ষেত্রে প্রথম
নির্বিট করে, WHO ২০২০, ৩১ মার্চ স্বীকৃত করে ধেয়ে যে
ক্রিয়ান করোনা পরিমাণৰ ক্ষেত্রে, ২০২০ সালের ১৭ মার্চ
করোনা সংক্রমণ এবং মৃত্যু-নিরিষে ইতালি চিনকেও জ্ঞানে
প্রচল দেয়, ২৬ মার্চ USA তে করোনা সংক্রমণ চিনকে দেখা দেয়
এবং ইতালিতে সর্বোচ্চ করোনা সংক্রমণ ৩৫টি।

প্রথমে ইংল্যান্ড USA তে ৬ ফেব্রুয়ারী, ২০২০ তে
প্রথম সংক্রমণ দীর্ঘ মতে,

এপ্রিলের মাসামাসি ২০২০ সালে প্রথম সংক্রমণ
পরিলিপিত হয়।

পৃথিবীতে করোনা রাঙ্গমাট:

বিষ্ণু অভিযানী হিসেবে করোনা এক জ্যোবহ পরিস্থিতি সৃষ্টি করেছে, ২০২০ সালের ১২ নভেম্বরে- তথ্য অনুযায়ী ৫ কোটি২৫লক্ষ ৪৪ হাজার ৮৭৭ হন সম্প্র বিষ্ণু করোনা আক্ষত হয়েছেন, তাম্বৰ্ড্য ১২ নভেম্বরে- তথ্য অনুযায়ী। কেটি ৪৫ লক্ষ ২৭ হাজার ৮৭০ হন বর্তমানে রাঙ্গমাট, কুকু হয়ে উঠেছেন ৩ কোটি ৬৭ লক্ষ ৮১ হাজার ৭৭৫ হন (২০২০, ১২ নভেম্বর), করোনায় বিষ্ণু মারা গিয়েছেন ২০২০ সালের ১২ নভেম্বরে তথ্য অনুযায়ী ১২ লক্ষ ৭২ হাজার ১০৭ হন।

পৃথিবীতে সবচেয়ে ব্যবহৃত হাতে ব্যানাম রাঙ্গমাট USA অর্থাৎ United States of America তে, ওয়াশিংটন, নিউইয়র্ক, জেলিকান প্রালি, ক্লালিয়ুকিয়া, অর্জিয়া, মেরি, লস এঙ্গেলেস, কালিম্বো এবং স্থান হয়ে উঠেছিল COVID-১৯-এর প্রবান্নতা ক্রেতে, USA-এর পর UK, ইতালি, ফ্রান্স, চীন, জেন, দিঝন কোরিয়া এবং প্রের্বেনাল উপ্পেঘযোগ্য দেশ ঘোনে করোনা রাঙ্গমাট উপ্পেঘযোগ্য দেশে বৃদ্ধি লেখেছিল। তাব মধ্যেই তোত, বাংলাদেশ, মার্কিস্কান, মার্কিপ্রাত-এবং দেশ কম্বু, ইন্দোনেশিয়া, মালয়েশিয়া, ফিলিপ্পিন্সের, তাপ্রেসিয়া, বাইল, আর্জেন্টিনা এবং ফিলিপিন্সের নাম দেশেও উপ্পেঘযোগ্য, তাপ্রিকা মাহাদেশের ফেনিক্স দেশেও COVID-১৯ ব্যবহৃত হচ্ছে উড়েছিল।

তবে পৃথিবীর ব্যবহৃত প্রধিবাসিত বৃক্ষ-ফুলি করণের অভিযানের ক্ষেত্রে হয়েছিল,

করোনা জ্বালামুখ ও আরতে তথ্যসূচনা

৩

বিষ্ণু করোনার সূচিমতি ২০১৭ সালের নভেম্বর থেকে শুরু হলেও আরতে COVID-19-এর প্রক্ষেপণ বৃদ্ধির পথে নড়ছে। আরতে COVID-19-এর সূচিমতি শুরু হয়েছে মার্চ-এপ্রিল থেকে, অর্থাৎ ইউনাইটেড অধিবক্তৃতা নিল্লিপি হয়ে পাঞ্চাশ, হারিয়ানা, রাজস্থান, পুজুয়াচি, মহারাষ্ট্র, মঙ্গলপ্রদেশ হয়ে দিঘিন আরতে প্রচৰিত হচ্ছে নড়ে।

২০২০ সালের ১২ নভেম্বর-এ প্রাপ্ত তথ্য অনুযায়ী আরতে খেটি COVID-19-এ সংক্রমিত হয়েছেন ৪৬০৫৪৪৫ হাজার ৪৭৬২ জন। এর মধ্যে শুরু হয়ে উচ্চেছেন ৪০০৫৪৮ হাজার ৬৭৪ জন, মারা গিয়েছেন ১২৮১৭৭ জন আরতীয়।

আরতীয় ছেতে জারীর মানুষের মামামুক্সু প্রাপ্তি রাজ্যিক এবং মুঝেন্দ্রাধ্যায়, বিকিনি অভিনেতা অভিনব বচন, সৌমিত্র চট্টোপাধ্যায়, রাজ্যিত মল্লিক, ডেভিডেক বচন, এক্ষয়রাহী প্রমুখরাও হয়েছেন করোনার মারিক।

১২ নভেম্বর, ২০২০ সালের তথ্য অনুযায়ী; মঙ্গলপ্রদেশ, পাঞ্চাশ, কাত্তগ্রাম, কেজুঁও, অঙ্গুপদেশ এবং কর্ণাকাৰ, সৌমিত্র নাড়ুতে করোনা সংক্রমণ প্রায় সম্মিলিত। এই নথি উত্তরপ্রদেশ, বিহার, পতিলা, চট্টগ্রাম, প্রিমুন্ডা, তাজাম, হারিয়ানা প্রদেশ রাজ্য করোনা সংক্রমণ প্রেরণ্য।

তবে ২০২০ সালের ১২ নভেম্বরের তথ্য অনুযায়ী আরতে গুরুত্বপূর্ণ ১.৭৮%, যা অন্তর্ভুক্তের উল্লম্ব যথেষ্ট সালে ক্ষানে আরতকে দুঃখ করিয়েছে।

১০

আরতে করোনা বা COVID-19 জাংক্রমনের কারণ:-

আরতে ইতালি, চীন কিংবা গুজরাতের মতো পৃষ্ঠায়ী জোনে
করোনা জাংক্রমন হচ্ছেন, বলতে বলে আরতে করোনা জাংক্রমন
হচ্ছে এখনো হৈ সাক্ষিকণেই, করোনা জাংক্রমনের কারণ
পুনৰুৎসাহ,-

» প্রথমে, বিমান এবং উলমাথে করোনা জাংক্রমন পুতুজিয়ে
পড়ে করোনা আঞ্চাত্ত দেশের বিভেত্ত ইতালির অধিবাসীদের
সংস্কারে এবং, তাবলুর সাথিকত্বে করোনা বুল প্রযোগ
এলাঙ্কাবৰ সঙ্গে সংযোগ আবক্ষে-বিভিন্ন স্থানে COVID-19
হৃদ্বিত্তে সাহায্য করে,

» মানুষের উচ্চতেনতা; বাজুর, মাঝেমাঝে ইতালি স্থানে
উচ্চতেনে গোপ পাই, অবিজ্ঞানিক মানবিকতাব-পরিচয় দেয়,
এই সুযোগেই COVID-19 বৃদ্ধি পায়,

» অধিকদের নিরিবাজন ; ১৭দিনের লক্ডাউন বিবি জাতিক্ষেত্রে
সুবাস্থিত ন ওঁঘাও আরতে COVID-19 বৃদ্ধির ত্রৈয় দরিদ্র
সেকে আনে,

» মূলত ৩০ জুনুয়ারী, ২০২০ স্থানে আরতে COVID-19
প্রথম জাংক্রমিত হলেও লক্ডাউনের নিষ্পত্তি নিতো দীর্ঘস্থায়
নেওয়া, সোয়ে বিনৰ্দ কে দোখ, ইলেক্ট্ৰোলিট এ মাঝে
পরিচয়- দীঘিন ও মৃত্যুগামতে COVID-19 মহামৰিদের গুণকাৰ
নিহয়ে দেয়,

এই সমস্যাকাৰ ন শুলিয়ে হৃতি মূলত আৱত
করোনা জাংক্রমন বৃদ্ধি পায়,

COVID-19 নিয়ন্ত্রণে মানুষের স্বাক্ষরণ

COVID-19 নিয়ন্ত্রণে মানুষের স্বাক্ষরণ এবং প্রয়োজনীয়তা।
কর্ণাল বুঝতে হৃৎসরের দায়া করা প্রয়োজন অপূর্ণপদ্ধতি,-

- ① জিগরেট, বিড়ি, আলকোহল জাতীয় মদ, শৈশি, দেশা ইত্যাদি
লেখা জাতীয় ফিল্ম সম্পূর্ণ বর্জন করা প্রয়োজন, কেবল একজনকে
প্রতিমুলি মানুষের মাঞ্চিক, দেহ, হৃৎসর, ঘৰ্ষণ, বৃক্ষ ইত্যাদিকে
দূর্বল করে ছেলে, যশলে কর্ণালে মানুষের স্বাক্ষরণ থাবা
ব্যবস্থা,
- ② কর্ণাল, প্রায়া, যোনগ্রাহ্য, পিণ্ডপ্রকার হোমিয়োপ্তীক্রান্ত্যাম,
ক্রিস্টাল, মাহিনারি ইত্যাদি কর্ণালচর্চামূলক কাঙ্কশ্ব করা প্রয়োজন, এই ফলে
কর্ণালের কান্তিমত্তা এবং ক্রিয়ামূলক বৃদ্ধি নাই, কর্ণালে
প্রতিশ্রেষ্ঠ ইমতী নড়ে ওঠে, কর্ণাল সহজে থাকে, ফলত,
যেকোনো যোনগ্রাহ্য সহজে কর্ণালে বাঁজা ব্যবিত্ত নাই,
- ③ ৬৫-৭৫ উর্ধ্ব বয়সের বাসিন্দার বাহিনী ৩০ দেশেরেক্ষণে
কাঠন তাঁরে কার্নালিক প্রতিশ্রেষ্ঠ ইমতী যথেষ্ট দূর্বল,
এই কাঠনে কর্ণালে সহজেই যোনগ্রাহ্য বাঁজা ব্যবিত্ত
নাই।
- ④ যাঁদের- দেয়ালেক্সি, পিসিমোবাই বা অন্তর্কোনে ইত্যি
ক্রিয়ামূলক যোগ আছে তাঁদের কর্ণালে প্রতিশ্রেষ্ঠমতা
এমনিতেই যথেষ্ট কো, ফলত, COVID-19 অভিযোগী
তাঁদেরকেও সহজেগ্রাম করতে পাবে, তাই তাঁদের
যাবে থাকাই প্রয়োজন,

(৫) বাহিরে প্রয়োগ হলে উকুল মাঝে মুছে নৃত্যের পথে
কেবলমাত্রে মাঝে এন সাক ও মুখ টেকে থাকে তা লভ্য
রাখতে হবে, কথা বলে কাহার মাঝে মুখ থেকে না আসলেই
প্রেয়, মাঝে কিম্বা ক্ষণেই হাতদেওয়া চলে না, বাহিরে
বেঁধে গেঁড়ে-কানে হাতদেওয়ার অঙ্গাম পরিভ্রান্ত
করতে হবে, তার উকুল প্রয়োকের থেকে কোনোই
ইন্দ্র মুষ্ঠি বহায় রাখতে হবে,

(৬) বাহির থেকে পাহিজে একে অবশেষ জ্ঞান-কান্তি এবং
হাত, মাঝে, মুখ অঙ্গাম বা পরিষ্কার করে তাৰ মধ্যে বাহির-
পোকেদের জন্মে বিজ্ঞেল গোলো, কোনোই ইমিলিমিলি-
জ্বানাপীয়ে হাত পরিষ্কার করতে হবে, প্রয়োচন কীৰ্তন
করে দিলে হৃব গোলো, তৎপৰ কীৰ্তন কুবজত ন
আকলে সেনিতি হস্তাব গোলো করে ইজে নেওয়া উকুল প্রিতি,

(৭) একজন পুরুষ হ'মাঞ্চাই তাত্ত্ব বাহিরে ধৈঁজত
পুরুলে গোলো, পুরু হায়না, কালিমল, শুড় কীৰ্তন এ
গোপালের দেকান যতী এতিয়ে যাওয়া যাব ততী
গোলো,

(৮) পটকি ইত্যে বানা কীৰ্তি, বাহিরে ঘোষণাত্ত্বে
তাতেক শেয়া, কান্তি - তা আমাদের ধোন-প্রতিশ্রূতি
তাতেকটীক জাহান্যুক্তি,

৭) যোৱা প্রতিশ্রোষিতে এলাজ, বৃষ্টি হীনতা প্রয়োগ করা
যোগে যাবে, তবেও COVID-19 প্রতিশ্রোষিতে অস্থী
ও পুরুষ নয়,

৮) সমস্ত বৈকল পুরুষ প্রতিশ্রোষিতে আলো, পুরুষের না হওয়ালো
জামাহের নথে যথেষ্ট মাঝেছে,

মূল্যায়ণ:-

পুরুষের বৈকল যায়, বর্তমানে পুরুষের ক্ষয়ক্ষোট
মুগ্ধালীভূতি পুরুষের COVID-19 ক্ষেত্রে হলেও
দীর্ঘকাল ক্ষেত্রে দেখা গেছে,

আমদের জীব নিখেতে যথেষ্ট পরিমাণ
দীর্ঘকাল ও ক্ষেত্রে অসম হিসেবে নয় আলো,

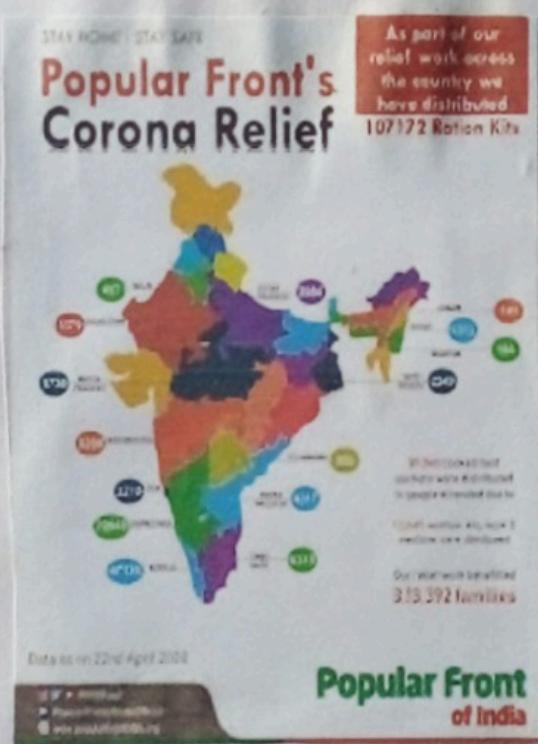
চিত্রঘণ্টা:-



বরোনা ডাইরাম
[কৃষি: গৃহকলিনিক্ষেপ]



পৃথিবীতে বছোন সংক্ষম
চৰএ:-উইকিমিডিয়া,



ତେବେଟ ସମ୍ରାଟ ଶାହିନୀରେ ପରିଚିତି: ରାଜକାଳିତ ତେବେଟ
[ହୃଦ- ଉତ୍ସବପତ୍ରି]

କ୍ରିଏବନ୍ଦୁତା

ଏକଷ୍ଟ ଦୀର୍ଘମ କଥାରେ କଥାର କଥାର ସଥେଟି ଗ୍ରହ
ଅଣାଇ ଦିଲାଯିଥିଲେ ୧୨୫,

ଏକଷ୍ଟ ବିଶ୍ୱାସ ଅତିଜାପୁତ୍ର ବାଚିବାର ଉପରେ ୨୩ୟାବ୍
ଆ ଏବେଳାଟି କଥାରେ ୧୨୫,

ଏକଷ୍ଟ କଥାରେ ଖୁବିଖୁବି ୧୨୫, ତଥେ ଘେଟ୍ରେ
ଖୁବି ତଥେ ଆ ମାର୍ତ୍ତିକାରେ ୧୨୫ ଅନେବି ଅନ୍ତରେ ମାତ୍ରାବିତ
ଏବେ ଏବେ ୧୨୫,

ইন্ডিয়ান

কোরোনা পেন্ডেমিক

Corona Pandemic - Wikipedia

COVID - Indian Journal

পরামর্শিকা

ফর্মান কাঁওয়ানগ্র

মোমেনবাহাদুর কাঁওয়ানগ্র

তামানবেগলা কোড়গ্র.

Debotom Das

মিহারীর স্বামী

৩:

নথিপত্র/নথিকর্তৃর স্বামী

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NITROGEN CYCLE AND ITS IMPORTANCE
For Living Beings

NAME

: DEEPRO SARKAR

COLLEGE ROLL NO

: CSUG/173/19

DEPARTMENT

: COMPUTER SCIENCE

YEAR

: 2020

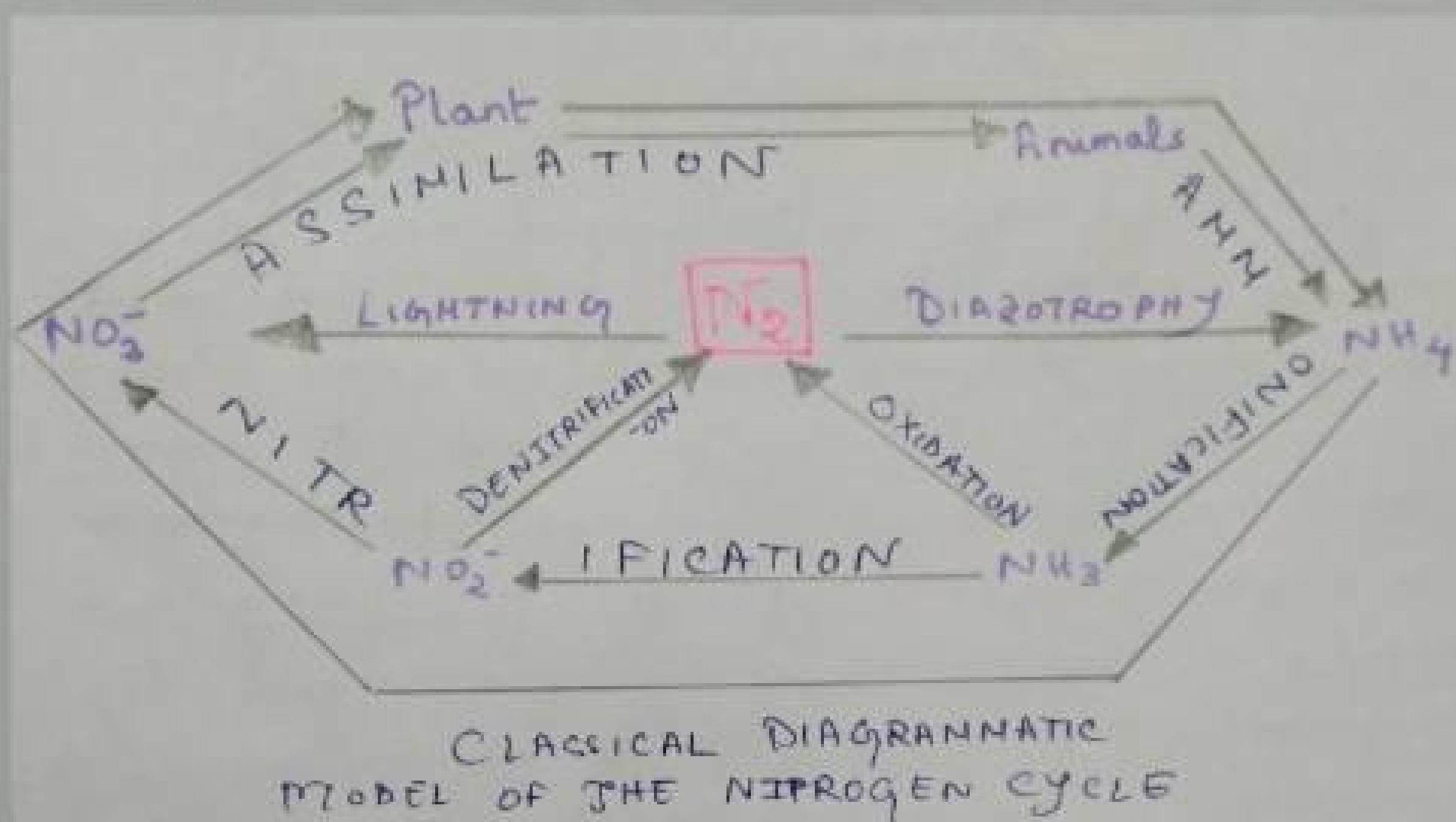
SIGNATURE

: *Sarkar*

INTRODUCTION

The 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 cycle include fixation, ammonification, nitrification and denitrification. The majority of Earth's atmosphere (78%) is atmospheric nitrogen, making it the largest source of N_2 . However, atmospheric N_2 has limited availability for biological use, leading to a scarcity of usable N_2 in many types of ecosystems.

Nitrogen is present in the environment in a wide variety of chemical forms including 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 other, as illustrated in the diagram:



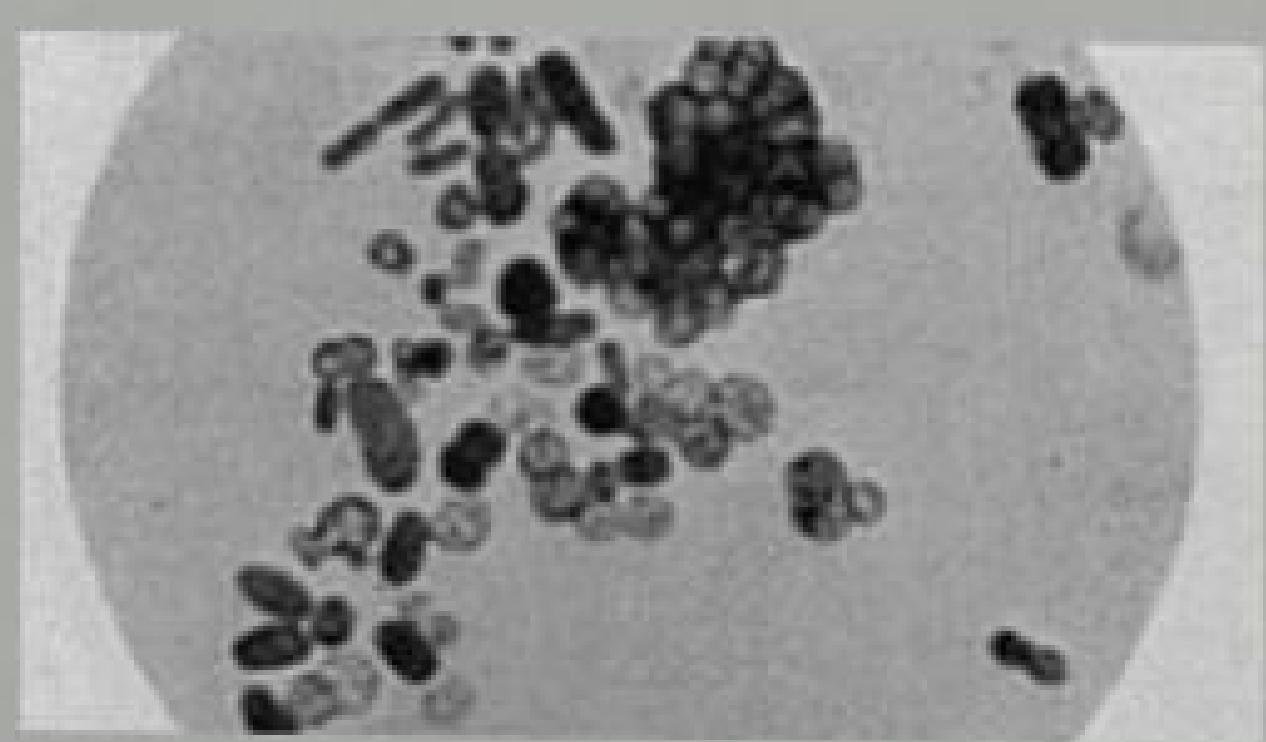
PROCESSES INVOLVED IN A NITROGEN CYCLE

The following processes are involved in a full-fledged Nitrogen cycle:

i) Nitrogen Fixation: The conversion of atmospheric N_2 gas into nitrates and nitrites through atmospheric, industrial and biological processes is called Nitrogen fixation. Atmospheric nitrogen must be processed into a usable form to be taken by plants. Between 5 and 10 billion, per kg per year are fixed by lightning strikes, but most fixation is done by free-living or symbiotic bacteria called diazotrophs. These bacteria convert atmospheric N_2 to ammonia which is then converted to other nitrogenous compounds. An example of such free-living bacteria is Agrobacter. These days, however, about 30% of the fixed nitrogen is obtained industrially. In the Haber-Bosch process, high temperature and pressures are used to convert nitrogen gas and a hydrogen source (natural gas or petroleum) into Ammonia.



Lightning helps in natural fixation



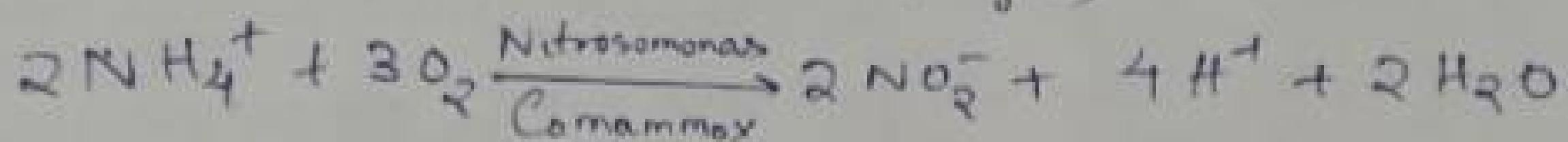
A stain of Agrobacter



Legumes storing nitrogenous compounds

2. Nitrification: In this process, the fixated ammonia is converted into nitrate by the presence of bacteria in the soil. Nitrates are formed by biological oxidation of the nitrite to nitrate. This nitrite used in nitrification ought to be formed after biologically oxidising Ammonia. The transformation of ammonia to nitrite is usually the rate limiting step of nitrification. Nitrification is an aerobic process performed by small groups of autotrophic bacteria & archaea. The oxidation of ammonia into nitrite is performed by 2 groups of organisms, Ammonia-oxidizing bacteria (AOB) and Ammonia-oxidizing Archae (AOA). The second step (oxidation of nitrite into nitrate) is mainly brought about by bacteria of the genus Nitrobacter and Nitrospina. The chemical reactions involved are as follows:

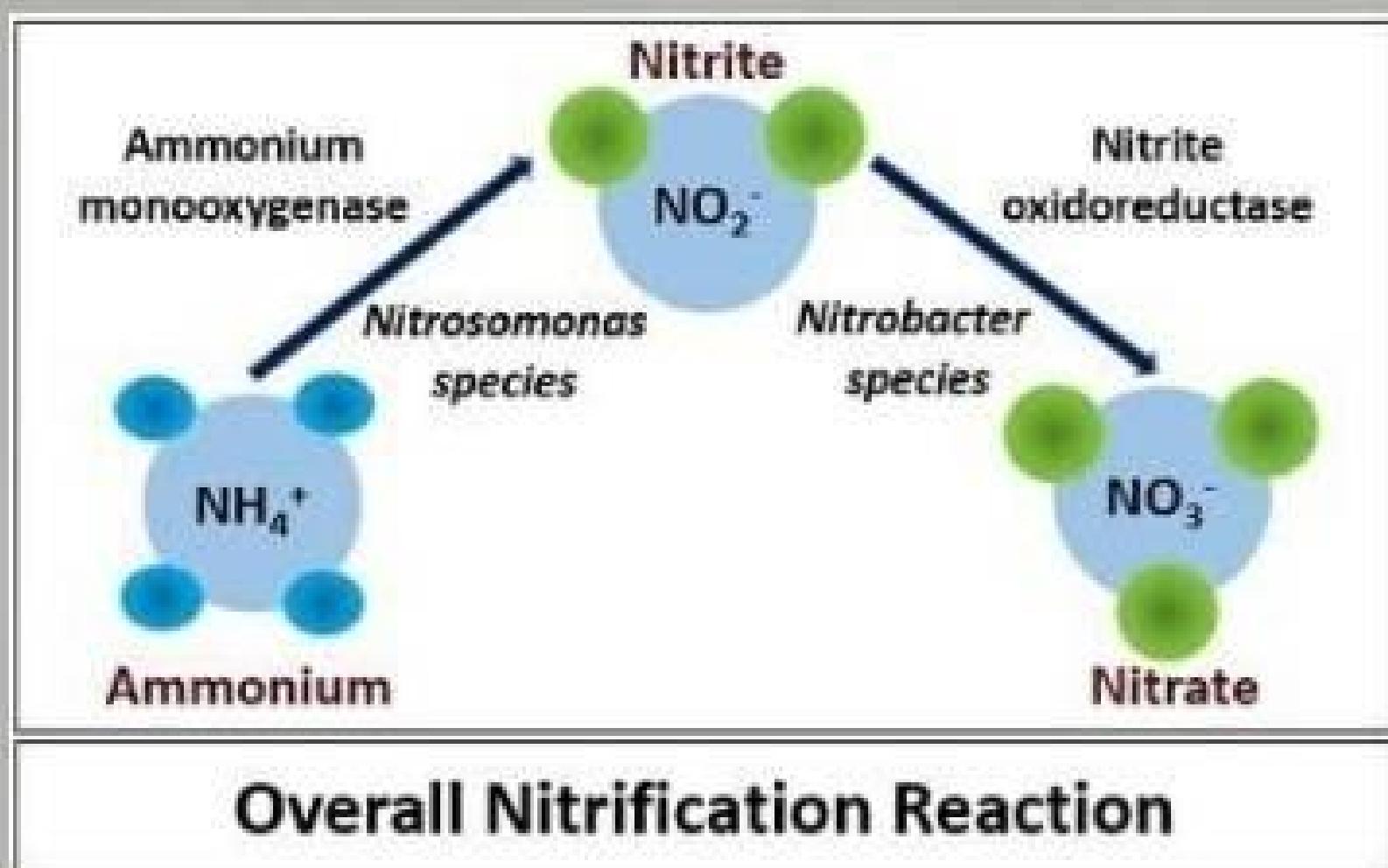
i) First step (Oxidising NH_4^+ ions to NO_2^- , and then to NO_3^- , that comes under second stage)



ii) Second step (Oxidising NO_2^- to NO_3^-)

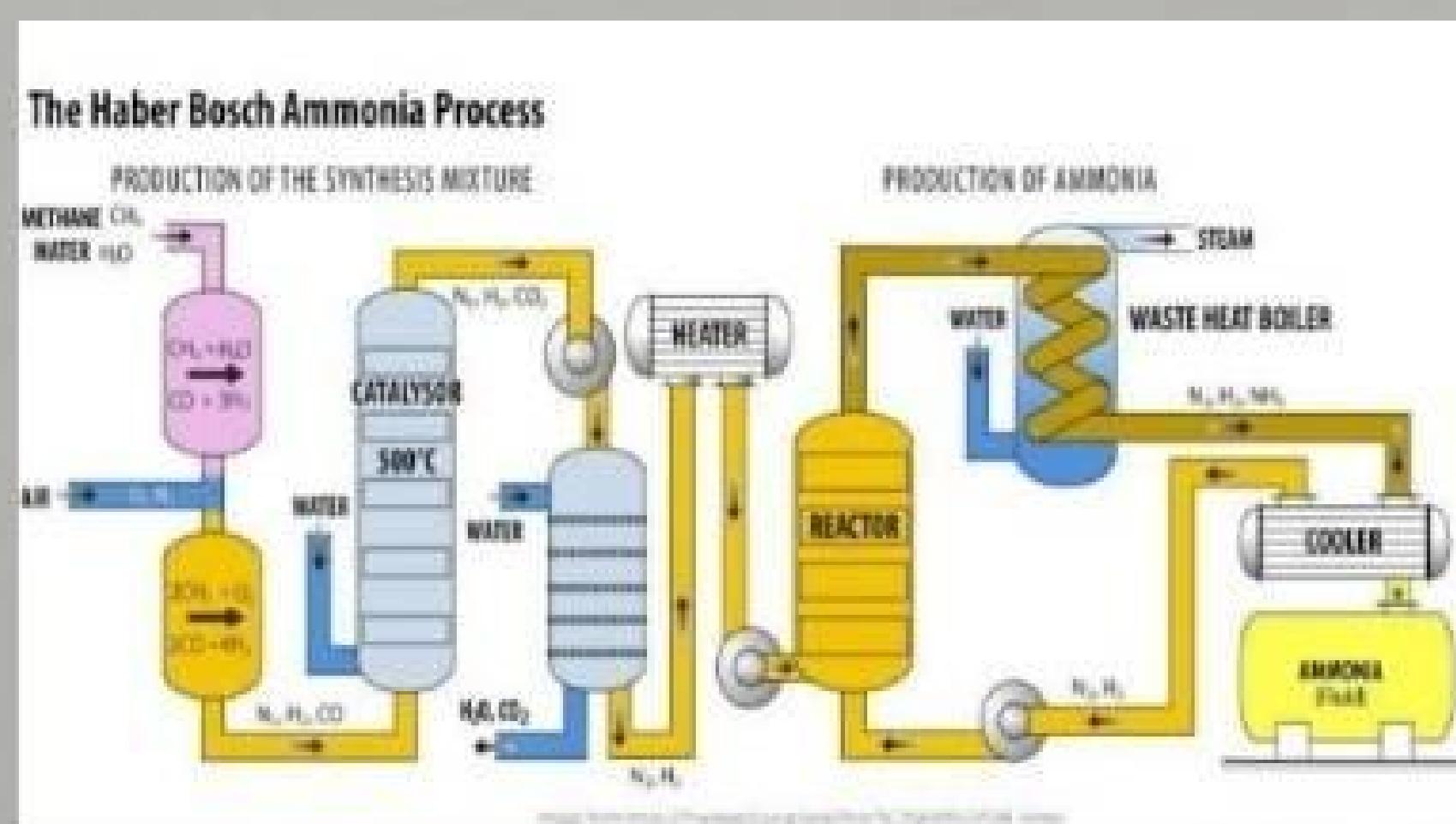


3) Assimilation: Plants can absorb nitrate or ammonium from the soil by their root hairs. If nitrate is absorbed, it is first reduced to nitrite ions and then ammonium ions for incorporation into amino acids, nucleic acids, and chlorophyll. In plants that have a symbiotic relationship with rhizobia, some nitrogen is assimilated in the form of ammonium ions directly from the nodules. It is now known, that there is a more complex cycling of amino acids between Rhizobia bacteroids and plants. Primary producers - plants take in the nitrogen compound from the soil with the help of their roots, which is available in the form of ammonium ions, ammonia, nitrite ions, nitrate ions. This way, it enters the food web.



Details of
Nitrification

Nitospira



Haber - Bosch process is important for
Industrial Ammonia production & Nitrogen fixation

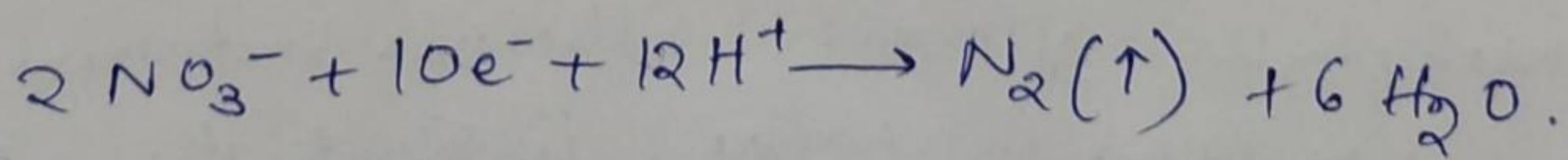


Rhizobia

4.) Ammonification: As organisms die, their mortal remains and debris eventually return to the soil. The nitrogenous compounds contained in their tissues is converted to ammonia by decomposers. This process converts organic nitrogen to inorganic ammonia (NH_3) or ammonium ions (NH_4^+). Some examples of microorganisms that bring about these reactions are: bacteria or fungi. This process is also alternatively called mineralization. The enzymes involved in the process are:

- i) Gln Synthetase (ii) Glu-2-oxoglutamate aminotransferase
- iii) Glue Dehydrogenase. Schematically, this process can be represented as: Organic nitrogen compounds $\longrightarrow \text{NH}_3/\text{NH}_4^+$.

5.) Denitrification: This, the last stage of Nitrogen cycle, is a process that involves reduction of nitrate ions to atmospheric/gaseous N_2 , spanning over a wide range of reactions. Certain families of anaerobic bacteria bring about this process. This process only occurs when there is little to no oxygen, such as deep in the soil, near the water table. Hence, areas such as wetlands provide a valuable place for reducing excess nitrogen levels via denitrification process. The denitrifying bacterial species — Clostridium and Pseudomonas process the nitrates present in soil to gain oxygen and gives out free nitrogen gas as a byproduct. The chemical reactions involved can be represented as:



Ammonification



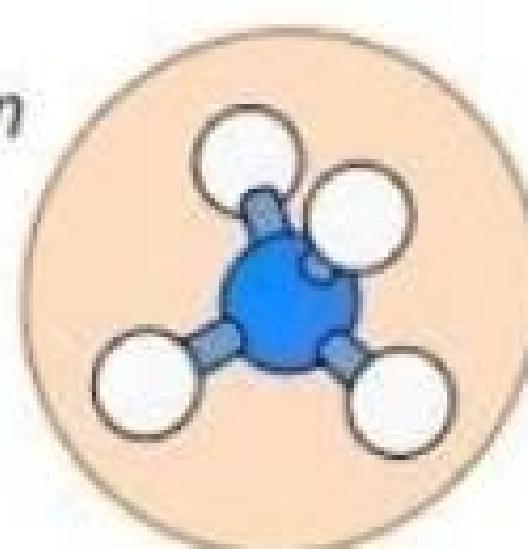
Plants / Animals

Decomposition



Soil Bacteria

Ammonification



Ammonium (NH_4^+)

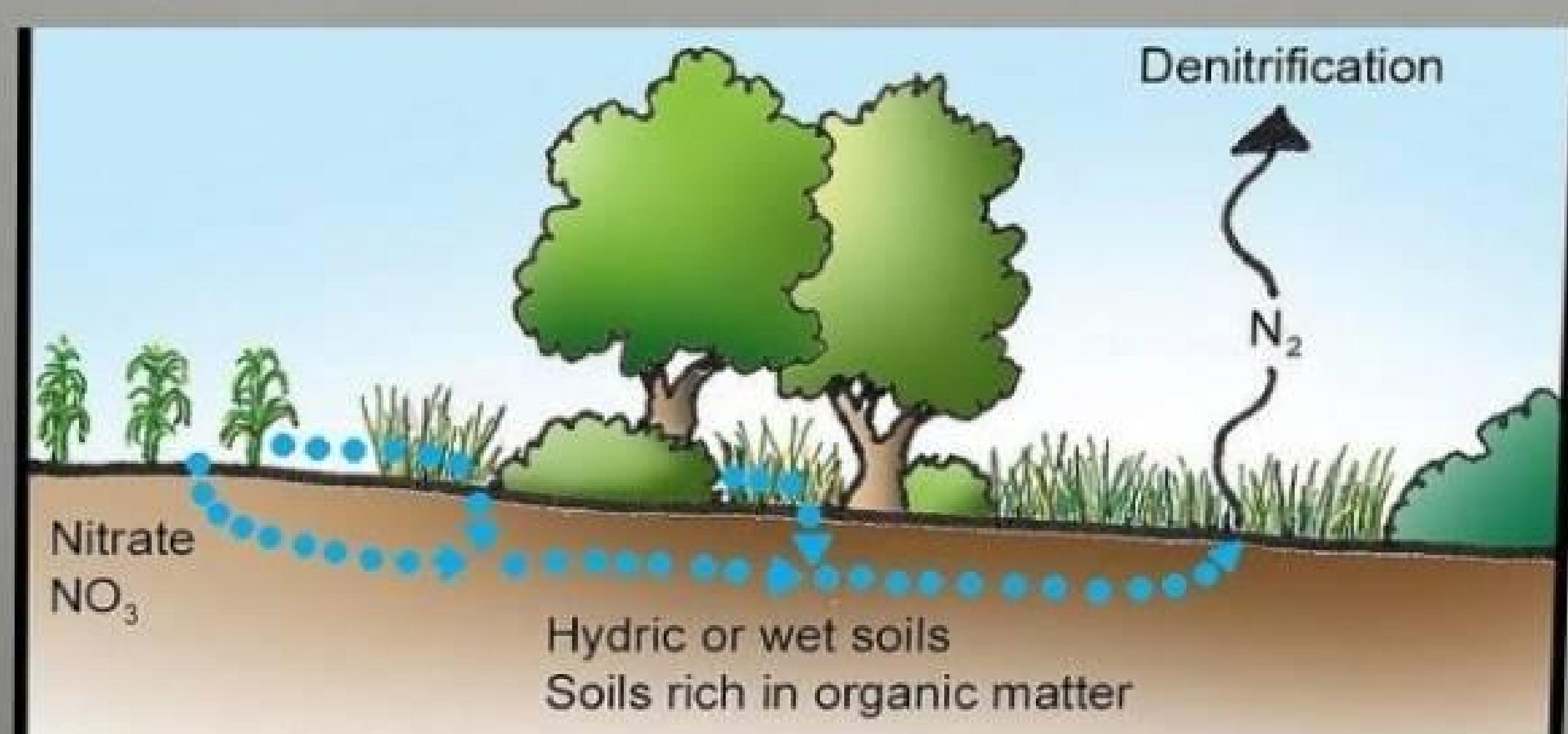
Diagrammatic Representation of
Ammonification process



Pseudomonas
Bacteria



Clostridium
Bacteria



Diagrammatic representation of
Denitrification

Importance of Nitrogen Cycle

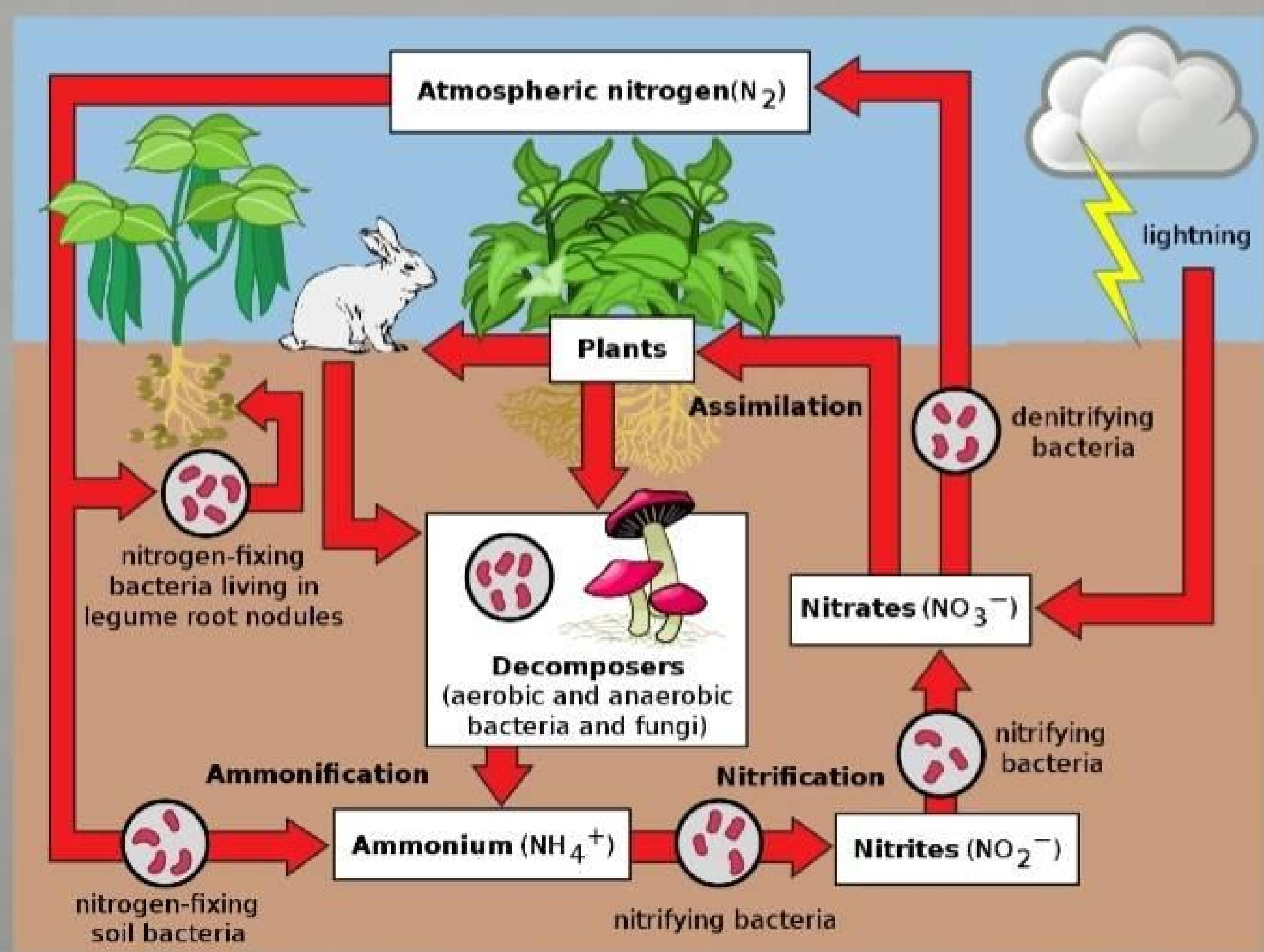
Nitrogen is the vital element for the synthesis of plant and animal protein. Nitrogen from the atmosphere cannot be directly taken up by plants unlike Bacteria. Nitrogen fixing bacteria convert atmospheric nitrogen into ammonium compounds and nitrites, which can be consumed by plants; by absorption through their roots.

Consequently, when animals eat the plants, the organic nitrogen is transferred to the animal. In animal cells, these nitrogen-compounds is used to synthesize a number of biochemicals like proteins. Nitrogen containing organic compounds made by living cells return to the environment as ammonia through metabolic waste and decomposition, and this ammonia is reabsorbed by plants in the nitrogen cycle.

In agriculture, we can add these compounds as fertilizer to the soil to increase plant productivity. If we are raising crops, we have to be careful not to overuse these nitrogenous compounds, as it may have serious and unwanted ramifications like eutrophication.

In the plant and animal biospheres, nitrogen is of immense importance. Since, gaseous nitrogen isn't suitable for consumption, living cells of plant and animal tissues, that aren't autotrophs have to depend on the nitrogen cycle for their supply of nitrogen rich compounds. Besides proteins many other important organic compounds like chlorophylls, cytosomes, alkaloids, vitamins are highly nitrogenous in nature. Without the nitrogen cycle these compounds wouldn't have existed, so would it have life!

Many human activities have significant impact on the nitrogen cycle. Burning fossil fuels, application of nitrogen based fertilizers and other activities can dramatically increase the amount of biologically available oxygen in an ecosystem. Because nitrogen availability often limits the primary productivity of many ecosystems, large changes in the availability of nitrogen can lead to severe alteration of the nitrogen cycle in both aquatic and terrestrial ecosystems. Industrial nitrogen fixation, hence, has increased exponentially since the 1940s.



Diagrammatic Representation of
the Nitrogen Cycle

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Corona pandemic and role of common people to
control it

NAME : DHIMAN NANDI
COLLEGE ROLL NO : CHUGI/201/19
DEPARTMENT : CHEMISTRY
YEAR : 2020
SIGNATURE : Dhiman Nandi

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Acknowledgement

The Success and final outcome of this project required a lot guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I thank Ramakrishna Mission Residential College, Narendrapur, for providing me an opportunity to do that project. I am extremely thankful to all of my ENVS teachers for providing me a nice support and guidance. I would not forget to remember my friends who gave me many informations.

Thanking you

Yours Obediently
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Introduction

'COVID-19' the most common word in present days. We can't find a single person who does not know about it, very hard to find a single country which has not affected by it. More over 40,660,963 (approximately) cases and 1,124,227 deaths were found. USA, India, Brazil, Russia etc hardly affected by it. We can see a sharp educational, social, economical deviation. Mother Nature proved us we are nothing in front of her. Approximately ten months of pandemic on going and we all ready lost a large number of people. A huge number of people lost their jobs, economically undeveloped countries face dullness of market. In that project of ENVS we are going to discuss about corona pandemic and the role of common people to resist it.

The first human cases of COVID-19 were first reported by officials by Wuhan, China³, in December 2019. The disease COVID-19 caused by a virus called novel coronavirus, later it termed as SARS-CoV-2. According to WHO, SARS-CoV-2 have their ecological origin in bat population. It spread very fastly. Within the 8 or 9 months this disease spread all over the world and became a pandemic.

Due to this pandemic, the Government of each countries decided some of lock down phases for controlling this situation. In present days we are in unlock phases. But COVID-19 can't be stopped. This is because common people are not alert. We must be careful about it.

- SARS COV2 virus:

The virus SARS COV2 is the cause of disease Covid-19. So here a common question how the virus spreads. People with the virus in their noses and throats may leave infected droplets on objects and surfaces when they sneeze, cough or touch surfaces, such as tables, books, door knobs etc. Other people may become infected by touching these objects, then touching their eyes, noses or mouths before cleaning their hands. People also infected by hand shake with infected people by same mechanism. According to WHO, the airbrone transmission of SARS COV2 is possible. It can occur during medical procedures that generate aerosol. WHO together with the scientific community has been actively discussing and evaluating whether SARS-COV2 may also spread aerosols without generating aerosol prod procedure.

Let's briefly discuss how SARS-CoV-2 attack on cell by this diagram:



• Symptoms of COVID-19 disease:

COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalizations.

here we discuss about some of symptoms.

▲ Most Common symptoms (93% cases)

- i. Fever.
- ii. dry Cough.
- iii. tiredness.

▲ less common symptoms (7% cases)

- i. aches and pain
- ii. sore throat
- iii. headache
- iv. loss of taste or smell.
- v. conjunctivitis

here we discuss the difference between COVID symptoms and common conditions.

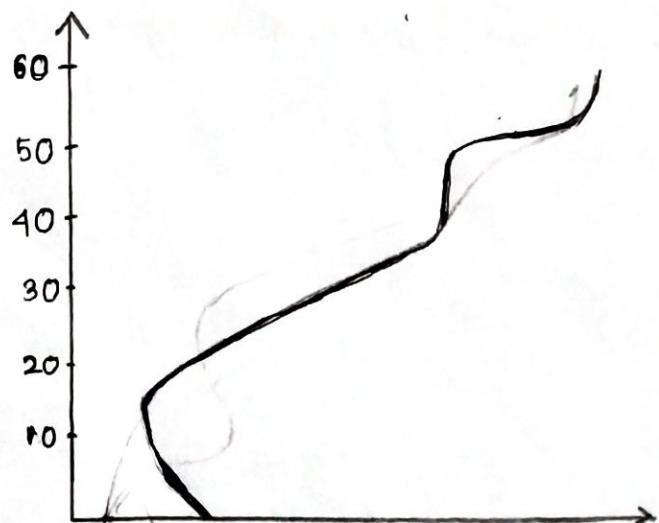
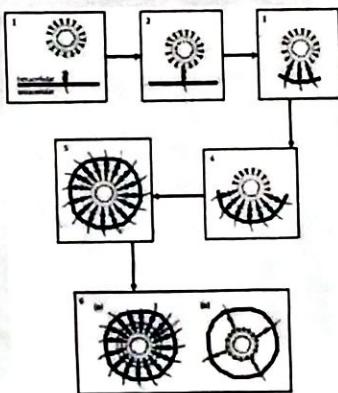
COVID-19 symptoms compared to common conditions

Symptom	COVID-19	Common Cold	Flu	Allergies
Fever	Common	Rare	Common	Sometimes
Dry cough	Common	Mild	Common	Sometimes
Shortness of breath	Common	No	No	Common
Headaches	Sometimes	Rare	Common	Sometimes
Aches and pains	Sometimes	Common	Common	No

- Age-dependent effects in the transmission and Control of COVID-19 Pandemic:

According to the first survey report on February, 2020, China, people has less immunity has greater chances to infected by SARS-COV2. All SARS-COV-2 infected people does not need hospitalization. Some of them which have very much less immunity and serious condition need hospitalization, and from those cases which have serious condition those have chance to death. WHO survey report said that heart patients, cancer patients, Asthma patients have greater chances to die. We can see a sharp age dependent effect in COVID cases. Reports from different countries clearly said that people with age above 55 years, highly chances to attack by SARS-COV-2. not only that we can see in same analogy for death cases. 70% people (approximately) which died in COVID-19 have a age group 50-70 years. The main reason for this incident with increasing age the health immunity system quality going to decrease.

A model and a more detailed description of these events is shown in Figure 3.



Age dependent daily death cases in India

We sufficiently discussed about COVID-19 disease. Let us have to talk about how to control the pandemic. From the first cases, till today there is only way to control it is social distancing. It can't spread without interaction between two people, directly or indirectly. For maintaining the social distancing or quarantine, the Government of all countries decided a large lock down period. We can see slow spreading of pandemic during this lockdown period by some of statistical data. But these lock down also have disadvantages. Overall world faced face a economical, educational crash as a result Govt have to decide unlock period.

Every month, frontline health responders around the world need these supplies (and more) to protect themselves and others from #COVID19

- 89 million masks
- 30 million gowns
- 1.59 million goggles
- 76 million gloves
- 2.9 million liters hand sanitizer



#COVID19

#coronavirus



World Health Organization

• COVID-19 Statistics:

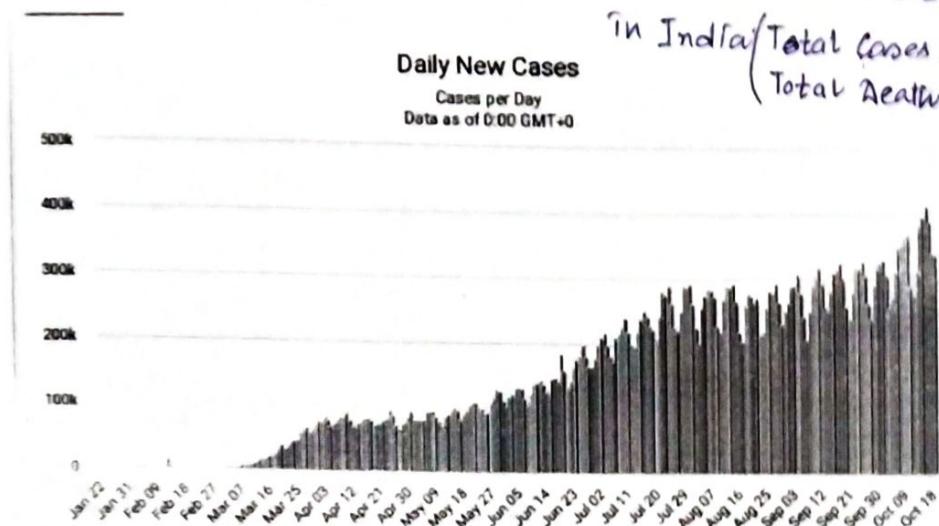
According to Worldometer
at present (Date: 12/11/20)

Total Cases: 52,685,639

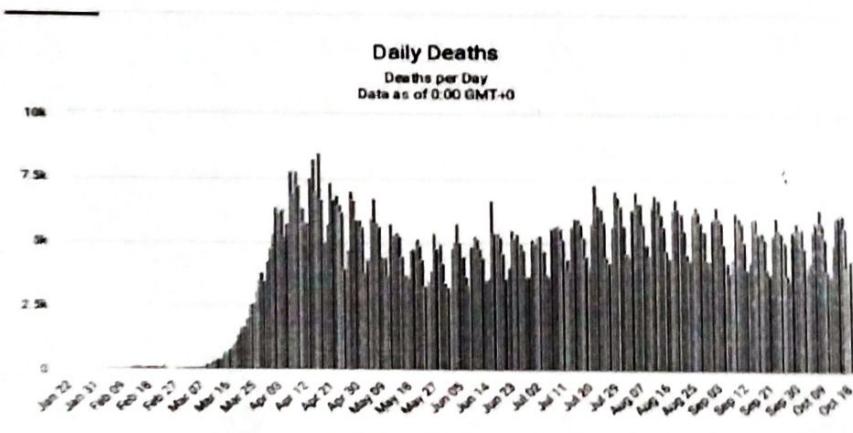
Total Deaths: 1,293,831

In India (Total Cases: 8,690,621)
Total Deaths: 128,204

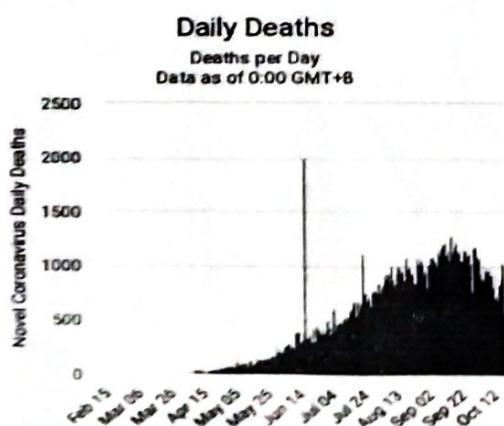
Daily Cases in World.



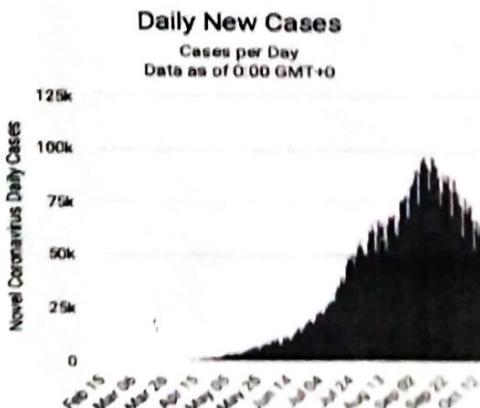
Daily Deaths in world



Daily New Deaths in India



Daily New Cases In India



• Impact of Corona Pandemic:

It is also nine months that we suffering Corona pandemic. Practically there are so many impacts that we can see in present days or in future. Economical, Educational, Social, Health or environmental impacts. We will discuss here.

A. Economical Impact:

Economical Crisis is more favourable word in place of Economical Impact because it has no positive side. After starting of Corona pandemic Overall world faced a great economical crash. Many affected countries already faced the dark side of economical crisis. We can

see-

1. Many of national, international private industries is going to be closed. Not only that GOVT. decided to sale many govt. industries for balancing economical loss.

2. According to the report of Times Of India more than 40 lakhs Government employees lost their job in India. and more than 3 crores people lost their jobs from private institutes.

41 lakh youth lose jobs in India due to COVID-19 pandemic: ILO-ADB Report



INDIA
750 road deaths in 2 months of lockdown

TNN | Jun 3, 2020, 04:55 IST



Representative image

3. Economical crisis also makes some pathetic deaths. Suicide death incident increase 29% rate during lock-down. ~~due to~~ During lock down period hawkers, Vendors, labours Suicide death cases came in front of us because they depends on their daily income but due to lockdown those path was closed.

4. We also faced the death cases of migrant labours while they came towards their home after lost the job.

economical impacts are only reason to stop the lock-down and reopen all countries. This impact makes us weak. According to United Nation's Statistical data more than 10 years will need to recover the crisis.

2] Educational Impact:

Educational impacts must have some of positive side with large negative side. Technologically undeveloped countries must faced the negative portion.

Corona pandemic teach us a new way of learning. It gives us ~~new~~ a opportunity of "E-learning".

Education in virtual medium makes it possible in that time but this education has a dark side it all ready bounded in limited portion of people.

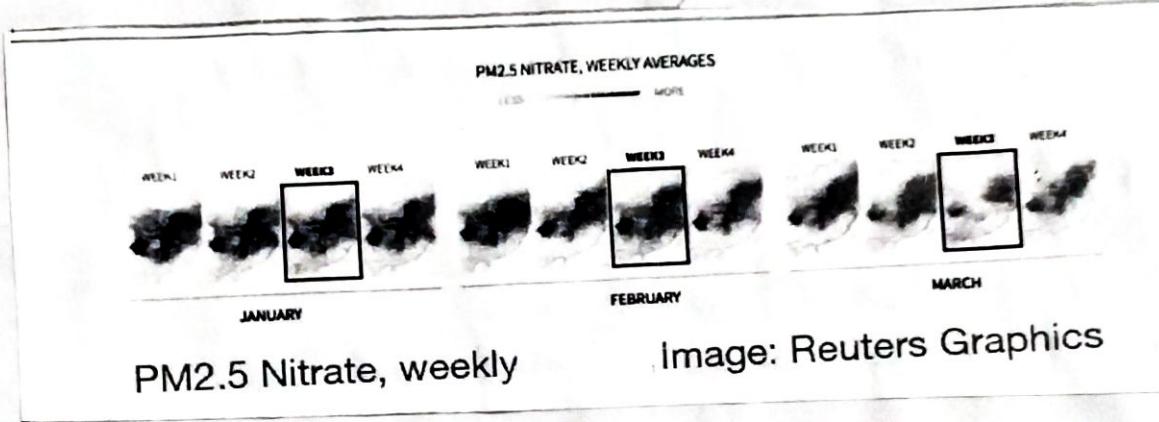
Many of students from financially weak background has not able to access this education system. In India we can't get a good internet connection from every places which also a big reason for limiting education. It is very difficult to learn

Practical based subject from virtual medium.

c. Environmental impact:

Corona pandemic made a good impact in case of environment. During the large lockdown period pollution rate was going to decrease.

(i) Air pollution rate going to decrease. UN report said that 88% air pollution rate is going to decrease in lockdown period through all over world. Amount of SO, NO₂, CN, CO₂, CO in the air decreased in lockdown period.



(ii) United Nation with other scientific research institutes said about the recovery of Ozone hole during lockdown.

(iii) Corona pandemic also make a good impact in case of wild life. Animals came on roads. Different birds had seen during lockdown period.

Ozone layer is recovering, says UN



D. Health Impact:

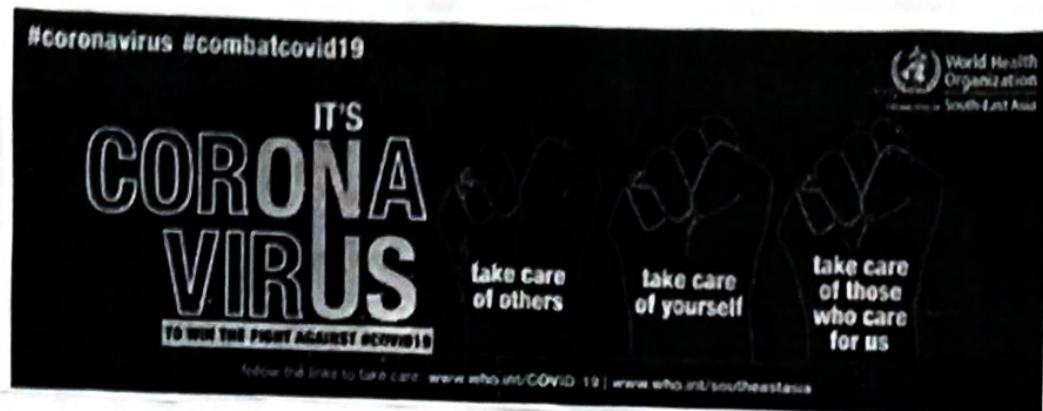
Corona pandemic also showed a large impact of health. An Observation report in united state during pandemic in time interval 1st March to April 25 clearly said that there was 87000 excess death cases during Corona Pandemic. From all deaths there was 65% COVID-19 cases and other 35% non COVID cases. The rate of death (non covid) increase 0.9% from normal days. This is a large health impact. Doctor refused patients for hospitalization during pandemic. Many medical employees leave their job due to pandemic as a result medical infrastructure became weak. Private nursing homes, Hospital refused patients (non covid) for admission.

According to collected data - 32583 patients with breast cancer, 24795 with colorectal cancer, 293505 with lung cancer patient died in march and april which easily proved the death case increase 8.3% from pre-pandemic period.

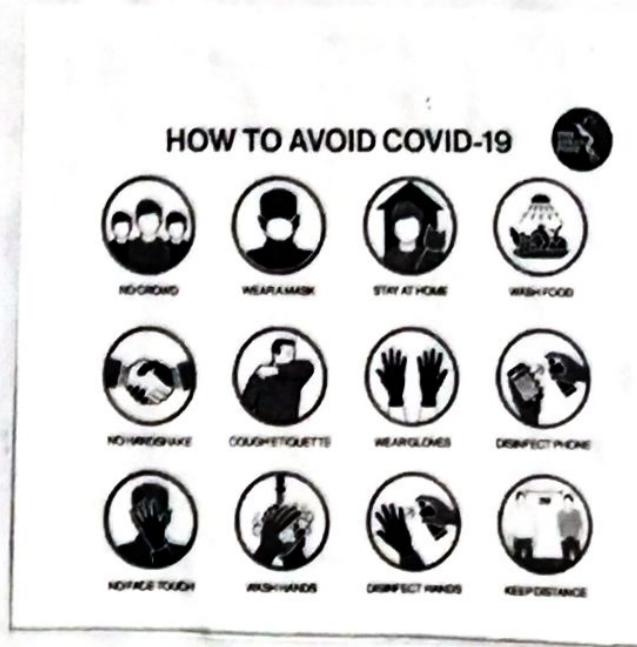
Neighbours refused to stay near patients home. not only for patients but also same thing we can see for medical employees. In some pathetic death cases we also seen in common people played a role as spectators in front of road accidents, no one helped injured.

● Role Of Common People To Control Pandemic:

Common people play an important role in Coronapandemic. Not only for control pandemic but also their financial, mental, free hand helps ~~other~~ to grow up the nation from those difficult time.



At first we need the awareness of COVID-19 in common people. It is very important to control pandemic. Their ~~unthought~~ Untaught works increase the pandemic. They must be obeyed the guidelines recommended by WHO.



▲ WHO Recommended Guideline For Common people:

1. Physical distancing at least one meter to be followed all times.
2. Use of face cover masks to be mandatory.
3. Practice frequent hand washing (for at least 40-60 seconds) even when hands are not visibly dirty.
4. All-time use alcohol based hand sanitizers.
5. Respiratory etiquettes to be strictly followed.
This involves strict practice of covering one's mouth while coughing/sneezing with tissue/handkerchief.
6. Self reporting of health by all and reporting illness at earliest.

Above discussed guidelines for controlling pandemic between common people. Government's Health department also recommended some of guidelines for COVID-19 patients to control disease in its family member.

1. Place the ill person in a room or area, they are isolated from others at the work place.
2. Report to concern central/state health authorities.
3. If suspected case reported very mild or mild symptoms than they suggested for home -Quarantine.
4. Hardly affected people must be hospitalized.
5. Affected or suspect family must be isolated and it is suggested for local people for giving them a mental and financial support for as much as possible.

Misguide of common people made the pandemic vigorous. Specially social media just like Facebook, WhatsApp, university, Telegram's fake messages always make harmful impact in our society. It is important to avoid those fake reports, news. Some viral videos, news, memes make wrong conception on our mind. During lockdown time some of medicines got popularity via social media as COVID-19 medicines but doctors clearly said that those are fake news. In India Health Ministry suggested that zinc, Vitamin C helps to grow our immunity but common people misunderstood these things and started to buy Vitamin C tablets and zinc acetate tablets. Some viral memes made a common man to die. It also disturbed mental health. So common people can stop those types by miss guidance.



- Common people can balance the economical crisis. Their financial contribution towards COVID-19 funds can help the governments. During lockdown a huge number of people lost their jobs. If neighbours financially supported those families than it is easy to grow our nation.
- Mental support is also important like financial support towards patients and patient's family. In some cases we have seen neighbours, local people.

Misbehaved with patient's family. They showed a very foolish meaning of social distancing. In some of cases local people stopped communication with COVID-19 patients family. It is really a bad thing. We should mentally support them. People also misbehaved with doctors, police, nurses etc. We must have to raise our helping hand towards them because they are the real hero in that time, they try to contribute their 100% service, we must be respect them.

► Self Consciousness is most important thing for each of the common people. If we see any types of COVID-19 symptoms in our body, we must be isolated himself from others and contact with health care centers as fast as possible. Foolish people always try to hide their symptoms in that cases disease spreads easily from them. As in that time we have no vaccine so Home quarantine is only way to control pandemic.

SO, we already discussed the primary level duties of common people to control the pandemic let we will discuss some of successful model designed by Govts of different countries for common people to control pandemic.

1. China already declared victory against pandemic. The death cases & almost neglected during last two months. 'HOPE' china is only reason for this. The model HOPE designed by The Government of China. Common people also cooperated with Govt. to complete this mission.

The model includes from root level common people to COVID-19 specialist scientist.

The model said about how to isolate a COVID-19 patient how to support him to fight against pandemic, how common people lead their daily life, how behave with

How doctors, Police, health employees complete their duties, everything.

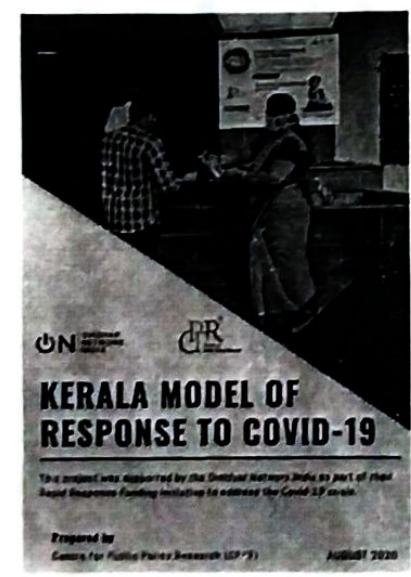
So, the model 'HOPE' which also succeeded by Government and common people of China. It can give us a great advantage. We can learn from "Hope China".



2. Not only in China but also state Kerala, India is also a great inspiration for world. Model Kerala also a successful Model against COVID-19 pandemic. According to Survey of India, Kerala always number one in case of educational growth. People Self Consciousness is very important for the pandemic period, Model Kerala reflects it. State Government of Kerala made a guideline and common people followed it. At first Government found

some of field, far from locality they made COVID Hospitals there. It helps people that every residence got a medical care at a distance 5 Km. Visitors, Students or Other common people who came at that time from outside were captured in Quarantine treatment. Common people avoid crowds. They increased awareness by Social media. Government made some of COVID-Test camp in each locality. People who felt

Some of symptoms they come in camps and freely gave samples for test. local people made financial support for COVID affected family. In this way they got victory.



Conclusion

The Coronavirus disease continues to spread across the world following a trajectory that is difficult to predict. But daily death cases, active case are going to decrease today. It is very difficult to say that when vaccine will come. Several countries continue their research works. Russia already made a vaccine but its result was not effective. A research group from Oxford University showed their vaccine project. The trials of this vaccine is ongoing. In India third phase trial also started. But we are not sure that when we will get it. If it will common people easily get it? Is also a big question in that time. So, we must obey all guidelines recommended by WHO or Indian Government. Always maintain social distancing, always wearing masks, using hand sanitizers. Can resist spreading. It is very important to increase awareness in between common people. We already lost many people, many people also lost their jobs, economy is in danger but at end the last hope to believe in ourself, we can fight against it and we win. Good days are waiting for us. Everything will normal again.

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RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Nitrogen cycle and its importance
for living beings

NAME : DIBAKAR BISWAS
COLLEGE ROLL NO : CHUG/198/19
DEPARTMENT : CHEMISTRY
YEAR : 2020
SIGNATURE : Dibakar Biswas

CONTENTS

- What is Nitrogen cycle
- Stages of Nitrogen cycle
- In Marine Ecosystem
- Schematic Diagram
- Importance
- Conclusion

■ Nitrogen cycle:

● Definition:

"Nitrogen cycle is a biochemical process which transforms the inert nitrogen present in the atmosphere to a more usable form of living organisms."

Further more, nitrogen is a key nutrient element for plants. However, the abundant nitrogen in the atmosphere can't be used directly by plants or animals. Read on to explore how the Nitrogen cycle makes usable nitrogen available to plants and other living organisms.

■ What is Nitrogen Cycle:

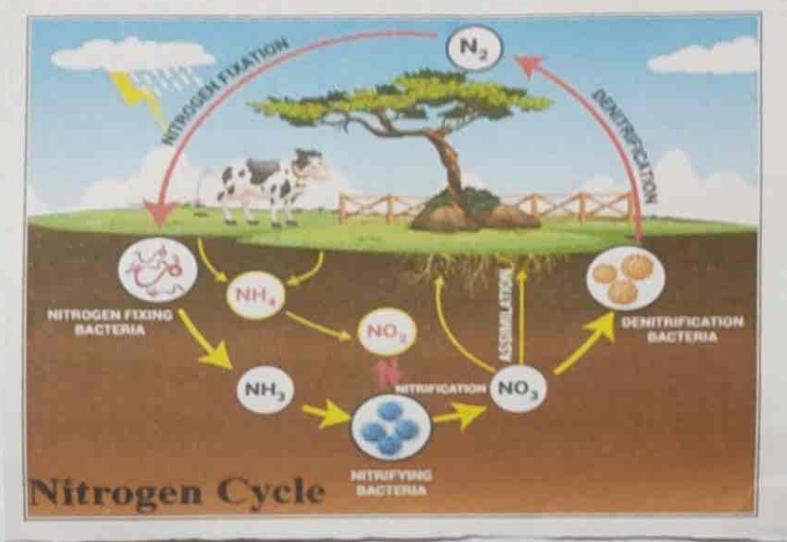
Nitrogen cycle is a biochemical process through which nitrogen is converted into many forms, consecutively passing from the atmosphere to the soil to organisms and back into the atmosphere.

It involves several processes such as nitrogen fixation, nitrification, denitrification, decay and putrefaction.

The nitrogen gas exists in both organic and inorganic forms. Organic nitrogen exists in living organism, and they get passed through the food chain by the consumption of other living organisms.

Inorganic forms of nitrogen are found in abundance in the atmosphere. The nitrogen is made available to plants by symbiotic bacteria which can convert the inert nitrogen into a usable form — such as nitrates and nitrites.

Nitrogen undergoes various types of transformation to maintain a balance in the ecosystem. Furthermore, this process extends to various biomes, with the marine nitrogen cycle being one of the most complicated biogeochemical cycles.



Stages of Nitrogen cycle:

Process of Nitrogen cycle consists of the following steps — Nitrogen fixation, Nitrification, Assimilation, Ammonification and Denitrification. The process takes place in several stages and are explained below:

- Nitrogen fixation:

It's the initial step of the Nitrogen cycle. Here, Atmospheric nitrogen (N_2) which is primarily available in an inert form, is converted into the usable form — ammonia (NH_3).

During the process of Nitrogen fixation, the inert form of nitrogen gas is deposited into soil from the atmosphere and surface waters, mainly through precipitation. Later the nitrogen undergoes a set of changes, in which two nitrogen atoms get separated and combine with hydrogen to form ammonia (NH_4^+).

The entire process is completed by symbiotic bacteria of Nitrogen fixation, which are known as Diazotrophs. Azotobacter and Rhizobium also have a major role in this process. These bacteria consists of a nitrogenase enzyme which has the capability to combine gaseous nitrogen with hydrogen to form ammonia.

Nitrogen fixation can occur either by the atmospheric fixation which involves lightning or industrial fixation by manufacturing ammonia under high temperature and pressure condition. This can also be fixed through man made processes, primarily industrial processes that create ammonia and nitrogen rich fertilisers.

• Types of Nitrogen fixation:

1. Atmospheric fixation:

A natural phenomenon where the energy of lightning breaks the nitrogen into nitrogen oxides and is then used by plants.

2. Industrial nitrogen fixation:

It's a man made alternative that aids in nitrogen fixation by the use of ammonia. Ammonia is produced by the direct combination of nitrogen and hydrogen and later, it's converted into various fertilizers such as urea.

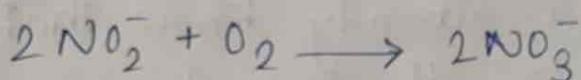
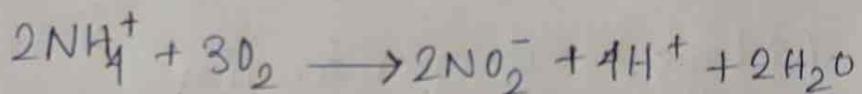
3. Biological nitrogen fixation:

We already know that nitrogen is not usable directly from the air for plants & animals. Bacteria like Rhizobium and blue-green algae transform the usable form of nitrogen into other compounds that are more readily usable. These nitrogen compounds get fixed in the soil by these microbes.

● Nitrification:

In this process, the ammonia is converted into nitrode by the presence of bacteria in the soil. Nitrates are formed by the oxidation of ammonia with the help of Nitrosomonas bacterium species. Later, the produced nitrates are converted into nitrates by Nitrobactor. This conversion is very important as ammonia gas is toxic for plants.

This reaction involved in the process of Nitrification is as follows:

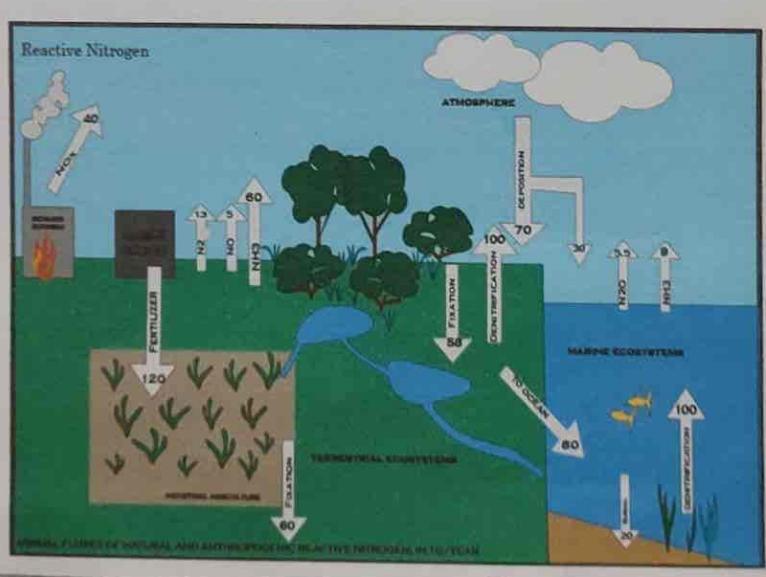


● Assimilation:

Primary producers — plants takes in the nitrogen compounds from the soil with the help of their roots, which are available in the form of ammonia, nitrite ions, nitrate ions or ammonium ions and are used in the formation of the plants and animal proteins. This way, it enters the food web when the primary consumers eat the plants.

• Ammonification:

When plants or animals die, the nitrogen present in the organic matter is released back into the soil. The decomposers namely, bacteria or fungi present in the soils convert the organic matter back into ammonium. This process of decomposition produces ammonia which is further used for other biological processes.



① Denitrification:

Denitrification is the process in which the nitrogen compounds makes it's way back into the atmosphere by converting nitrate (NO_3^-) into gaseous nitrogen (N). This process of the Nitrogen cycle is the final stages and occurs in the absence of oxygen. Denitrification is carried out by the denitrifying bacterial species - *Clostridium* and *Pseudomonas*, which will process nitrate to gain oxygen and gives out free nitrogen gas a byproduct.

☒ Nitrogen cycle in Marine Ecosystem:

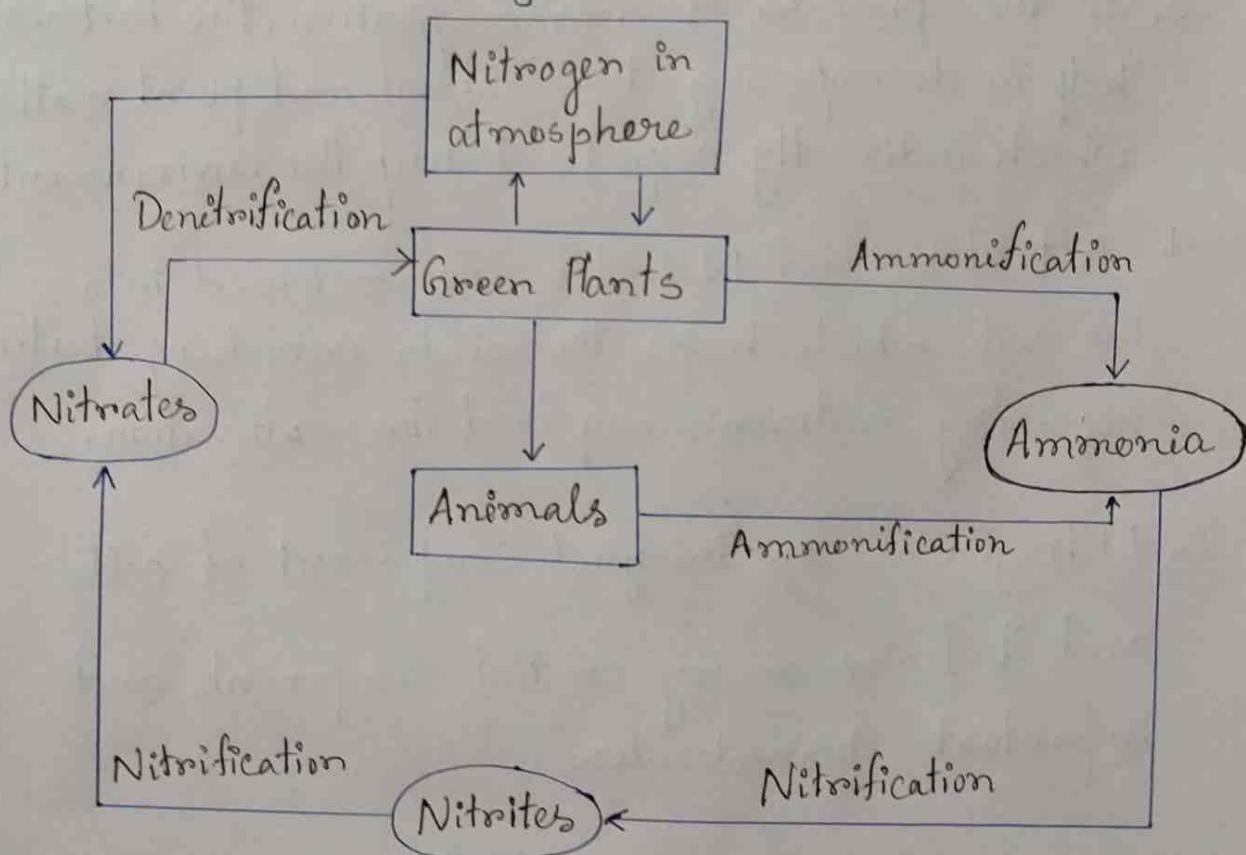
The process of nitrogen cycle occurs in the same manner in the marine ecosystem as in the terrestrial ecosystem. The only difference is that it's carried out by marine bacteria.

The nitrogen containing compounds that fall into the ocean as sediments get compressed over long periods and forms sedimentary rocks. Due to geological uplift, these sedimentary rocks move to land.

Initially, it was not known that these nitrogen containing compounds in 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.

Schematic Diagram:



❑ Importance of Nitrogen cycle:

Importance of Nitrogen Cycle are as follows:

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

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

Conclusion:

- Nitrogen is abundant in the atmosphere, but it's unusable to plants or animals unless it's converted into nitrogen compounds.
- Nitrogen-fixing bacteria play 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 cells.

- Animals assimilate nitrogen by consuming these plants or other animal that contain nitrogen. Humans consume proteins from these plants and animals and then, the nitrogen assimilates into our system.
- During the final stages of nitrogen cycle, bacteria and fungi help decompose organic matter where the nitrogenous compounds get dissolved into the soil which is again used by plants.
- Some bacteria then convert these nitrogenous compounds in the soil and turned it into nitrogen gas. Eventually, it goes back to atmosphere.
- These sets of process repeat continuously and thus maintain the percentage of nitrogen in the atmosphere.

• 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 constant help throughout the course of investigation.

Date : 14.11.20

Dibakar Biswas

Signature of the
student

• CERTIFICATE •

Certified that the project work submitted
by Dibakar Biswas is done under the
Supervision of my honorable sir as a
part of curriculum for the partial fulfilment
of the class - UG 2nd semester.

Date:

Signature of the
teacher

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: CORONA
PANDEMIC AND ROLE OF COMMON PEOPLE
TO CONTROL IT

NAME : HRISHAV SARKAR

COLLEGE ROLL NO : ENUG/058/19

DEPARTMENT : ENGLISH

YEAR : 2020

SIGNATURE : Hrishav Sarkar.

Coronavirus Pandemic taught us that we all are connected and thus entire world is a family. Although connected, medical experts have suggested social distancing as one of the perfect weapon to fight against the new evil. For protection against the disease, a collective social observance of the individual measures themselves. It is critical for containing the spread of the disease to isolate and treat diagnosed cases and isolate those who had any contact with sick or infected person.

The disease can be transferred from infected surface to our mouth, nose or eyes via our hands. Therefore washing our hand with soap for twenty to thirty seconds when they are dirty, eliminate the ability of virus to infect. Apart from washing our hands with soap, alcohol based hand sanitizer are known to disrupt the envelope structure of the virus and eliminate its ability to infect. Viruses can remain on the infected surface for days at a quality and quantity that can maintain their infectivity. It can survive upto 3-4 days on plastic and steel surface; upto 24 hours on cardboard and 4 hours on copper.



Corona Virus



An personal protection method, everyone must wear a mask that covers their mouth and nose. The spread of saliva and droplets from the respiratory tract can be prevented when sick individual use mask. This proves to be effective from being the environment unhygienic. Vomiting in the airborne droplets that spread when to be infected. Vomiting in the air for upto the sick people or nose and cough can hang in the air for upto 2 hours more particular than land on the surface due to gravity and impact the surrounding surfaces. Sneezing or coughing directly into someone's face can cause the person to catch the disease through the eyes as well. To prevent that, using glass can be effective. It gets very important how close we are to a sick person and for how long we were. We must always maintain atleast 1m the distance from any sick person. Practically, the more distance we keep the better it is. In social life, its very important to use a mask that basically closes the mouth and nose. It is recommended for healthy people to use



masks, preferably surgical masks. Healthcare personnel must use special mask which include N95 (FFP 1), N99 (FPP3) which can filter 99% (upto) corona virus. These masks can be used upto eight hours.

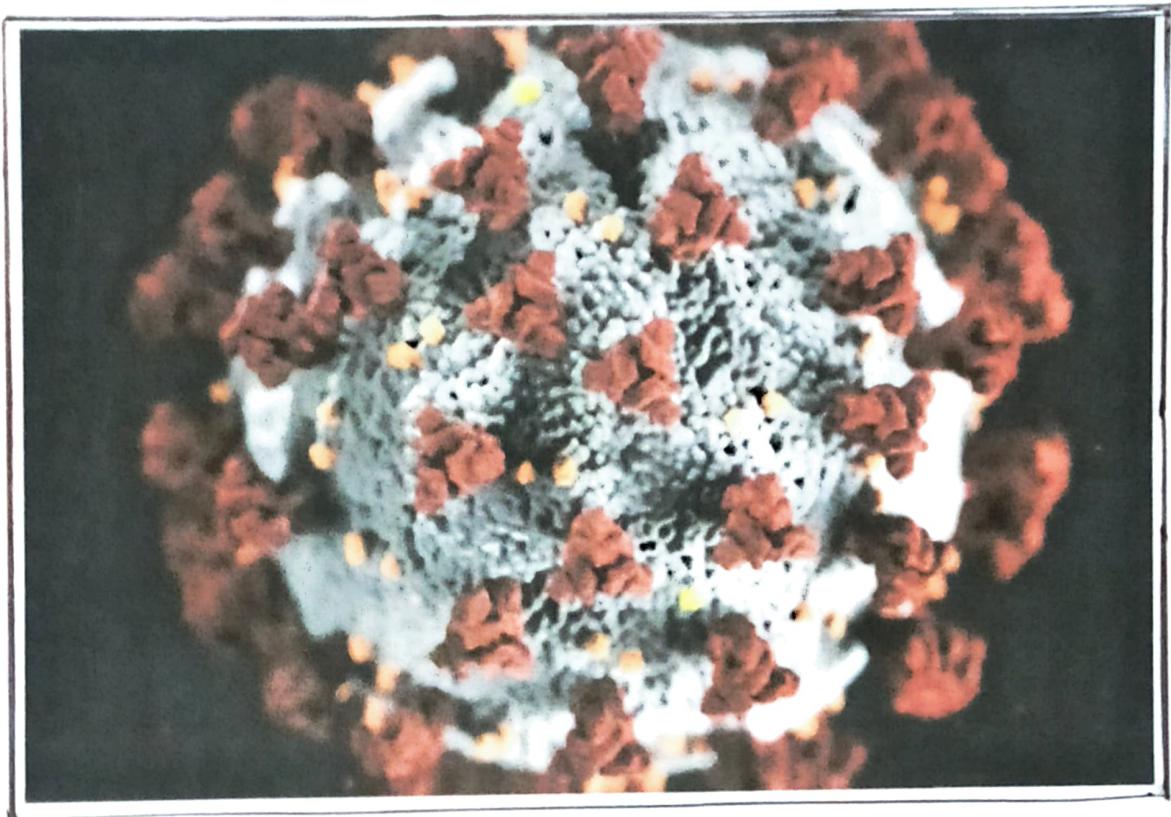
It is suggested that we can use such mask after sterilizing it for about fifteen to thirty minutes with UV rays. Since they cost more and are not easily to procure.

It is said that vitamins can be beneficial within the diet. Its reported that administration of Vitamin C as an antioxidant, especially in high doses will be beneficial in severe cases. Based on this researches suggest that dietary supplements such as vitamin E₂₀ and D₂₁ can be effective to prevent disease. Although 70% alcohol is effective to clean infected surface and ensure hand hygiene but drinking alcohol does not disinfect the mouth and throat and it is negative to affect the immune system. In fact, it is also reported that obesity at an young age worsens the course of Covid19 and increases the resistance to treatment as well.

Admittedly there is much blot about being tested positive for Covid19 and facing quarantine for a couple of weeks. But "whatever gets measured gets managed." If the positive cases are effectively measured we shall be able to contain the outbreak effectively. So its our responsibility to spread the right kind of awareness.

within the family, society or acquaintances rather than wasting time on optional stuff.

The outbreak of corona virus has also affected the mental health of humans as everyone reacts differently to stressful situations. So, in this hour of stress or anxiety lets spread the right knowledge, right videos and ensure all that we are going to win



this battle. Actually, it is not the coronavirus which is dangerous but it is the quick spread which is a threat. Social distancing, sanitisation and wearing mask along with testing more and more are only the weapons mankind possesses to win this battle.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Nitrogen cycle and
its importance for living beings

NAME : JAGANNATH RISHI
COLLEGE ROLL NO : SNUG/107119
DEPARTMENT : Sanskrit
YEAR : 2020
SIGNATURE : Jagannath Rishi

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I am thankful to my teacher Mr. S. P. Singh and my mother

Mr. S. P. Singh for giving me the best guidance throughout my life.

Also I am thankful to my teacher Mr. S. P. Singh for his help in my studies.

He always motivates us to work hard and to do our best.

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INTRODUCTION:

The nitrogen cycle is the process by which nitrogen is converted between its various chemical forms. This transformation can be carried out via both biological and non-biological processes. Important processes in the nitrogen cycle include Fixation, mineralization, nitrification, denitrification. The majority of Earth's atmosphere (approximately 78%) is nitrogen.

WHAT IS NITROGEN CYCLE?

Nitrogen cycle is a biogeochemical process through which nitrogen is converted into many forms. Consecutively passing from the atmosphere to the soil to organism and back into the atmosphere. It involves several processes such as Nitrogen Fixation, nitrification, denitrification, decay and putrefaction.

The nitrogen gas exists in both organic and inorganic forms. Organic nitrogen exists in living organisms, and they get passed through the food

chain by the consumption of other living organisms. Inorganic forms of nitrogen are found in abundance in the atmosphere.

This nitrogen is made available to plants by symbiotic bacteria which can convert the inert nitrogen into a usable form - such as nitrates and nitrites.

Nitrogen undergoes various types of transformation to maintain a balance in the ecosystem. Furthermore, this process extends to various biomes, with the marine nitrogen cycle being one of the most complicated biogeochemical cycle.

NITROGEN CYCLE DEFINITION:

"Nitrogen Cycle is a biogeochemical process which transforms the inert nitrogen present in the atmosphere to a more usable form for living organisms."

Furthermore, nitrogen is a key nutrient element. For plants, however, the abundant nitrogen in the atmosphere cannot be used directly by plants or animals.

WHERE CAN YOU FIND IT?:

Page - 3

Let's start with the main sources of nitrogen.

Nitrogen gas is the most abundant element in our atmosphere. The other main source of nitrogen is in the nitrates of soil. The nitrogen in the atmosphere cannot be used while the nitrates in the soil can be able used by plants. Nitrogen can be converted into useful "nitrate" compounds by bacteria, algae, and even lightning. Once in the soil, the nitrogen becomes biologically accessible.

BORROWING NITROGEN:

Plants are the main users of nitrogen in the soil. They are able to take in the nitrates through their root system. Once inside the plant, the nitrates are used in organic compound that let the plant survive. Organic compounds have carbon atoms. Those compounds might be proteins, enzymes, or nucleic acids.

Once the plants have converted the nitrogen, the element can be returned to the soil or taken up by animals.

Page - 4

Herbivores eat plants and convert many of the amino acids into new proteins. Omnivores that eat both plants and animals are able to take in the nitrogen rich compounds as well. The nitrogen compounds are only borrowed. Nitrogen atoms are returned to the soil in poop and dead organisms. Once in the soil, the whole process can start again.

■ STAGES OF NITROGEN CYCLE:

process of Nitrogen cycle consists of the following steps — Nitrogen Fixation, Nitrification, Assimilation, Ammonification and Denitrification. These processes take place in several stages and are explained below:-

NITROGEN FIXATION:

It is the initial step of the nitrogen cycle. Here, Atmospheric nitrogen (N_2) which is primally available in an inert form, is converted into the useable form - ammonia (NH_3).

During the process of Nitrogen fixation, the inert

Form of nitrogen gas is deposited into soil from the atmosphere and surface water.

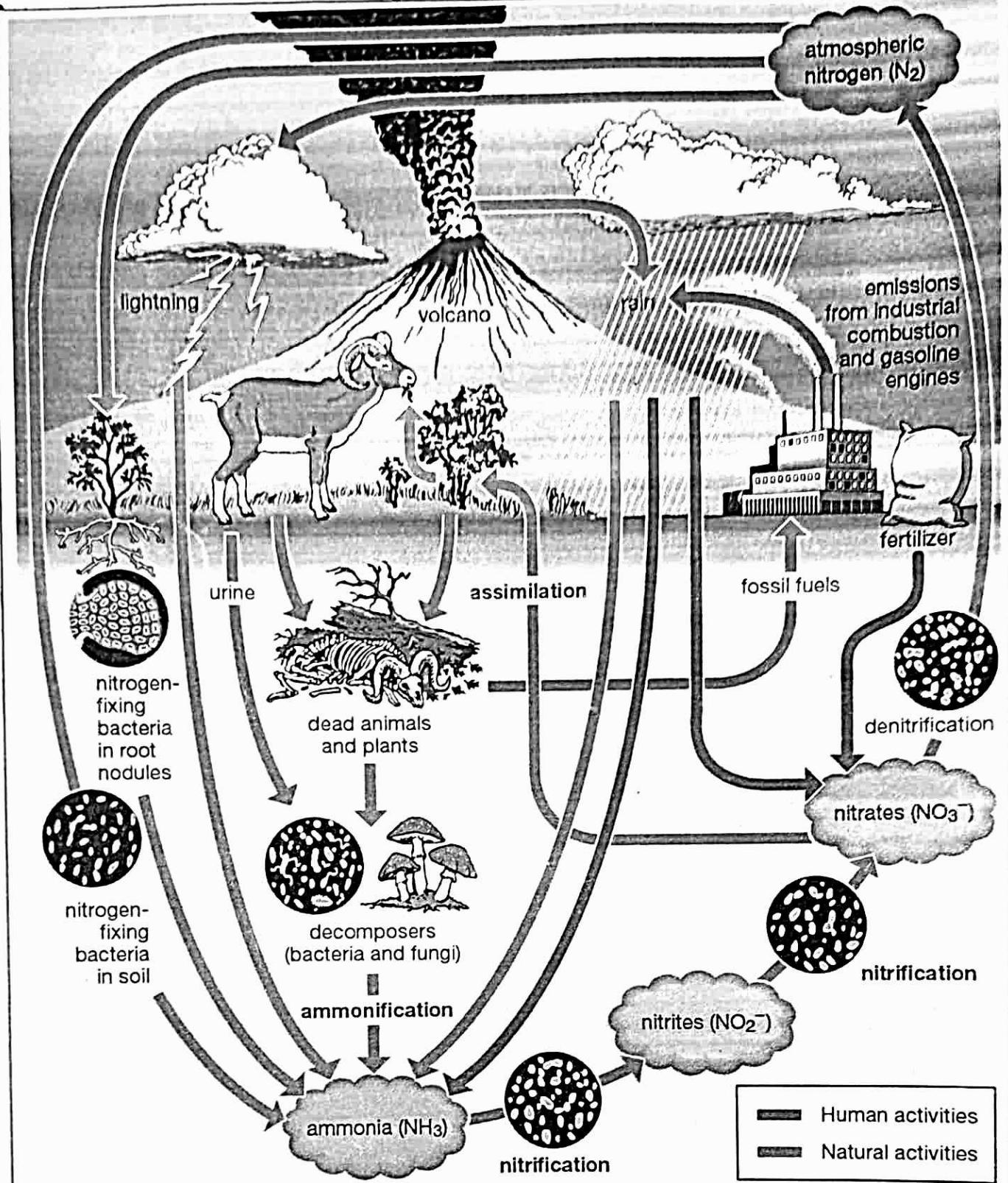
mainly through precipitation. Later, the nitrogen undergoes a set of changes, in which two combine with nitrogen atoms get separated and combine with hydrogen to form ammonia (NH_4^+).

The entire process of Nitrogen fixation is completed by symbiotic bacteria which are known as Diazotrophs. Azotobacter and Rhizobium also have a major role in this process. These bacteria consist of a nitrogenase enzyme which has the capability to combine gaseous nitrogen with hydrogen to form ammonia.

Nitrogen fixation can occur either by the atmospheric fixation - which involves lightning or industrial fixation by manufacturing ammonia under high temperature and pressure condition. This can also be fixed through man-made processes, primarily industrial processes that create ammonia and nitrogen-rich fertilizers.

TYPES OF NITROGEN FIXATION:

1. Atmospheric fixation: A natural phenomenon where the energy of lighting breaks the nitrogen into nitrogen oxides and is then used by plants.



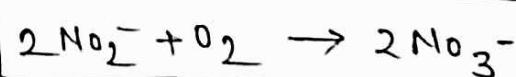
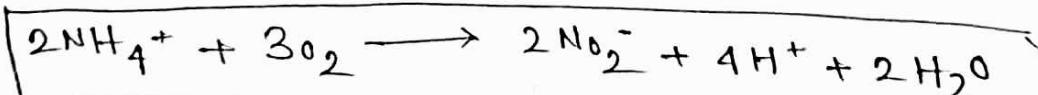
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2. Industrial nitrogen fixation: Is a man-made alternative that aids in nitrogen fixation by the use of ammonia. Ammonia is produced by the direct combination of nitrogen and hydrogen and later, it is converted into various fertilizers such as urea.

3. Biological nitrogen fixation: We already know that nitrogen is not usable directly from the air for plants and animals. Bacteria like Rhizobium and blue-green algae transform the unusable form of nitrogen into other compounds that are more readily usable. These nitrogen compounds get fixed in the soil by these microbes.

Nitrification In this process, the ammonia is converted into nitrate by the presence of bacteria in the soil. Nitrites are formed by the oxidation of Ammonia with the help of Nitrosomonas bacterium species. Later, the produced nitrites are converted into nitrates by Nitrobacter. This conversion is very important as ammonia gas is toxic for plants.

The reaction involved in the process of Nitrification is as follows:-



Assimilation: primary producers - plants take in the nitrogen compounds from the soil with the help of their roots. Which are available in the form of ammonia, nitrite ions, nitrate ions or ammonium ions are used in the formation of the plant and animal proteins. This way, it enters the food web. When primary consumers eat the plants.

Ammonification: When plants or animals die, the nitrogen present in the organic matter is released back into the soil. The decomposers, namely bacteria or fungi present in the soil, convert the organic matter back into ammonium. This process of decomposition produces ammonia, which is further used for other biological processes.

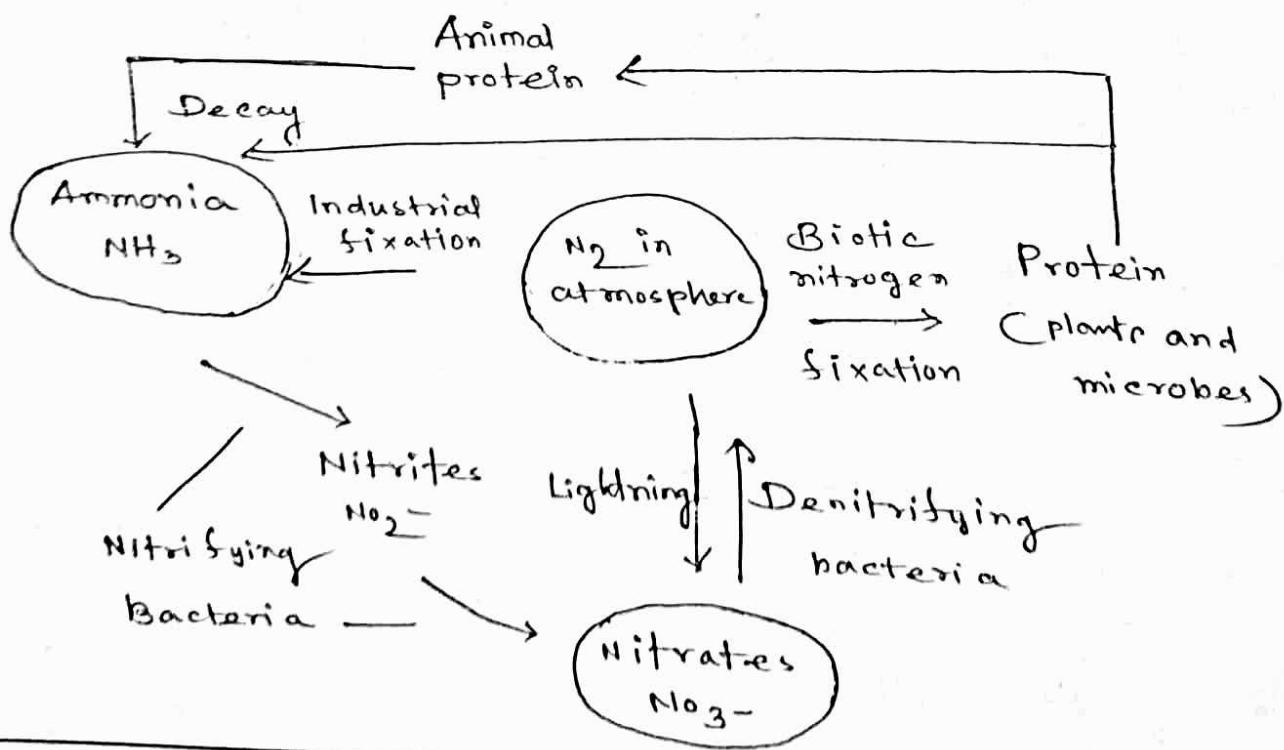


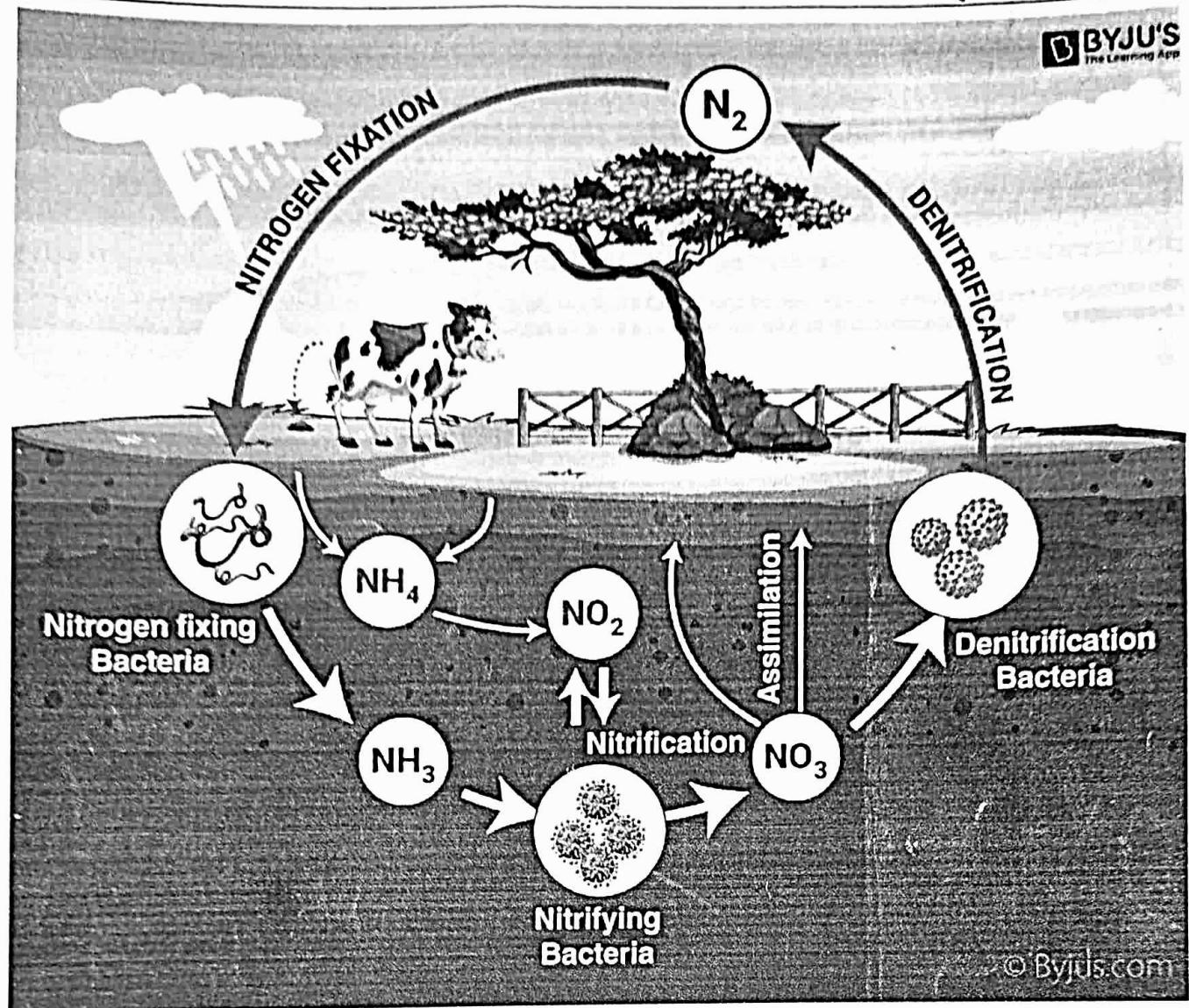
Diagram of Nitrogen cycle

DENITRIFICATION: Denitrification is the process in which the nitrogen compounds makes its way back into the atmosphere by converting nitrate (NO_3^-) into gaseous nitrogen (N). This process of the nitrogen cycle is the final stage and occurs in the absence of oxygen. Denitrification is carried out by the denitrifying bacterial species *Clostridium* and *pseudomonas*. Which will process nitrate to gain oxygen and give out free nitrogen gas as a byproduct.

IMPORTANCE OF NITROGEN CYCLE

Importance of the nitrogen cycle are as follows:

1. Helps plants to synthesise chlorophyll from the nitrogen compounds.
2. Helps in converting inert nitrogen gas into a useable form for the plant 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 the 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 component of the cell and it forms many crucial compounds and important biomolecules.

Nitrogen is 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 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

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I respect and thank Prof. N. C. Maiti, for providing me an opportunity to do the project work and giving us all support and guidance which made me complete the project duty. I am extremely thankful to him for providing such a nice support and guidance.

MANAGEMENT PLANNER

Jagannath Richi
signature