

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE

NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE : Nitrogen cycle and its Importance
for living beings.

NAME : RAJIBUL RAHAMAN.

COLLEGE ROLL NO: HIUG/110/19.

DEPARTMENT : HISTORY.

YEAR : 2020.

SIGNATURE : Rajibul Rahaman.

CONTENTS

- What is Nitrogen Cycle.
- Stages.
- In Marine Ecosystem.
- Importance.
- Conclusion.
- Acknowledgement.
- Certificate.

❑ Nitrogen Cycle Definition:-

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

Furthermore, nitrogen is a key nutrient elements for plants. However ; the abundant nitrogen in the atmosphere cannot 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 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.

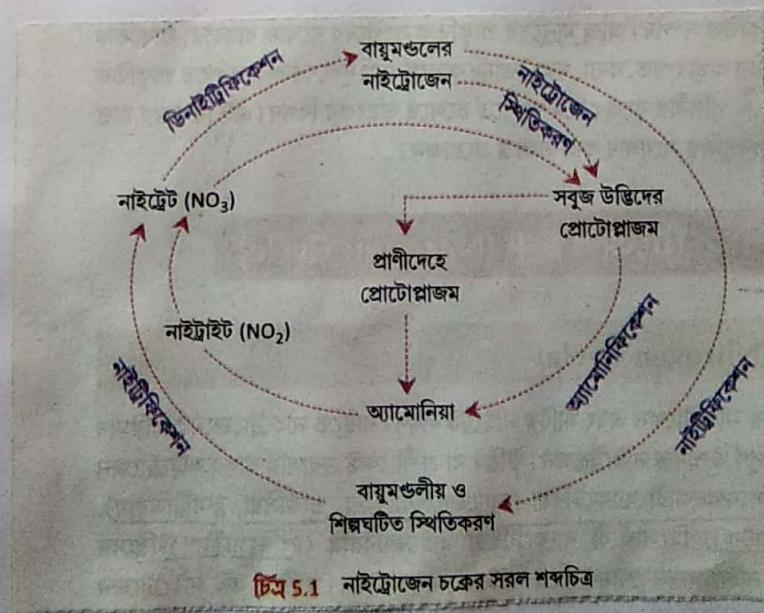
It involves several process such as nitrogen fixation, nitrification ; denitrification , decay and parasitism.

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

food chain by the consumption of other living organism.

Inorganic forms of nitrogen are found in abundance in the atmosphere. The nitrogen is made available to plants by symbiotic bacteria which can fix nitrogen 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, Assilation, Ammonification and Denitrification. The 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 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 developed into soils 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 of Nitrogen fixation is completed by symbiotic bacteria which are known as *Diazotrophs*. *Azotobacter* and *Rhizobium* also has a major role in this process. These bacteria consists of a nitrogenase 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 process, primarily industrial processes that credit 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 :- 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 fertilisers such as urea.

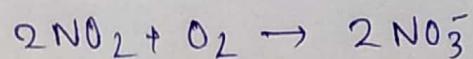
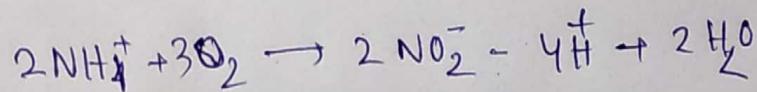
3. Biological Nitrogen fixation :- We already known that nitrogen is not usable directly from the air for plants and animals. Bacteria like Rhizobium and blue-green algae transform the unusable and blue-form of nitrogen into other compounds that are

more readily usable, these nitrogen compounds get fixed in the soil by these microbes.

① Nitrification :-

In this process, the ammonia is converted into nitrate by the presence of bacteria in the soil. Nitriles are formed by the oxidation of Ammonia with the help of Nitrosomonas bacterium species, later, the produced nitriles are converted into nitrotes by Nitrobacter, this conversion is very important as ammonia gas is toxic for plants.

This plants involved in the processes of Nitrification is as follows:



② Assimilation :-

primary producers - photos 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 ion or of the plant and animal proteins, this way, it enters the food web when the primary consumer eat the plants.

H1104/11019

• Ammonification :- When plants or animals die, the nitrogen present in the organic 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.

• Denitrification :-

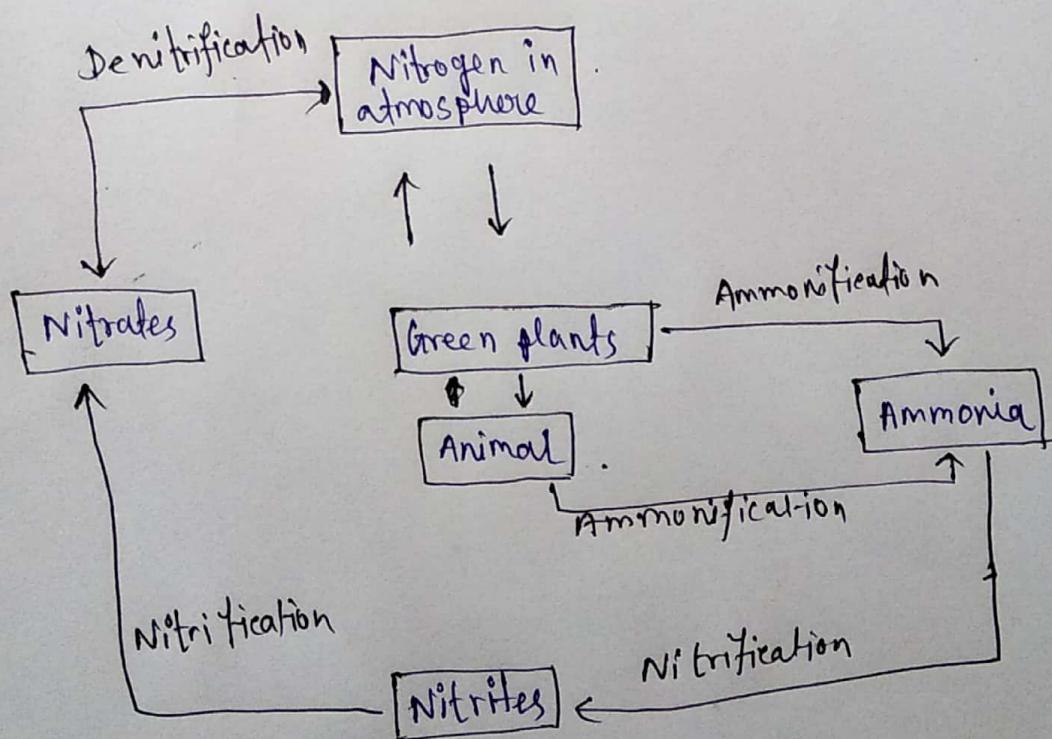
Denitrification is the process in which the nitrogen compound makes its way back into the atmosphere by converting nitrate(NO_3^-) into gaseous nitrogen(N). This process of the nitrogen cycle is the final stage and occurs in the absence of oxygen. Denitrification is carried out by the denitrifying bacterial species - *Edwardsiella* and *Pseudomonas*, which will process nitrate to gain oxygen and gives out the nitrogen gas as byproduct.

■ Nitrogen cycle in Marine Ecosystem :

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

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

Schematic Diagram:



H11Ubt/110/19

■ Importance of Nitrogen Cycle :-

1. Helps plants to synthesise chlorophyll from the nitrogen compounds.
2. Helps in converting fixed nitrogen gas into a usable form for the plants through the biochemical process.
3. In the process of ammonification, the bacteria help in decomposing the animal and plant matter which indirectly helps to clean up the environment.
4. Nitrogen and nitrates 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 atmosphere nitrogen into nitrogen compounds that can be used by 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 nitrogen cycle, bacteria and fungi help decompose organic matter, where the nitrogenous compounds get dissolved into the soil which is again used by plants.
- 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 : 15.11.20

Rajibul Rahaman

Signature of the
student

-: CERTIFICATION :-

Certified that the project work submitted by Rajibul Rahaman is done under the supervision of my honorable sig as a part of curriculum for the partial fulfilment of the class- UG 2nd semester.

Date: _____

signature of teacher

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

*Nitrogen cycle and its importance
for living beings*

NAME : RAKTIM MAITY

COLLEGE ROLL NO : PHUG/212/19

DEPARTMENT : PHYSICS

YEAR : 2020

SIGNATURE : Raktim Maity

College Roll no - PHUG /212/19

CONTENTS

- What is Nitrogen Cycle
- Stages
- In Marine Ecosystem
- Importance
- Conclusion
- Acknowledgement
- Certificate

Nitrogen Cycle Definition

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

Furthermore, nitrogen is a key nutrient elements for plants. However, the abundant nitrogen in the atmosphere cannot 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 ?

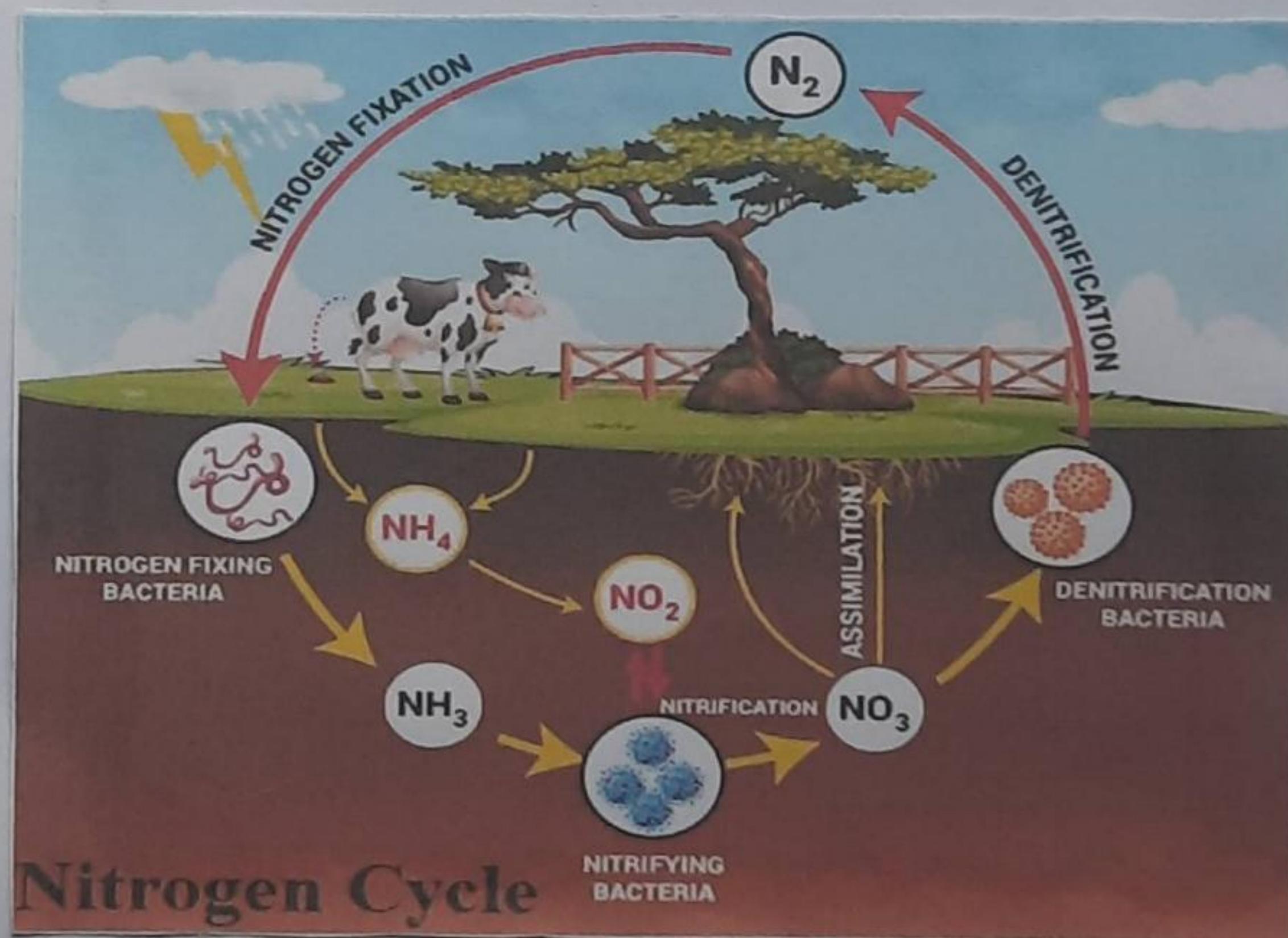
Nitrogen cycle is a biogeochemical process through which nitrogen is converted into many forms, consecutively passing from the atmosphere to the soil to organism and back into the atmosphere.

It involves several process 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 processes take place in several stages and are explained below :

① Nitrogen fixation

It is 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 soils 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 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 fertilisers.

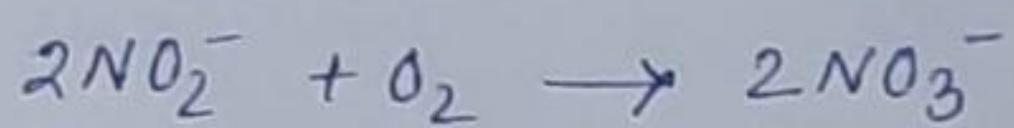
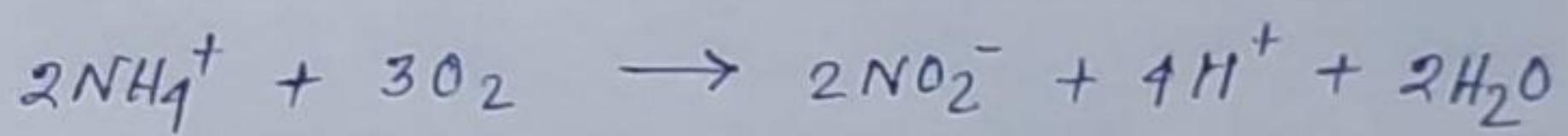
● Types of Nitrogen Fixation

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: 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 fertilisers 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.

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



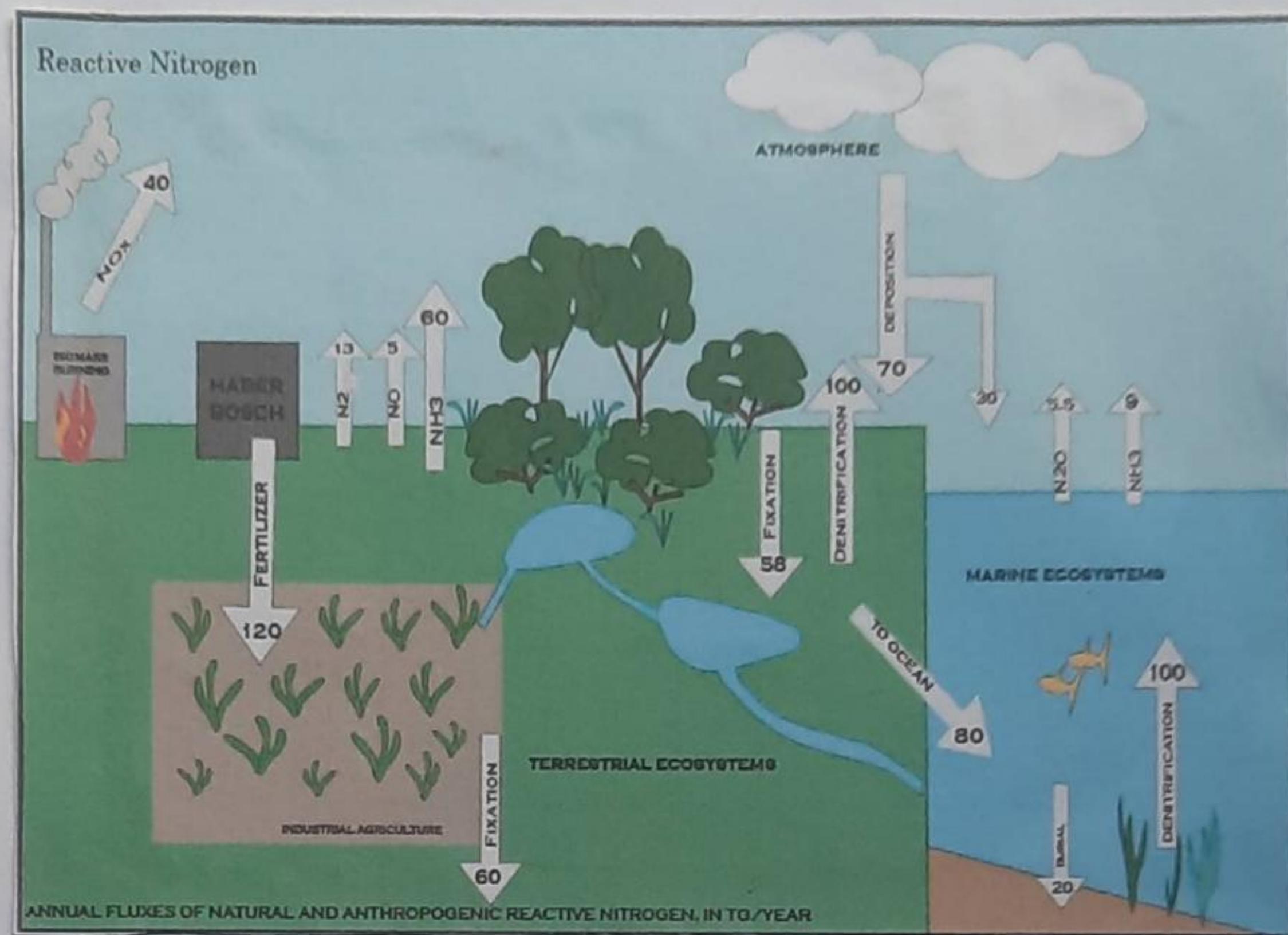
● Assimilation

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 plant 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 soil, convert the organic matter back into ammonium.

This process of decomposition produces ammonia, which is further used for other biological processes.



⑩ Denitrification

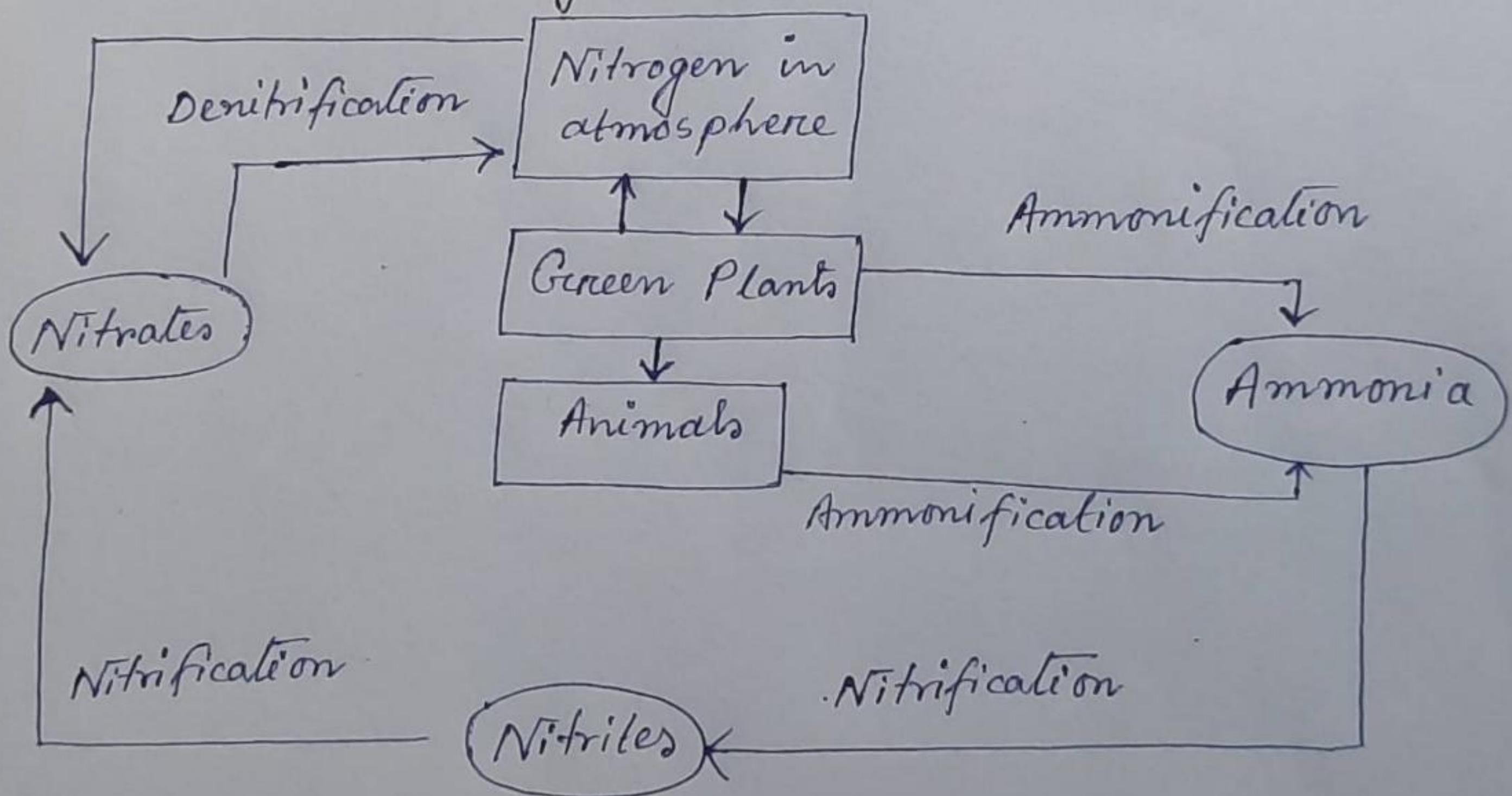
Denitrification is the process in which the nitrogen compounds makes its way back into the atmosphere by converting nitrate (NO_3^-) into gaseous nitrogen (N). This process of the nitrogen cycle is the final stages and occurs in the absence of oxygen. Denitrification is carried out by the denitrifying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

IV Nitrogen cycle in Marine Ecosystem

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

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

V Schematic Diagram



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 usable form for the plants through the biochemical process.
3. In the process of ammonification, the bacteria help in decomposing the animal and plant matter which indirectly helps to clean up 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 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 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 through out the course of investigation.

Date : 12/11/20

Raktim Maity

Signature of the
Student

□ CERTIFICATE □

Certified that the project work submitted by Raklim Maiti is done under the supervision of my honourable 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:

*Nitrogen cycle and its importance
for living beings*

NAME : RAKTIM MAITY

COLLEGE ROLL NO : PHUG/212/19

DEPARTMENT : PHYSICS

YEAR : 2020

SIGNATURE : Raktim Maity

College Roll no - PHUG /212/19

CONTENTS

- ① What is Nitrogen Cycle
- ② Stages
- ③ In Marine Ecosystem
- ④ Importance
- ⑤ Conclusion
- ⑥ Acknowledgement
- ⑦ Certificate

Nitrogen Cycle Definition

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

Furthermore, nitrogen is a key nutrient elements for plants. However, the abundant nitrogen in the atmosphere cannot 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 ?

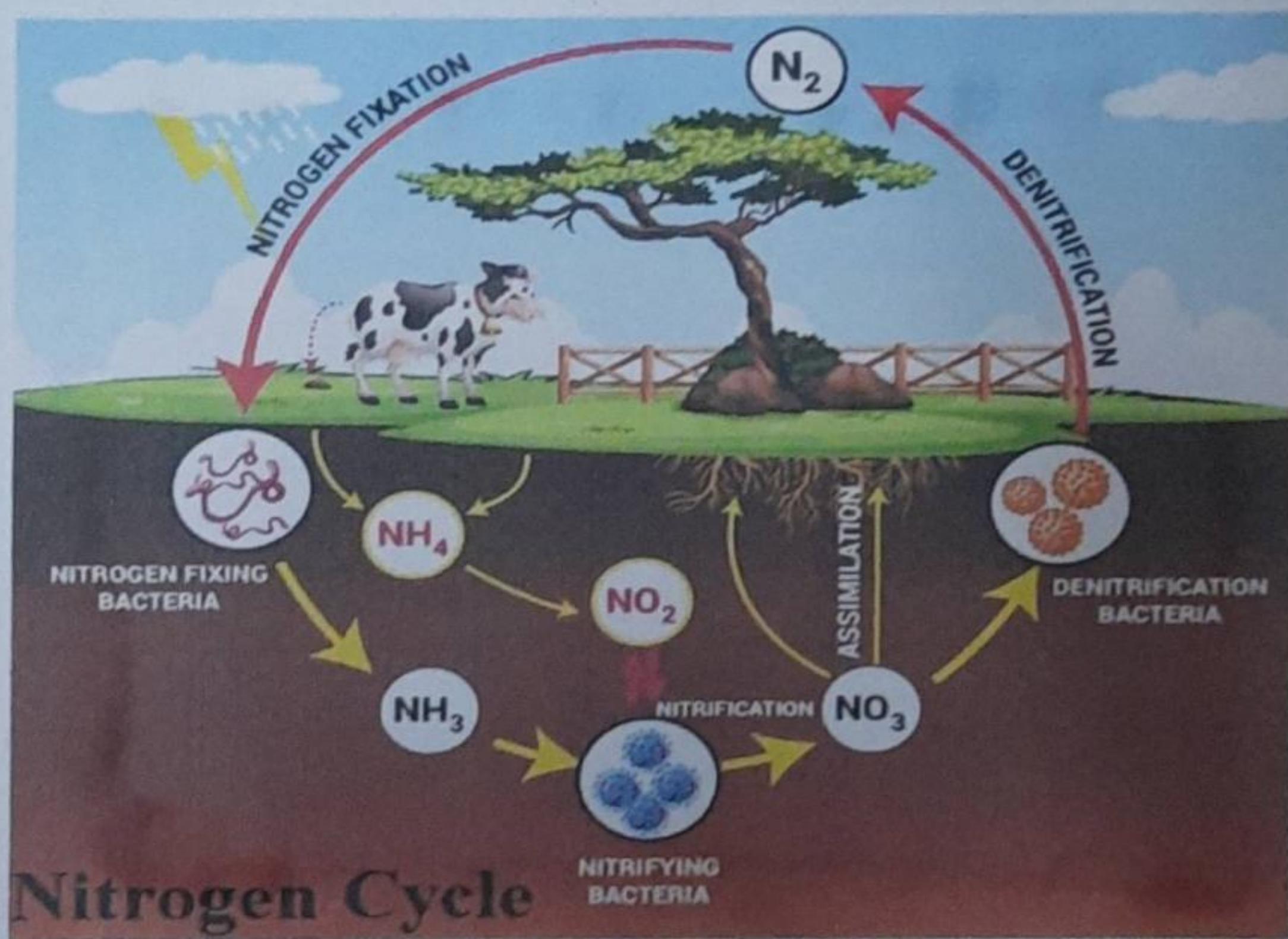
Nitrogen cycle is a biogeochemical process through which nitrogen is converted into many forms, consecutively passing from the atmosphere to the soil to organism and back into the atmosphere.

It involves several process 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 processes take place in several stages and are explained below:

① Nitrogen fixation

It is 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 soils 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 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 fertilisers.

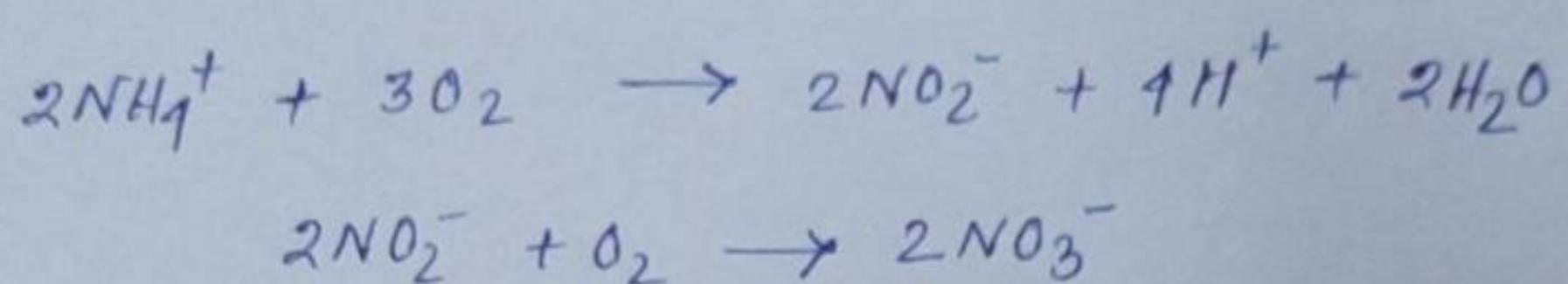
● Types of Nitrogen Fixation

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: 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 fertilisers 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. Nitrates are formed by the oxidation of Ammonia with the help of Nitrosomonas bacterium species. Later, the produced nitrates are converted into nitrates by Nitrobacter. This conversion is very important as ammonia gas is toxic for plants.

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



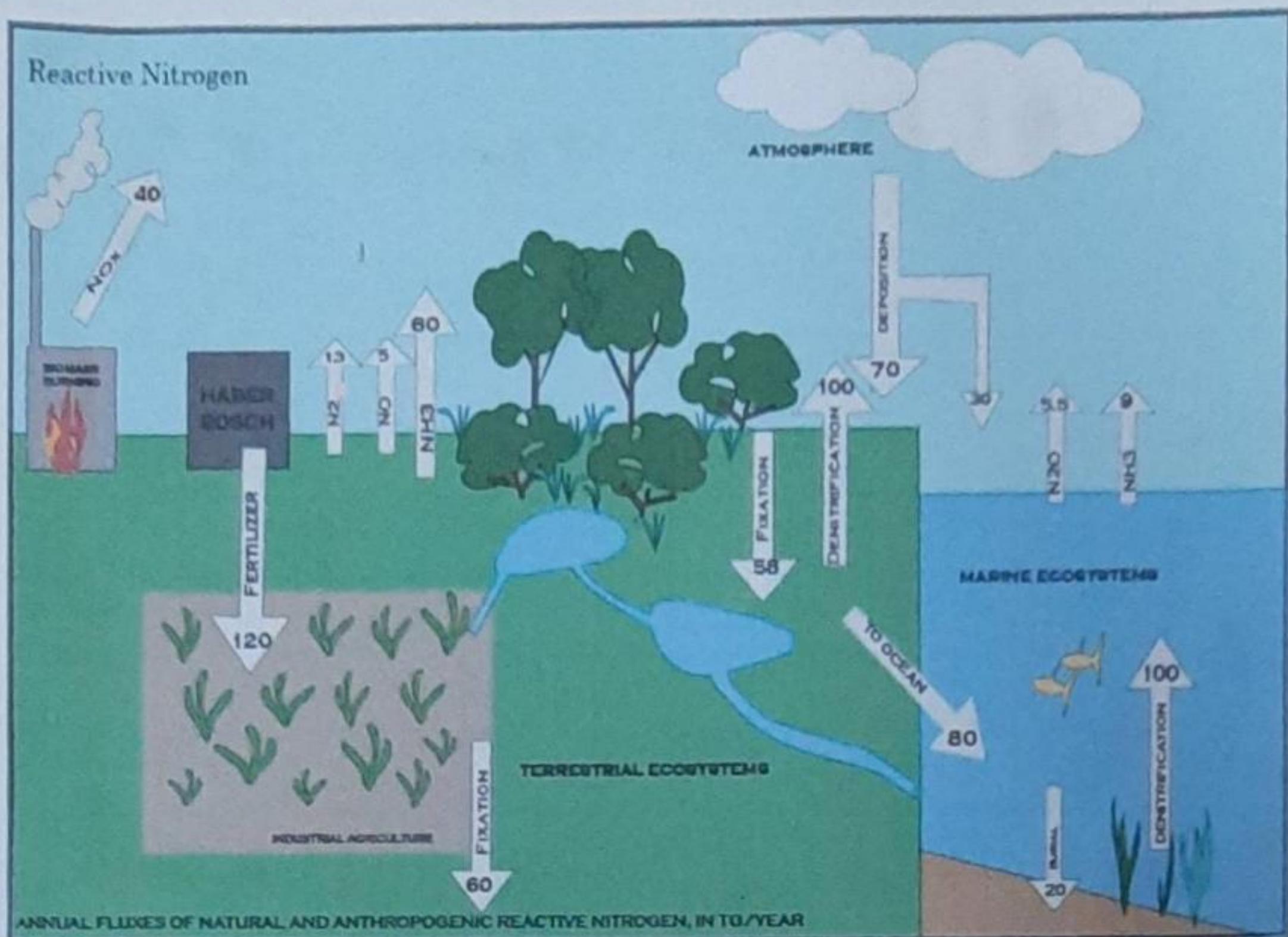
● Assimilation

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 plant 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 soil, convert the organic matter back into ammonium.

This process of decomposition produces ammonia, which is further used for other biological processes.



④ Denitrification

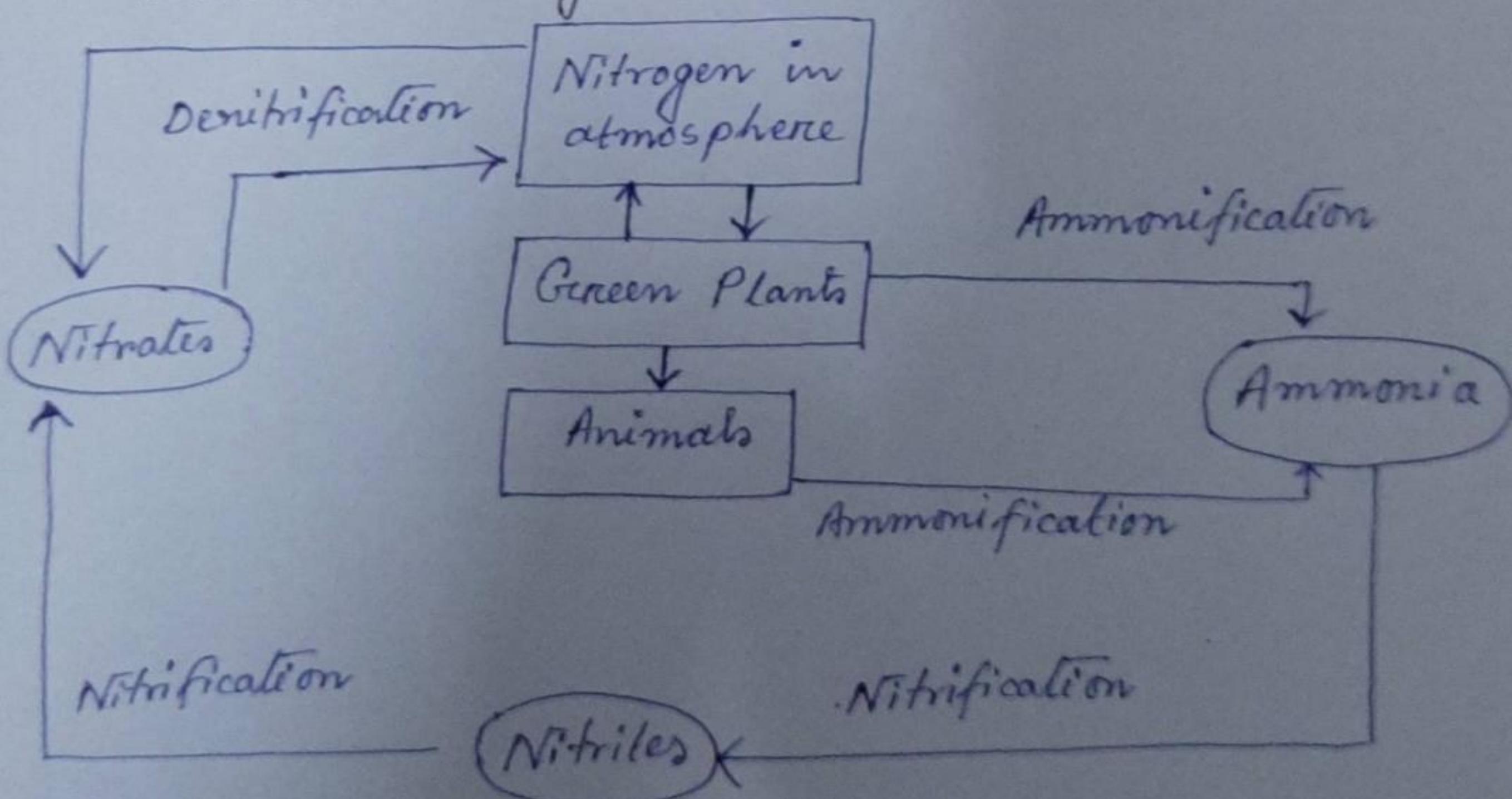
Denitrification is the process in which the nitrogen compounds makes its way back into the atmosphere by converting nitrate (NO_3^-) into gaseous nitrogen (N). This process of the nitrogen cycle is the final stages and occurs in the absence of oxygen. Denitrification is carried out by the denitrifying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

III Nitrogen cycle in Marine Ecosystem

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

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

III Schematic Diagram



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 usable form for the plants through the biochemical process.
3. In the process of ammonification, the bacteria help in decomposing the animal and plant matter, which indirectly helps to clean up the environment.
4. Nitrates and nitriles 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 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 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 through out the course of investigation.

Date:

Raktim Maity

Signature of the
Student

□ CERTIFICATE □

Certified that the project work submitted by Raktim Maity is done under the supervision of my honourable 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:

Nitrogen Cycle and It's Importance For
Living Beings

NAME : Riddhick Datal

COLLEGE ROLL NO : CSUGI/045/19

DEPARTMENT : Computer Science

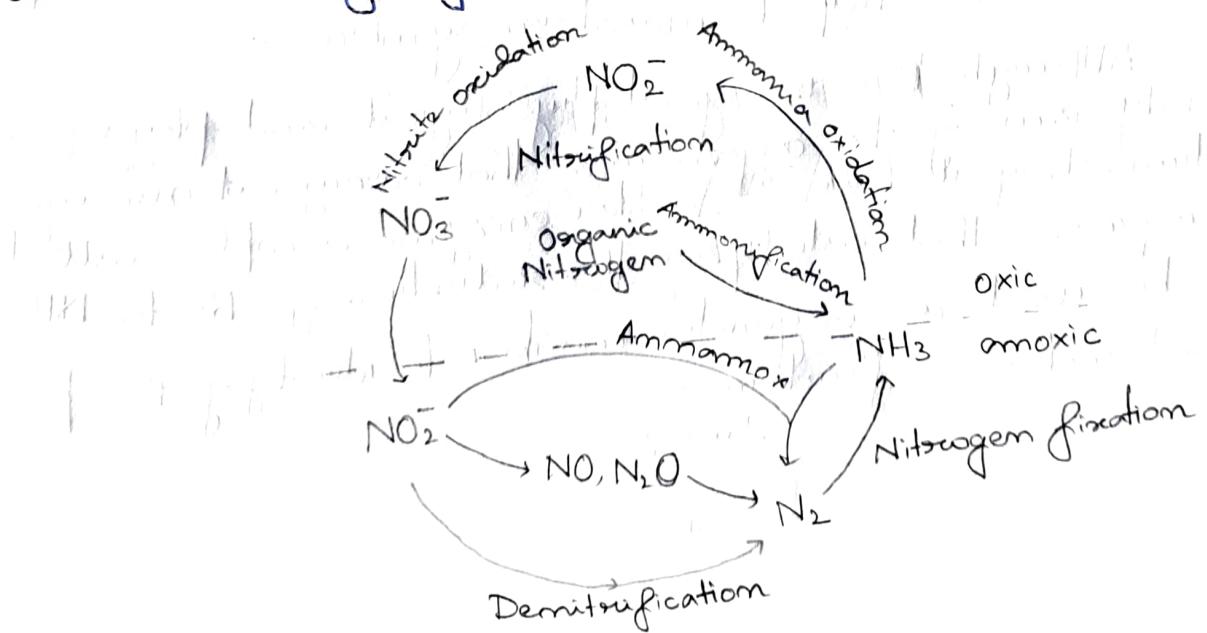
YEAR : 2020

SIGNATURE : Riddhick Datal

Introduction:

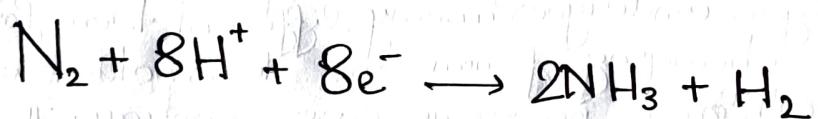
Nitrogen is one of the primary nutrients, critical for the survival of all living organisms. It is a necessary component of many biomolecules, including proteins, DNA and chlorophyll. Although nitrogen is very abundant in the atmosphere as dinitrogen gas (N_2), it is largely inaccessible in this form 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 and organic forms. Thus, nitrogen undergoes many different transforms in the ecosystem, changing from one to another as organisms use it for growth and, in some cases, energy. The major transformations of nitrogen are nitrogen fixation, nitrification, denitrification, ammonox and ammonification. The transformation of nitrogen into its many oxidation states is key to productivity in the biosphere and is highly dependent on the activities of a diverse assemblage of microorganisms, such as bacteria, archaea, and fungi.



Nitrogen Fixation

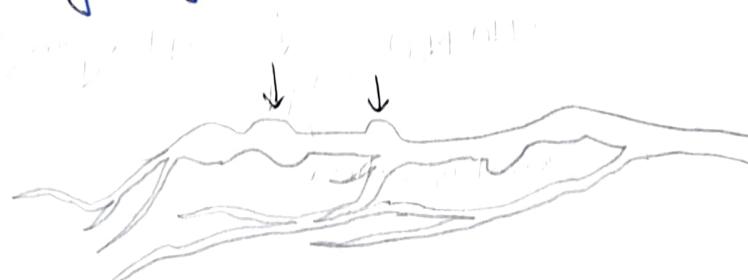
Nitrogen gas (N_2) makes up nearly 80% of the earth's atmosphere. But plants and animals are not able to use nitrogen gas in that form. The process of converting N_2 into biologically available nitrogen is called nitrogen fixation. N_2 is a very stable compound due to the strength of the triple bond between the nitrogen atoms, and it requires a large amount of energy to break its bond. The whole process requires eight electrons and at least 16 ATP molecules. As a result only a selected group of prokaryotes are able to carry out this energetically demanding process.



Chemical reaction of Nitrogen fixation

Some nitrogen-fixing organisms are free-living while others are symbiotic nitrogen fixers, which require a close association with a host to carry out the process. Most of the symbiotic associations are very specific and have complex mechanisms that help to maintain symbiosis.

Although there is a 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 nitrogeen fixation.

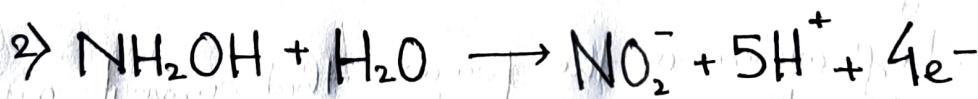
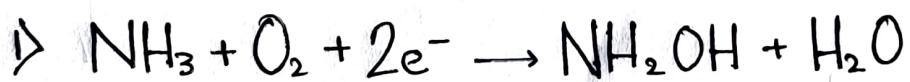


Nitrogen-fixing modules on a clover plant root

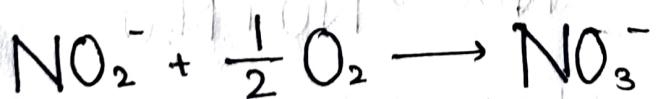
Nitrification:

Nitrification is the process that converts ammonia to nitrite and then to nitrate, and it is another important step in the nitrogen cycle. Most nitrification occurs aerobically and is carried out exclusively by prokaryotes.

There are two distinct steps of nitrification that are carried out by distinct types of microorganisms. The first step is the oxidation of ammonia to nitrite, which is carried out by microbes known as ammonia-oxidizers. As Aerobic ammonia oxidizers convert ammonia to nitrite via the intermediate hydroxylamine, a process that requires two different enzymes, ammonia monooxygenase and hydroxylamine oxidoreductase.

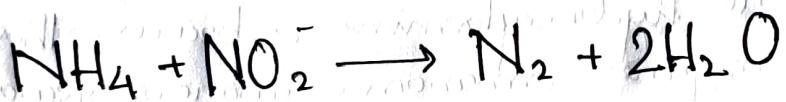


The second step in nitrification is the oxidation of nitrite (NO_2^-) to nitrate (NO_3^-). This step is carried out by a completely separate group of prokaryotes, known as nitrite-oxidizing Bacteria.



Anammox:

Traditionally, all nitrification thought to be carried out under aerobic conditions, but recently a new type of ammonia oxidation occurring under anoxic conditions was discovered. Anammox is carried out by prokaryotes belonging to the Planctomycete phylum of Bacteria. The first described anammox bacterium was Brocadia anammoxidans. Anammox bacteria were first discovered in anoxic bio-reactors of wastewater treatment plants. It is clear that Anammox represents an important process in global nitrogen cycle.

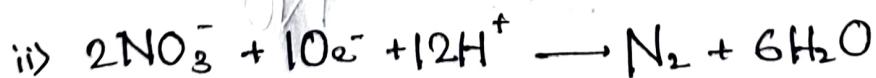
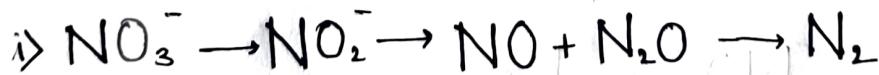


Chemical reaction of anaerobic ammonia oxidation



Denitrification:

Denitrification is the process that converts nitrate to nitrogen gas, thus removing bioavailable nitrogen and returning it to the atmosphere. Dinitrogen gas (N_2) is the ultimate end product of denitrification, but other intermediate gaseous forms of nitrogen exist.



Reactions involved in denitrification

Denitrification is important in that it removes fixed nitrogen from ecosystem and returns it to the atmosphere in a biologically inert form (N_2).

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 in the ecosystem as ammonia. The ammonia then becomes available for uptake by plants and other microorganisms for growth.

Ecological Implications of Human Alterations to the 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 ecosystem. And because nitrogen availability often limits the primary productivity of many ecosystems, large changes in the availability of nitrogen can lead to severe alterations of the nitrogen cycle in both aquatic and terrestrial ecosystem.

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.

Importance of Nitrogen Cycle:

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

Summary:

Nitrogen is arguably the most important nutrient in regulating primary productivity and species diversity in both aquatic and terrestrial ecosystems.

Microbially-driven processes such as nitrogen fixation, nitrification and denitrification, constitute the bulk of nitrogen transformations, and play a critical role in the fate of nitrogen in the Earth's ecosystem.

Want of knowledge regarding the nitrogen cycle and its impact on species is being highlighted by various experts.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

NAME : RIK NANDI
COLLEGE ROLL NO : ENUG/184/19
DEPARTMENT : ENGLISH
YEAR : 2020
SIGNATURE : Rik Nandi

Project Topic

Water Pollution and measures to control it :-



Introduction :-

Water is typically referred to as polluted when it is impeded by anthropogenic contaminants. Due to these contaminants it does not support a human use, such as drinking water, or undergoes a marked shift in its ability to support its biotic community such as fish. Natural phenomena such as Volcanoes, algae blooms, storms and earthquakes also cause major changes in water quality and the ecological status of water.

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

The organisation Global oceanic environment survey consider water pollution as one of the main environmental problems.

One of the main concerns, is that water pollution, harm Phytoplakton who produce 70% of oxygen and remove a large part of carbon dioxide on earth. The organisations proposes a number of measures for fixing the situation, but they should be taken in the next 10 years for being effective.

India and China are two countries with high levels of water pollution. An estimated 580 people in India die of water pollution related illness everyday. About 90% of the water in the cities of China is polluted.



In addition to the acute problems, of water pollution in developing countries, developed countries also continue to struggle with water pollution. For example, in a report on water quality in the United States in 2009, 44% of assessed bays and estuarine miles, 64% of streams miles were classified as polluted.

* Brief Discussion

Definition, source and causes :-

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 underground water. water pollution results when contaminants are introduced into the natural environment. For example, 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 ~~still~~ living down stream. 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.



Water pollution can be classified as surface water or ground water pollution.

The causes of water pollution include a wide range of chemicals as well as physical parameters. Contaminants may include organic and inorganic substances.

Water pollution is measured by analysing water samples. Physical, chemical and biological tests can be conducted. Control of water pollution requires appropriate infrastructure may include wastewater treatment plants.

Sewage treatment plants and industrial wastewater treatment plants are usually required to protect water bodies from untreated wastewater.

Water pollution has become a major issue now-a-days, it leads to lot of harm to the human lives. Measures should be taken to prevent this problem.

Agricultural wastewater treatment for farming, and erosion control at construction sites can also help prevent water pollution. Nature based solution are another approach to prevent urban runoffs. Quality and quantity of water pollution includes reduction speed and states, best management practices for water pollution include approaches to manage flow. In the united states, best management practices for water pollution and improve water quality to reduce the quantity of water

Sources of Water Pollution:-

These are the main sources of water pollution; Point sources and the non-point sources. Point source include factories, wastewater treatment facilities, septic systems, and other sources that are clearly discharging pollutants into water sources. Non-Point sources are more difficult to identify - because they cannot be tracked or traced back to a particular location. It include runoff including sediment, fertilizers, chemicals and animal wastes from farms, fields, construction sites and mines.

The United States Environment Protection Agency divides water pollution into following six categories:

- (i) Biodegradable waste.
- (ii) Plant nutrients, such as Phosphates and Nitrates.
- (iii) Heat.
- (iv) Hazardous and Toxic chemicals
- (v) Sediment
- (vi) Radioactive Pollutants.

Causes of water Pollution

The causes of water pollution are as follows:-

- (i) Urbanisation
- (ii) Deforestation
- (iii) Damming of Rivers
- (iv) Destruction of wetland
- (v) Industries
- (vi) Mining
- (vii) Agriculture
- (viii) Energy use
- (ix) Accidental water pollution.

- The physical disturbance of land due to construction of houses, industries, roads etc.
- bottom dwelling plants cannot photosynthesize as the sun's rays cannot reach them.
- Enhanced eutrophication may result due to the water spending a longer time in the dam.
- pH of water, color of water, amount of nutrients.
- Destroys the habitat of many birds and fish.
- Can increase the dirtiness of water.
- increases soil erosion.

Measures to Prevent Water Pollution

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

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

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

Other than these are few simple steps which can be followed to save and conserve water.

- Conserve water by turning off the tap water when running water is not necessary. This helps prevent water shortages and reduces the amount of contaminated water that needs treatment.
- Be careful about what you throw down your sink or toilet. Don't throw paints, oils or other forms of litter down the drain. Use environmentally friendly products such as washing powders, household cleaning agents and toiletries.
- Take great care not to overuse pesticides and fertilizers. This will prevent runoffs of the material into nearby water sources.
- By having more plants in your garden, you are preventing fertilizers, pesticides and contaminated water from running off into nearby water sources.
- Don't throw litter into rivers, lakes or oceans. Help clean up any litter you see on beaches or in rivers and lakes and put it in trash bins.

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: AIR POLLUTION IN CITIES
AND MEASURES TO CONTROL IT

NAME : RUDRA DHARA
COLLEGE ROLL NO : PHUG/130/19
DEPARTMENT : PHYSICS
YEAR : 2020
SIGNATURE : *Rudra Dhara*

CONTENTS

<u>Topic</u>	<u>Page No.</u>
• Introduction and definition of Air Pollution	1
• Air Pollutants in Cities	1 - 3
• cause of air pollution in cities	4
• Effects of Air Pollution in Cities	4 - 8
• Measures to control Air Pollution	8 - 12
• conclusion	12
• Acknowledgement	13
• Certificate	14

AIR Pollution In Cities and Measures

To Control It :-

From the begining of human civilization, man started to exploit the nature. In twentyfirst century, massive urbanisation not only making disaster to the nature but creating major issues to the man also.

In cities this pollution is intensified, spacially air pollution. Air pollution is creating major health issues which is a major problem in the planet.

Air Pollution:-

Air pollution is the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or caused damage to the climate or different objects.

Air Pollutants in the Cities and Sources:

As cities are filled with industries, cars, and people. It is the source almost all kind of pollutants.

Different pollutant and sources are :-

① Carbondioxide (CO_2) :-

CO_2 is the main 'green house gas' which causes 'global warming'. It reduce the O_2 level in air.

It is mainly produced by cars and industries due to burning of fossil fuel.

② Sulfur Oxides (SO_x) :-

SO_x in atmosphere converted to H_2SO_4 in moist. It causes acid rain.

It is also poisonous.

It is mainly produced by fossil fuel, cars and petrochemical industries are common source of it.

③ Nitrogen Oxides (NO_x) :-

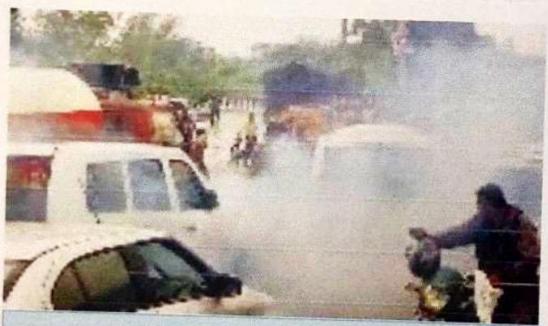
NO_x is a common green house gas and poisonous too.

It is mainly produced by cars.

④ carbonmonoxide (CO) :-

CO is very poisonous gas which may cause ~~det~~ death if intaked in large amount.

It is produced by the burning of fossil fuel.



AIR POLLUTION BY CARS

⑤ Volatile Organic Compounds (VOC) :-

VOC are well known outdoor air air pollutant. They are the organic compound generally used as solvent eg - Benzene, isoprene, terpenes methanol etc. They are very poisonous even if taken in small amount. It is proven that they cause cancer.

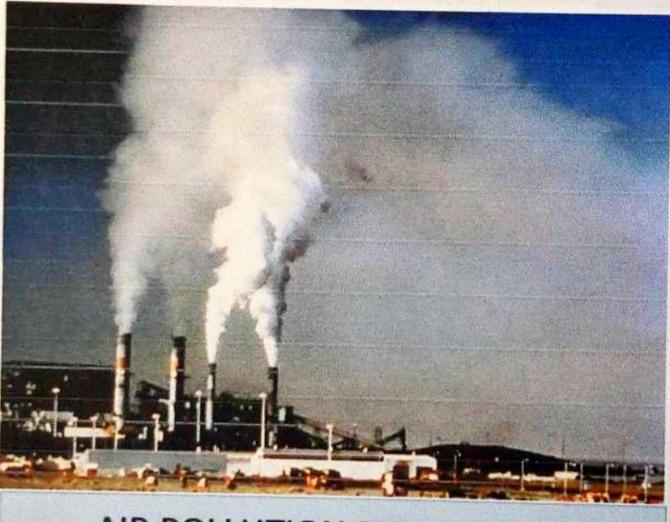
CH_4 is also a VOC which is not poisonous but it is a green house gas.

Mainly ~~to~~ households, cars, and chemical industries, paint are primary source of VOCs

⑥ SPM (Suspended particulate Matter) :-

Now-a-days SPM is major pollutant in urban areas. It is the suspended dust particle, asbestos, ash, and other harmful particles suspended in air as a ~~aerosol~~ aerosol.

⑦ Others:- CFC, phosphine, smoke etc are also air pollutant.



AIR POLLUTION BY INDUSTRY

Cause of Pollution in Air in Cities:-

- ① Cities have very high population densities.
- ② Large number of cars and industries operates in small area.
- ③ Less regulation of pollution sources.
- ④ Very poor tree to land ratio.

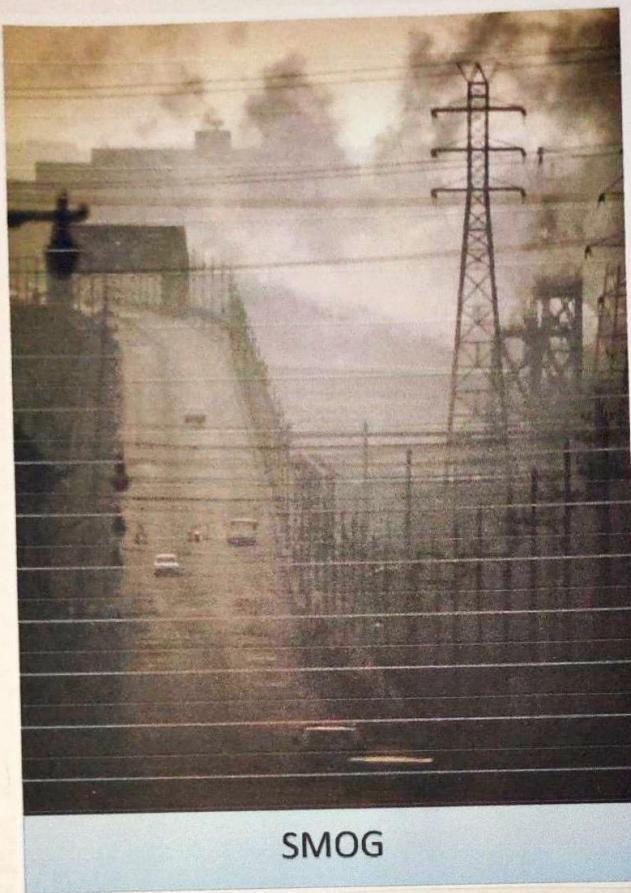
Effects of Air Pollution:-

There are many adverse effects of air pollution which are following:-

Smog:-

smoke + fog = Smog. Smog is a intense effect of air pollution. Man-made smog is derived from coal combustion emission, vehicular emissions, industrial emissions, and photochemical reaction.

Due to photochemical reaction ~~so~~ Smog is composed of ground level Ozone (O_3)



SMOG



AFTER AND BEFORE SMOG

PAN (Peroxyacetyl nitrate). Smog is a major problem for the cities like 'Los Angeles', 'New Delhi', 'Beijing', 'Lahore' etc.

One of the most dangerous type smog is photochemical smog. It is the chemical reaction of sunlight, NO_x , VOC in atmosphere, which leaves PAN ground level ozone.

Smog continues to harm human health in cities. It is harmful for senior citizens, children, and people with heart & lung conditions such as emphysema, bronchitis, and asthma. Smog is responsible for an estimated 9500 premature death in the year 2016 alone.

* Smog also causes cancer.

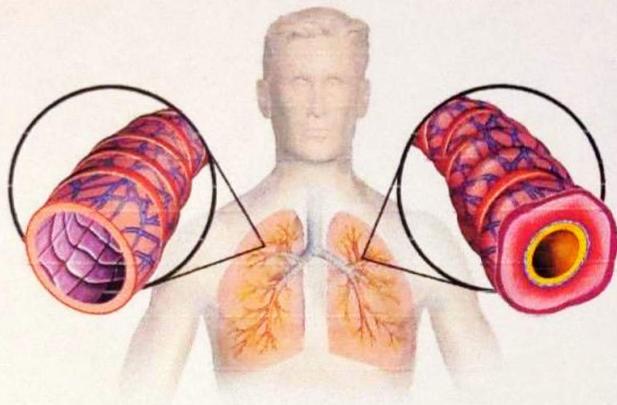
② Heat Island: Due to high concentration of greenhouse gasses and low tree to land ratio, city areas are now heated above the normal temperature. This increases storm and destabilizes normal rain wind.

③ Health effects:-

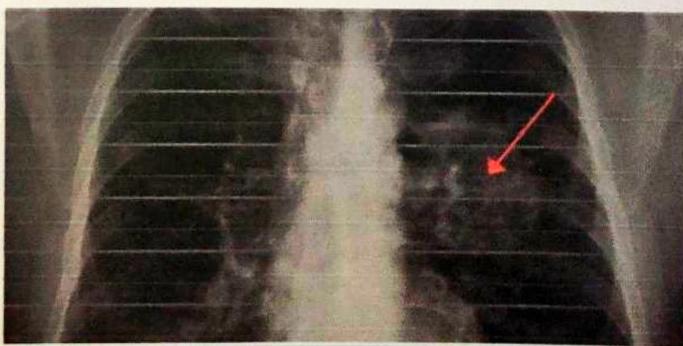
a) Mortality:- World Health Organization estimated in 2014 that every year air pollution causes the premature death of some 7 million people worldwide.

b) Cardiovascular disease:- A 2007 review of evidence found that ambient air pollution exposure is a risk factor correlating with increased total mortality from cardiovascular events (range: 12% to 14% per $10 \mu\text{g}/\text{m}^3$ increase)

c) Lung disease:- Research has demonstrated increased risk of developing asthma and COPD from increased exposure to traffic-related air pollution. Additionally, air pollution has been associated with increased hospitalization and



ASTHMA



LUNG CANCER

mortality from asthma and COPD.

chronic obstructive pulmonary disease (COPD) includes diseases such as chronic bronchitis and emphysema.

d) ~~The~~ Cancer:-

A review of evidence regarding whether ambient air pollution exposure is a risk factor for cancer in 2007 found solid data to conclude that longterm exposure to SPM and VOCs increase overall risk of cancer by 6%.

e) Affects children and other Animals:-

Due to pollution children are highly affected, and Many disease and death happen every year due to Airpollution.

Little animals and birds are also very affected, destroying the ecological balance.

④ Economic effects:

Air pollution costs the world economy '\$5 trillion' per year as a result of productivity losses and degraded quality of life, according to a study by the World Bank.

Measures to Control Air Pollution:-

Various pollution control technologies and strategies are available to reduce air pollution. Which are following :-

A.) Land-use Planning:

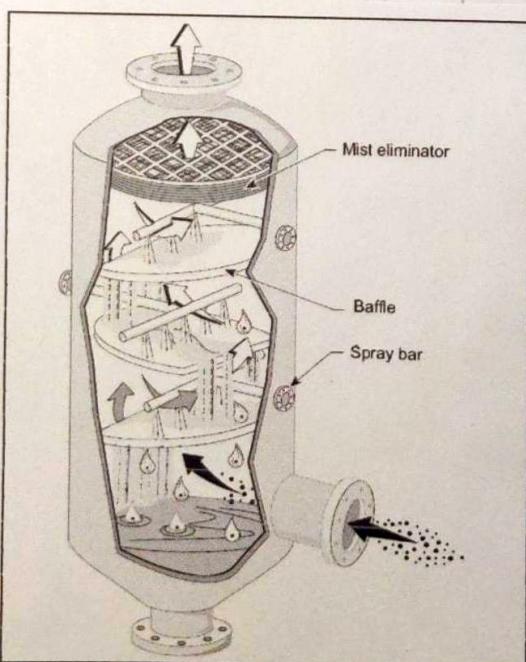
Using land in proper manner, increase forest areas in cities, removing heavy industry and regulation population density reduce the Airpollution in cities.

B.) Reduction of Fossil Fuel:-

Various efforts are taken to reduce fossil fuel. To reduce air pollution in cities we need to increase the number of solar cells and



ELECTROSTATIC PRECIPITATOR



BAFFLE SPRAY SCRUBBER

C) Plantation of Trees:

Trees are very good natural controllers of pollutants. Several varieties like snake plant, erica palm, aglonima etc, not only absorb CO_2 but also absorb VOCs.

D) Control Devices:

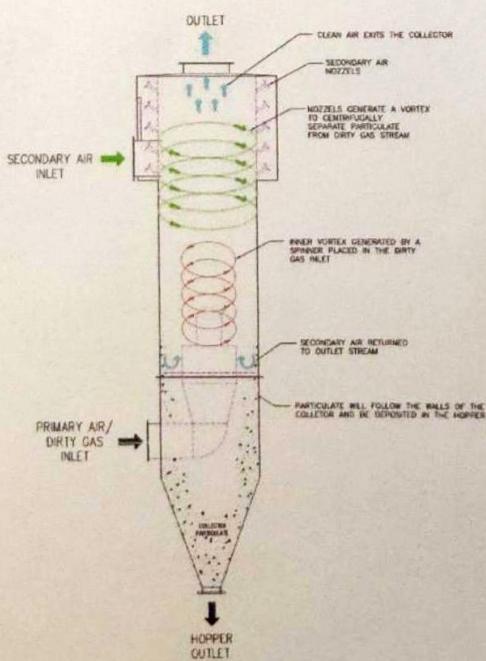
The following items are commonly used as pollution control devices in industries and transportation. If those devices can be used we can reduce the level of pollution.

- Particulate Control:

- > Mechanical collectors (dust cyclones, ~~multicyclone~~)
- > Electrostatic precipitators (ESP)
is a particulate control device clean air using induced electrostatic charge.



BAGHOUSE



DUST CYCLONE AIR CLEANER

- > Baghouses are designed to handle heavy dust loads, and a dust collector consists of a blower, dust filter, a filter-cleaning system which removes dust.
- > Particulate scrubbers is a wet scrubber which remove gases like SO_x , NO_x and CO and CO_2 as well as SPM
- Scrubber: Scrubber systems are a diverse group of air pollution control devices that can be used to remove some particulates and gases from industrial exhaust streams.
there are ~~diff~~ different types of scrubber which are:-
 - > Baffle spray scrubber
 - > Cyclonic spray scrubber
 - > Ejector venturi scrubber
 - > Mechanically aided scrubber
 - > Spray tower
 - > Wet scrubber .

- NO_x control: There are different tools to control NO_x emission which are
 - > Low NO_x burners
 - > Selective catalytic reduction
 - > Selective non-catalytic reduction
 - > NO_x scrubbers
 - > Catalytic converter
- VOC abatement: Many plants absorb VOCs. we also can use: activated carbon filter, flares, Thermal oxidizers etc to reduce it.
- SO₂ control: $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$
as SO₂ becomes H_2SO_4 in moist wet scrubber is useful.

E) Controlling Vehicle Emission:

Vehicle Emission can be controlled by using new engines, biofuel; we also need to increase electric cars. Odd-Even System employed in Delhi is also a very good technique.

F) Public Awareness:

Public Awareness is ~~the~~ key to stop any kind of environmental pollution. Because human is the main cause of pollution. If people ~~decided to~~ are educated to stop pollution then it is just a matter of Awared people.

G) ~~Government~~

G) Governmental and Geopolitical steps:

Government of many countries as well as UN have taken steps to reduce Air pollution. If the ~~a~~ lawsuits are effiectly implemented then we can easily reduce air pollution in cities.

Conclusion:- cities are the economic life lines of any country. Educational, economic, industrial power houses are majorly located in cities. But airpollution causing lots of damage . So, we need to reduce air pollution as ~~as~~ much and as soon as possible to improve our lives .

ACKNOWLEDGEMENT:

I convey my deep sense of gratitude to sir for giving me the option to write on 'air pollution in cities' ~~post~~ project. I am also very thankful to 'Wikipedia' and 'National Geographic' Community in the internet for serving me with gigantic data bases.

Date: 13 Nov 2020

Rudra Dhar

signature of the
student

CERTIFICATE

Certified that the project work submitted by ~~Rahul~~ Rudra Dhar is done under the supervision of my honourable 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:

AIR POLLUTION IN CITIES
AND MEASURES TO CONTROL IT

NAME : RUDRA DHARA
COLLEGE ROLL NO : PHUG/130/19
DEPARTMENT : PHYSICS
YEAR : 2020
SIGNATURE : Rudra Dhar

CONTENTS

<u>Topic</u>	<u>Page No.</u>
Introduction and definition of Air Pollution	1
Air Pollutants in Cities	1 - 3
cause of air pollution in cities	4
Effects of Air Pollution in Cities	4 - 8
Measures to control Air Pollution	8 - 12
Conclusion	12
Acknowledgement	13
Certificate	14

AIR Pollution In Cities and Measures

To Control It :-

From the begining of human civilization, man started to exploit the nature. In twentyfirst century, massive urbanisation not only making disaster to the nature but creating major issues to the man also.

In cities this pollution is intensified, spacially air pollution. Air pollution is creating major health issues which is a major problem in the planet.

Air Pollution:-

Air pollution is the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or caused damage to the climate or different objects.

Air Pollutants in the Cities and Sources:

As cities are filled with industries, cars, and people. It is the source almost all kind of pollutants.

Different pollutant and sources are :-

① Carbondioxide (CO_2) :-

CO_2 is the main 'green house gas' which causes 'global warming'. It reduce the O_2 level in air.

It is mainly produced by cars and industries due to burning of fossil fuel.

② Sulfur Oxides (SO_x) :-

SO_x in atmosphere converted to H_2SO_4 in moist. It causes acid rain.

It is also poisonous.

It is mainly produced by fossil fuel. Cars and petrochemical industries are common source of it.

③ Nitrogen Oxides (NO_x) :-

NO_x is a common green house gas and poisonous too.

It is mainly produced by cars.

④ carbonmonoxide (CO) :-

CO is very poisonous gas which may cause ~~det~~ death if intaked in large amount.

It is produced by the burning of fossil fuel.



AIR POLLUTION BY CARS

⑤ Volatile Organic Compounds (VOC) :-

VOC are well known outdoor air air pollutant. They are the organic compound generally used as solvent eg - Benzene, isoprene, terpenes methanol etc. They are very poisonous even if taken in small amount. It is proven that they cause cancer.

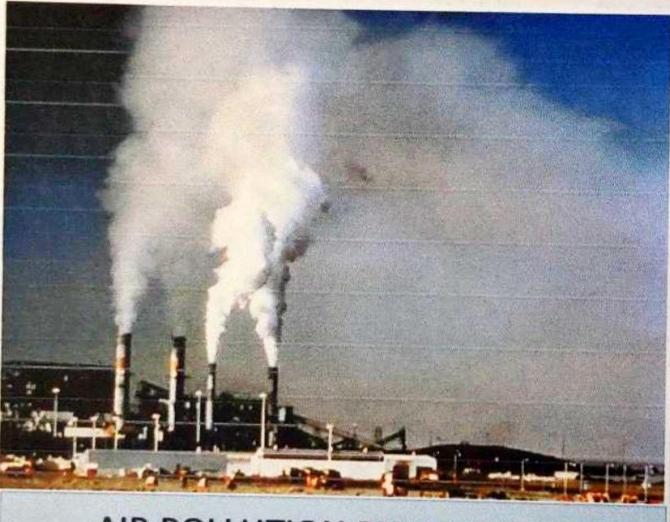
CH_4 is also a VOC which is not poisonous but it is a green house gas.

Mainly ~~to~~ households, cars, and chemical industries, paint are primary source of VOCs

⑥ SPM (Suspended particulate Matter) :-

Now-a-days SPM is major pollutant in urban areas. It is the suspended dust particle, asbestos, ash, and other harmful particles suspended in air as a ~~aerosol~~ aerosol.

⑦ Others:- CFC, phosphine, smoke etc are also air pollutant.



AIR POLLUTION BY INDUSTRY

Cause of Pollution in Air in Cities:-

- ① Cities have very high population densities.
- ② Large number of cars and industries operates in small area.
- ③ Less regulation of pollution sources.
- ④ Very poor tree to land ratio.

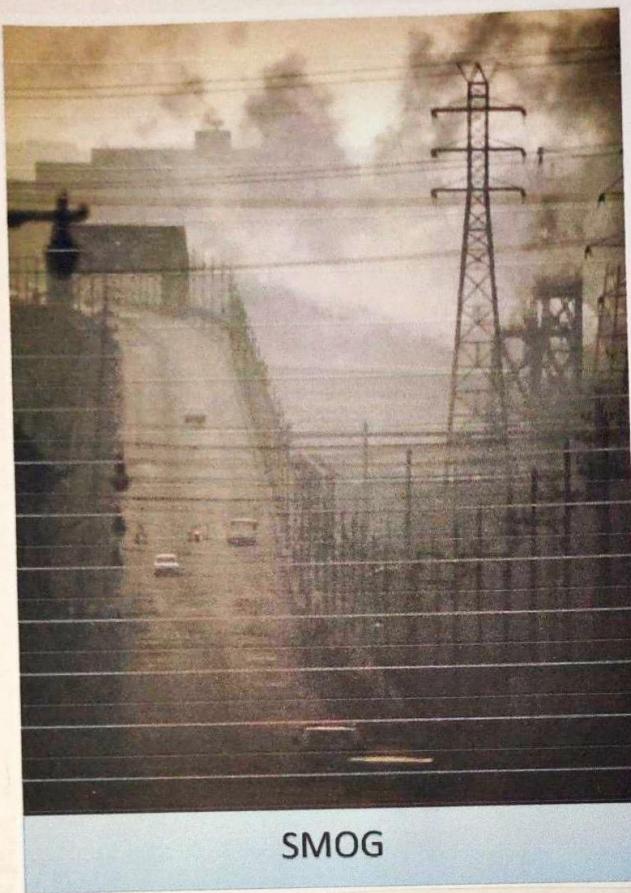
Effects of Air Pollution:-

There are many adverse effects of air pollution which are following:-

Smog:-

smoke + fog = Smog. Smog is a intense effect of air pollution. Man-made smog is derived from coal combustion emission, vehicular emissions, industrial emissions, and photochemical reaction.

Due to photochemical reaction ~~so~~ Smog is composed of ground level Ozone (O_3)



SMOG



AFTER AND BEFORE SMOG

PAN (Peroxyacetyl nitrate). Smog is a major problem for the cities like 'Los Angeles', 'New Delhi', 'Beijing', 'Lahore' etc.

One of the most dangerous type smog is photochemical smog. It is the chemical reaction of sunlight, NO_x , VOC in atmosphere, which leaves PAN ground level ozone.

Smog continues to harm human health in cities. It is harmful for senior citizens, children, and people with heart & lung conditions such as emphysema, bronchitis, and asthma. Smog is responsible for an estimated 9500 premature death in the year 2016 alone.

* Smog also causes cancer.

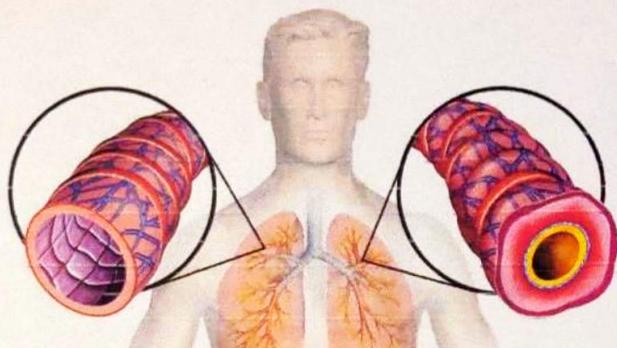
② Heat Island: Due to high concentration of greenhouse gasses and low tree to land ratio, city areas are now heated above the normal temperature. This increases storm and destabilizes normal rain wind.

③ Health effects:-

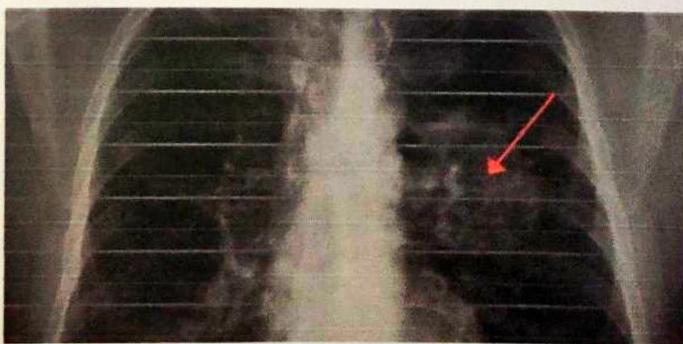
a) Mortality:- World Health Organization estimated in 2014 that every year air pollution causes the premature death of some 7 million people worldwide.

b) Cardiovascular disease:- A 2007 review of evidence found that ambient air pollution exposure is a risk factor correlating with increased total mortality from cardiovascular events (range: 12% to 14% per $10 \mu\text{g}/\text{m}^3$ increase)

c) Lung disease:- Research has demonstrated increased risk of developing asthma and COPD from increased exposure to traffic-related air pollution. Additionally, air pollution has been associated with increased hospitalization and



ASTHMA



LUNG CANCER

mortality from asthma and COPD.

chronic obstructive pulmonary disease (COPD) includes diseases such as chronic bronchitis and emphysema.

d) ~~The~~ Cancer:-

A review of evidence regarding whether ambient air pollution exposure is a risk factor for cancer in 2007 found solid data to conclude that longterm exposure to SPM and VOCs increase overall risk of cancer by 6%.

e) Affects children and other Animals:-

Due to pollution children are highly affected, and Many disease and death happen every year due to Airpollution.

Little animals and birds are also very affected, destroying the ecological balance.

④ Economic effects:

Air pollution costs the world economy '\$5 trillion' per year as a result of productivity losses and degraded quality of life, according to a study by the World Bank.

Measures to Control Air Pollution:-

Various pollution control technologies and strategies are available to reduce air pollution. Which are following :-

A.) Land-use Planning:

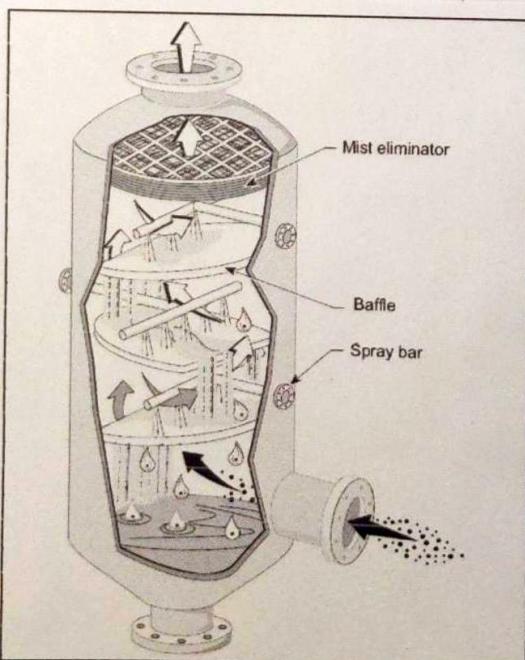
Using land in proper manner, increase forest areas in cities, removing heavy industry and regulation population density reduce the Airpollution in cities.

B.) Reduction of Fossil Fuel:-

Various efforts are taken to reduce fossil fuel. To reduce air pollution in cities we need to increase the number of solar cells and



ELECTROSTATIC PRECIPITATOR



BAFFLE SPRAY SCRUBBER

C) Plantation of Trees:

Trees are very good natural controllers of pollutants. Several varieties like snake plant, erica palm, aglonima etc, not only absorb CO_2 but also absorb VOCs.

D) Control Devices:

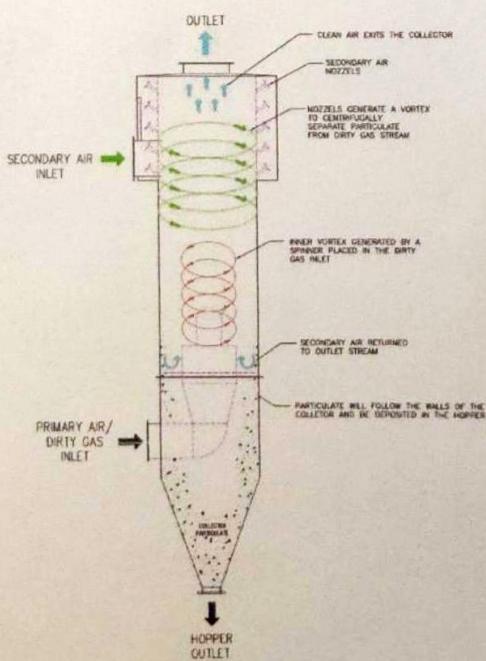
The following items are commonly used as pollution control devices in industries and transportation. If those devices can be used we can reduce the level of pollution.

- Particulate Control:

- > Mechanical collectors (dust cyclones, ~~multicyclone~~)
- > Electrostatic precipitators (ESP)
is a particulate control device clean air using induced electrostatic charge.



BAGHOUSE



DUST CYCLONE AIR CLEANER

- > Baghouses are designed to handle heavy dust loads, and a dust collector consists of a blower, dust filter, a filter-cleaning system which removes dust.
- > Particulate scrubbers is a wet scrubber which remove gases like SO_x , NO_x and CO and CO_2 as well as SPM
- Scrubber: Scrubber systems are a diverse group of air pollution control devices that can be used to remove some particulates and gases from industrial exhaust streams.
there are ~~diff~~ different types of scrubber which are:-
 - > Baffle spray scrubber
 - > Cyclonic spray scrubber
 - > Ejector venturi scrubber
 - > Mechanically aided scrubber
 - > Spray tower
 - > Wet scrubber .

- NO_x control: There are different tools to control NO_x emission which are
 - > Low NO_x burners
 - > Selective catalytic reduction
 - > Selective non-catalytic reduction
 - > NO_x scrubbers
 - > Catalytic converter
- VOC abatement: Many plants absorb VOCs. we also can use: activated carbon filter, flares, Thermal oxidizers etc to reduce it.
- SO₂ control: $\text{SO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4$
as SO₂ becomes H_2SO_4 in moist wet scrubber is useful.

E) Controlling Vehicle Emission:

Vehicle Emission can be controlled by using new engines, biofuel; we also need to increase electric cars. Odd-Even System employed in Delhi is also a very good technique.

F) Public Awareness:

Public Awareness is ~~the~~ key to stop any kind of environmental pollution. Because human is the main cause of pollution. If people ~~decided to~~ are educated to stop pollution then it is just a matter of Awared people.

G) ~~Government~~

G) Governmental and Geopolitical steps:

Government of many countries as well as UN have taken steps to reduce Air pollution. If the ~~a~~ lawsuits are effiectly implemented then we can easily reduce air pollution in cities.

Conclusion:- cities are the economic life lines of any country. Educational, economic, industrial power houses are majorly located in cities. But airpollution causing lots of damage . So, we need to reduce air pollution as ~~as~~ much and as soon as possible to improve our lives .

ACKNOWLEDGEMENT:

I convey my deep sense of gratitude to sir for giving me the option to write on 'air pollution in cities' ~~post~~ project. I am also very thankful to 'Wikipedia' and 'National Geographic' Community in the internet for serving me with gigantic data bases.

Date: 13 Nov 2020

Rudra Dhar

signature of the
student

CERTIFICATE

Certified that the project work submitted by ~~Rahul~~ Rudra Dhar is done under the supervision of my honourable 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:

Nitrogen Cycle and its importance for living beings.

NAME : RUPAYAN CHATTOPADHYAY
COLLEGE ROLL NO : STUG 103 19
DEPARTMENT : STATISTICS
YEAR : 2020
SIGNATURE : Rupayan Chattopadhyay

ACKNOWLEDGEMENT

I would like to express my special thanks of gratitude to my Environmental Science teachers "Narayan Maity" and Sourik Bhattacharya sir for their able & guidance and support in completing my project.

I would also like to extend my gratitude to my friends or classmates for helping me to complete my project.

Dt - 13/11/2020

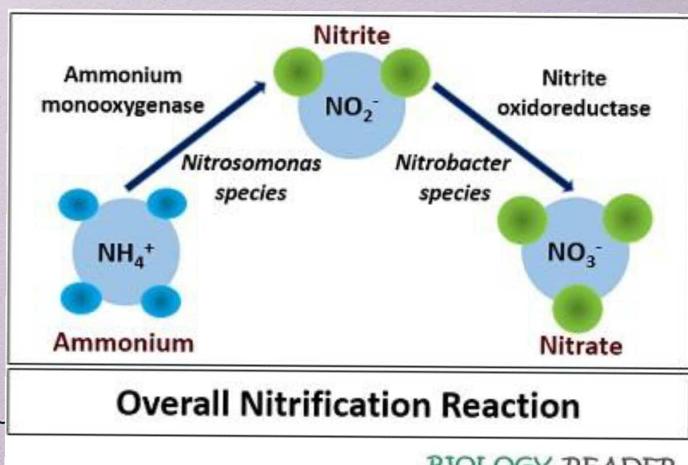
Rupayan Chattopadhyay .
UG - 1st year , Statistics dept.
Roll No. - ST UG | 103 | 19

available nitrogen is naturally generated via the biological conversion of N_2 to NH_3/NH_4^+ . A small group of bacteria and cyanobacteria are capable of using the enzyme nitrogenase to break the bonds among the molecular nitrogen and combine it with hydrogen.

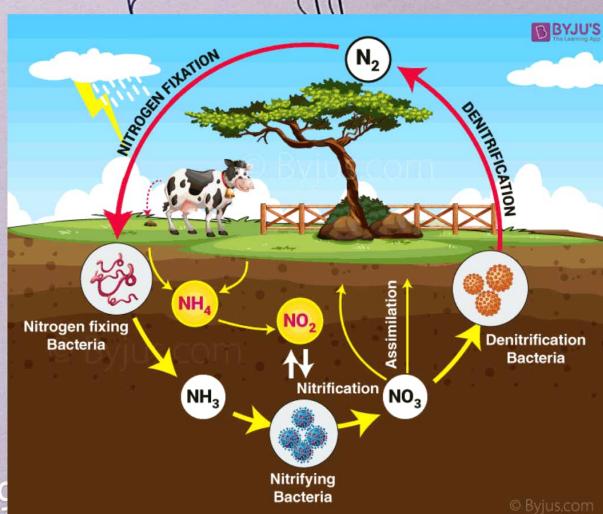
Nitrogenase only functions only in the absence of oxygen. The exclusion of oxygen is accomplished by many means. Some bacteria live beneath layers of oxygen-excluding slime on the roots of certain plants. The most important soil-dwelling bacteria, Rhizobium, live in oxygen-free zones in nodules on the roots of legumes and some other woody plants. Aquatic filamentous cyanobacteria utilize the oxygen-excluding cells called heterocysts.

Nitrification:

Nitrification is a two step process in which NH_3/NH_4^+ is converted to NO_3^- . First, the soil bacteria Nitrosomonas and Nitrococcus convert NH_3 to NO_2^- and then another soil-dwelling bacteria, Nitrobacter, oxidizes NO_2^- to NO_3^- . These bacteria gain energy through these conversions both of which require oxygen to occur.



BIOLOGY READER



Nitrogen is essential to life because it is a key component of proteins and nucleic acids. Nitrogen occurs in many forms and is continuously cycled among these forms by a variety of bacteria. Although nitrogen is abundant in the atmosphere as diatomic nitrogen gas (N_2), it is extremely stable, and conversion to other forms requires a great deal of energy. Historically, the biologically available forms NO_3^- and NH_3 have often been limited; however, current anthropogenic processes, such as fertilizer production, have greatly increased the availability of nitrogen to living organisms. The cycling of nitrogen among its many forms is a complex process that involves numerous types of bacteria and environmental conditions.

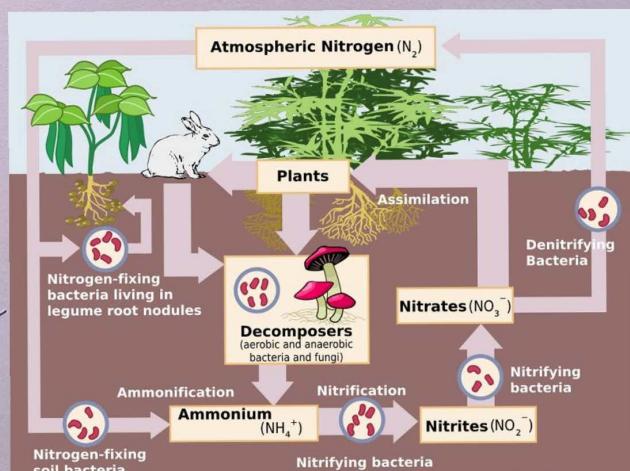
In general, the nitrogen cycle has five steps:

1. Nitrogen Fixation (N_2 to NH_3 / NH_4^+ or NO_3^-).
2. Nitrification (NH_3 to NO_3^-).
3. Assimilation (Incorporation of NH_3 and NO_3^- into biological tissues)
4. Ammonification (Organic nitrogen compounds to NH_3).
5. Denitrification (NO_3^- to N_2)

Nitrogen Fixation:

Nitrogen fixation is the process by which gaseous (N_2) is converted to ammonia (NH_3 or NH_4^+) via biological fixation or nitrate (NO_3^-) through high-energy physical processes. N_2 is extremely stable and a great deal of energy is required to break the bonds that join the two N atoms.

N_2 can be converted directly into NO_3^- through processes that exert a tremendous of heat, pressure and energy. Such processes include combustion, volcanic action, lightning discharges and industrial means. However, a greater amount biologically



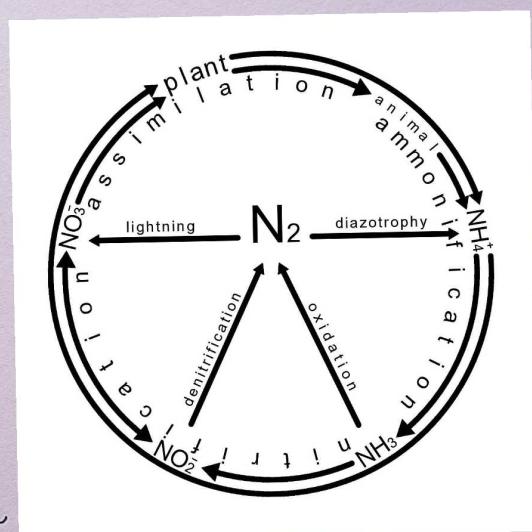
Assimilation:

Assimilation is the process by which plants and animals incorporate the NO_3^- and ammonia formed through nitrogen fixation and nitrification.

Plants take up these forms of nitrogen through their roots, and incorporate them into plant proteins and nucleic acids. Animals are then able to utilize nitrogen from the plant tissues.

Ammonification:

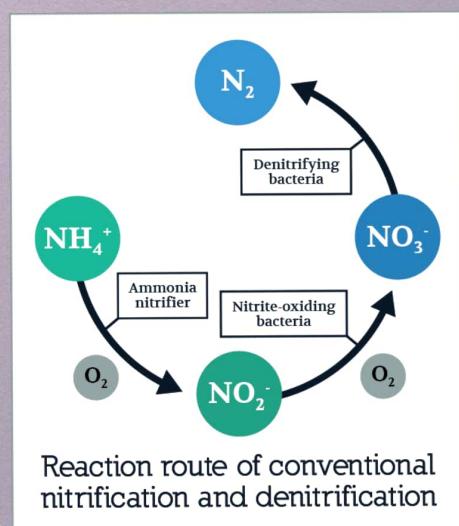
Assimilation produces large quantities of organic nitrogen, including proteins, amino acids, and nucleic acids. Ammonification is the conversion of organic nitrogen to ammonia. The ammonia produced by this process is excreted into the environment and is then available for either nitrification or assimilation.



Denitrification:

Denitrification is the reduction of NO_3^- to gaseous N_2 by anaerobic bacteria.

This process only occurs where 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 replacing or place for reducing excess nitrogen levels via denitrification process.



Reaction route of conventional nitrification and denitrification

Common Forms of Nitrogen:

The most common forms of ⁱⁿorganic nitrogen in the environment are diatomic nitrogen gas (N_2), nitrate (NO_3^-), nitrite (NO_2^-), ammonia (NH_3), and ammonium (NH_4^+). The species that predominate depend on the chemical, physical, and biological environment.

In aquatic environments, the presence of nitrogen as unionized ammonia ammonia (NH_3) or ammonium (NH_4^+) is dependent on the pH and temperature.

When the pH is below 8.75, NH_4^+ predominates. Increases in pH signify increases in the hydroxyl ion (OH^-) concentration of the water, meaning the above reaction will shift to the left in order to reach equilibrium. Above a pH of 9.75, NH_3 predominates. NH_3 is a more toxic to aquatic life. If biological assimilation of NH_3 is not occurring at a sufficient rate, NH_3 may accumulate and cause detrimental effects to aquatic life.

In soils, NH_4^+ ions are strongly sorbed by clay particles and organic matter, which have a net negative surface charge. In alkaline soils, NH_4^+ in the soil will be transformed into NH_3 gas, and lost to the atmosphere. Under warm growing conditions, NH_4^+ in the soil will be transformed to NO_3^- via nitrification. NO_3^- is very soluble, and can easily be leached from soils under wet conditions.

Nitrogen Monitoring:

Monitoring nitrogen levels is necessary for many reasons, including detecting baseline nutrient levels and trends, preventing eutrophication, maximizing soil productivity, and minimizing toxic effects of ammonia or nitrite poisoning.

Ecological Implications of Human Alterations to the Nitrogen Cycle:

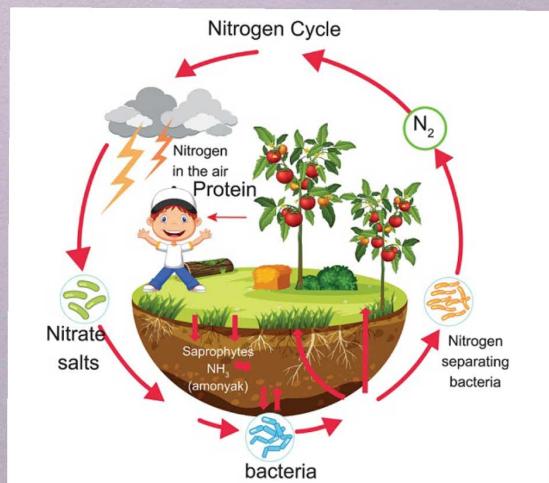
Many human activities have a significant impact on the nitrogen cycle. Burning fossil fuels, application of nitrogen-based fertilizers and other activities can dramatically increase the amount of biologically available nitrogen in an ecosystem. And because nitrogen availability often limits the primary productivity of many ecosystems, large changes in the availability of nitrogen can lead 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 global 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, fertilizers are used extensively to increase plant production, but unused nitrogen, usually in the form of nitrate, can leach out of the soil, enter streams and rivers, and ultimately make its way into our drinking water. The process of making synthetic fertilizers for use in agriculture by using N_2 and H_2 , known as Haber-Bosch process, has increased significantly over the several past decades. In fact, at present, nearly 80% of the nitrogen found in human tissues originated from Haber-Bosch process.

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 (no oxygen) or hypoxia (low oxygen), altered bio-diversity, changes in food web structure, and general habitat degradation. One common consequence of increased nitrogen is an increase in harmful algal blooms. Toxic blooms of certain types of dinoflagellates have been associated with high fish and shellfish mortality in some areas. Even without such economically catastrophic effects, the addition of nitrogen can lead to changes in biodiversity and species composition that may lead to changes in overall ecosystem function. Some have even suggested that alterations to the nitrogen cycle may lead to an increased risk of parasitic and infectious diseases among humans and wildlife. Additionally, increases in nitrogen in aquatic systems can lead to increased acidification in freshwater condition.

Importance of Nitrogen Cycle for Life:

The cycling of nitrogen through the ecosystem is crucial for maintaining productive and healthy ecosystems with neither too much nor too little nitrogen. Plant production and biomass are limited by the availability of nitrogen. Understanding how the plant-soil nitrogen cycle works can help us make better decisions about what crops to grow and where to grow them, so we have an adequate supply of food. Knowledge of the nitrogen cycle can



also help us reduce pollution caused by adding too much fertilizers to soils. Certain plants can uptake more nitrogen or other nutrients, such as phosphorus, another fertilizer, and can even be used as a "buffer", or filter, to prevent excessive fertilizer from entering waterways.

Not enough nitrogen in the soils leaves plant hungry, while too much of a good thing can be bad; excess nitrogen can poison plants even and even life stock.

The delicate balance of substance that is important for maintaining life is an important area of research, and the balance of nitrogen in the environment is no exception. So, we have to confine activities as such, so, the natural composition of nitrogen in the environment be balanced properly.

CONCLUSION

Nitrogen is the most important nutrient in regulating primary productivity and species diversity in both aquatic and terrestrial ecosystems. Microbially driven process such as nitrogen fixation, nitrification, and denitrification, constitute the bulk of nitrogen transformations and play a critical role in the fate of nitrogen in the earth ecosystems. However as human populations continue to increase, the consequences of human activities continue to threaten our resources and have already significantly altered the global nitrogen cycle.

BIBLIOGRAPHY.

I have taken help from the following websites, for my knowledge about nitrogen cycle and some associated pictures

- 1) Wikipedia.
- 2) Byjus.
- 3) Biology Dictionary and etc.

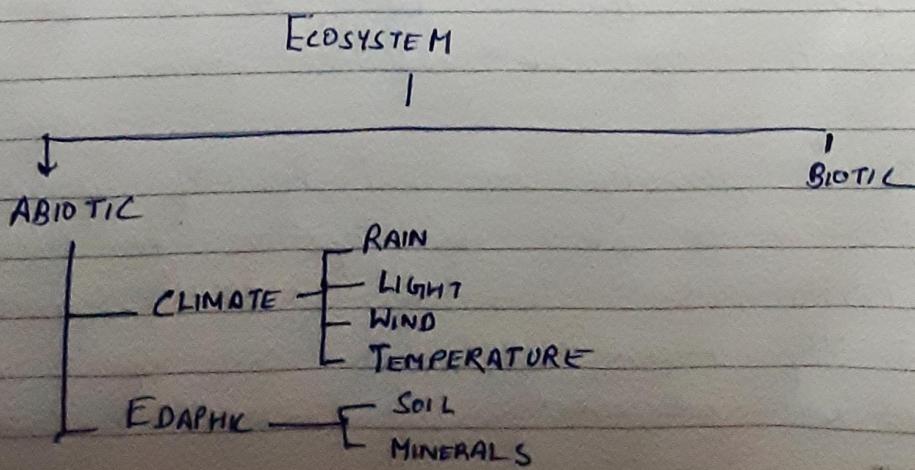
2ND SEM UG ENVS EXAM

NAME: RUITORSHI PROBHO Roy
 ROLL NO: ECUGI/052/19

1.

- a) Environment provides us with a variety of resources. These Natural resources are classified into two categories -
- (i) Biotic (Living part of nature)
 - (ii) Abiotic (Non living part of nature)

The physical components of Abiotic segment of an environment are the geographical, climatic and soil characteristics i.e. the non living part of the environment ~~are~~ including air, water, soil, minerals, along with the ~~climatic~~ climate, and solar energy.



a) Decomposers or deteriorates are a group of organisms consisting of small animals like worms, insects, bacteria & fungi, which break down dead organic material into smaller particles and finally into simpler substances that are used by plants as nutrition.

Decomposition thus is a vital function in nature, as without this, all the nutrients would be tied up in dead matter and no new life could be produced.

When plants and animals die, the complex substances making their body is broken down by the deteriorates and the minerals and nutrients are returned to the soil. Insects, worms, bacteria and fungi fulfill their role as decomposers on plants and animals and return the nutrients back to the soil for the plants to consume them.

i) Arsenic toxicity or arsenicosis develops after 2-5 years of exposure to arsenic contaminated drinking water depending on the amount of water consumption and arsenic concentration in water. Initially

the skin begins to darken (called diffuse melanosis) which later leads to spotted melanosis when darkened spots begin to appear on chest, back & limb limbs. At a later stage leucomelanosis sets in and the body begins to show black & white spots. In the middle stage of arseniosis the skin in parts becomes hard & fibrous. Rough, dry skin with nodules on hands or the soles of feet indicate severe levels of toxicity. This can cumulate to gangrene or cancer. Arsenic poisoning also invites complications like liver and spleen enlargement, cirrhosis of liver, diabetes, goiter & skin cancers.

e) Bio-Accumulation -

Excess of Pesticides cause bio-magnification and bio-accumulation.

Bio-Accumulation - Persistent pesticides accumulating in the bodies of animals, over a period of time, increases in concentration leading to a phenomenon called Bio-accumulation where the animal is unable to flush them out of their system.

(4)

Date: ___/___/___

Bio-Magnification :- When an animal affected

by bio-accumulation is eaten by a carnivore leading to further concentration of pesticides in the body of carnivore, at the phenomenon is described as bio-magnification.

The phenomenon of acquiring increasing levels of a substance in the body of the bodies of higher trophic level organisms is Bio-Magnification, this process especially in the case of insecticides like DDT have been proved to be disastrous.

f) NITROGEN CYCLE:

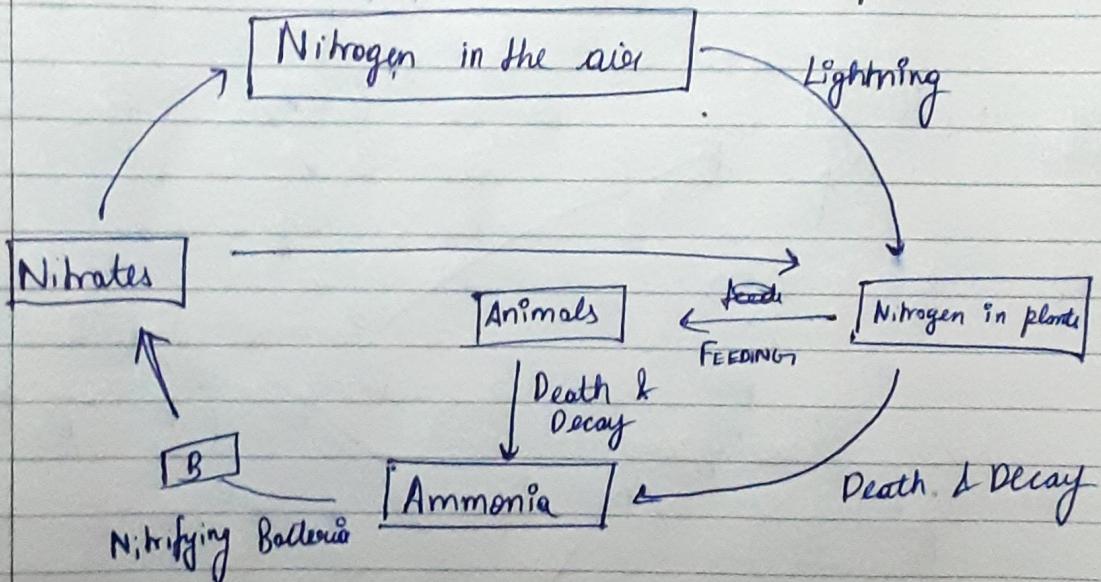
Carnivorous animals feed on herbivorous animals that live on plants.

Nitrogen fixing bacteria and fungi in soil fix nitrogen in the soil to be taken up by the plants as Nitrates.

Nitrates help the plant in forming new plant proteins. These ~~is~~ is used by ~~for~~ animals who ~~use~~ feed on plants. These herbivores are eaten by carnivores, who ~~go~~ to whom the nitrogen is transferred.

When animals defecate, the waste

materials are broken into smaller parts by 'soil animals' into which are further acted on by bacteria and fungi, which convert the complex nitrogen substances into nitrates for plants to consume. Similarly, bodies of carnivores and herbivores are acted on by decomposers to convert the complex nitrogen compounds to soil soluble nitrates for plants.



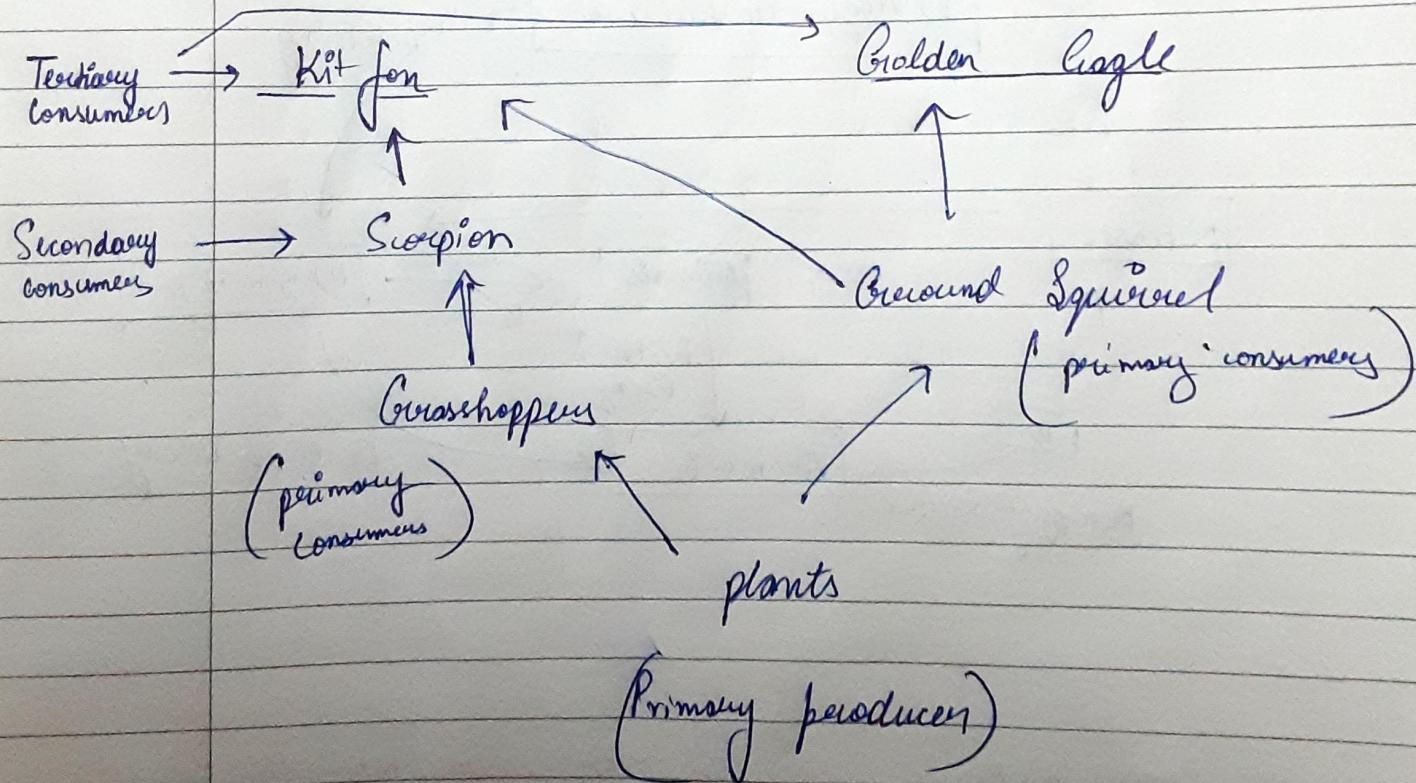
2.

- a) Food WEB: It is an important conceptual tool for illustrating the feeding relationships among species within a community, revealing species interactions & community structure, and understanding the dynamics of energy transfer in an ecosystem. It also implies the

Transfer of food energy from its source in plants through herbivores to carnivores.

It is representing the energy flows & predator - prey relationship. It is the system of interlocking and interdependent food chains.

One such food cycle in desert eco-system involving golden eagle, scorpion, kit fox, ground squirrel, grasshopper and plants.



b)

Noise Pollution

c)

Noise Pollution:

(7)

Date _____

Pollution is the introduction of contaminants into the natural environment that cause adverse change.

One type of energy pollution is

Noise pollution.

Noise pollution is an undesirable and unwanted sounds, which is subjective based on individuals, and it is not a substance that can accumulate in the environment like most other pollutants.

Sources of noise pollution are noise emanating from factories, road traffic, aircraft engine sound while taking off, landing and cruising, high intensity sonar.

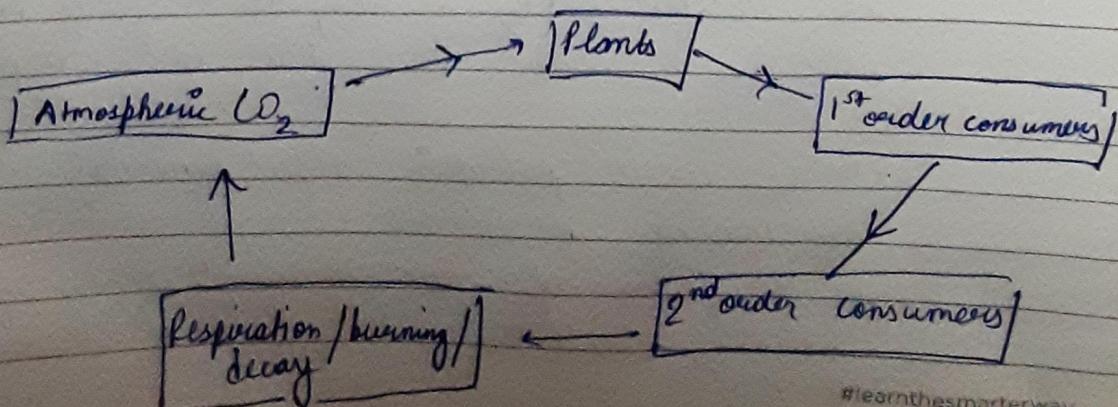
The most damaging direct effect of excessive noise is physical damage of ear and temporary or permanent loss of hearing called a Temporary Threshold Shift (TTS), where people are unable to detect weak sounds. The unit of measuring sound is Decibels (dB). Temporal effects are noticed at sound levels b/w 80-130 dB.

Also, noise pollution affect mental health by causing emotional or psychological effects in the form of anxiety, irritability, stress, mental fatigue & lack of concentration.

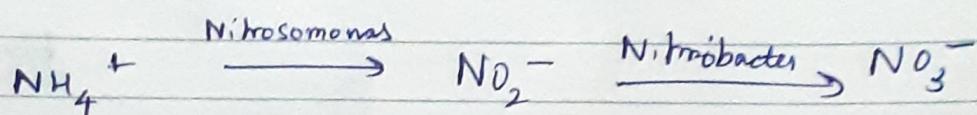
d) CARBON CYCLE!

The carbon, which occurs in organic compounds, is included in both Abiotic & biotic parts of an eco-system. It is the building block of both plant and animal tissue. It occurs as CO_2 in the atmosphere.

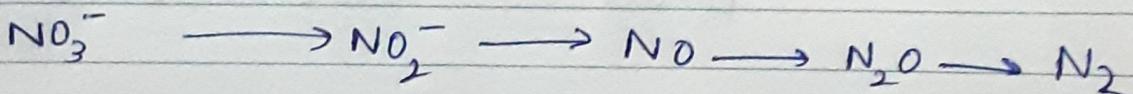
Plants take up CO_2 through leaves, and combines it with water absorbed from the soil, in the presence of sunlight to form Carbohydrates. This process is called photosynthesis. In this process, plants release oxygen in the atmosphere as O_2 which is vital for animals. Herbivores feed on plants, using them & their carbohydrates for growth & energy. Both plants & animals release CO_2 during respiration. They also return fixed carbon to soil in the waste they excrete, and when plants & animals die, they return their carbon to soil. This process completes the C - cycle.



c) Nitrification: An oxidatⁿ process which starts with the ammonium which gets oxidised into nitrite, performed by the bacteria Nitrosomonas. Later on, this nitrite gets oxidised into nitrate by Nitrobacter sp. The bacteria are autotrophic and perform under aerobic conditions. Nitrate is an important Nitrogen source for plants and occurs at pH levels of 6.5 to 8.5 b/w 16-35°C.



Denitrification:



It is the redⁿ process where Nitrate is removed in the form of Nitrogen and converted to Nitrogen gas. The bacteria involved are Bacillus, Acetobacter, Lactobacillus, Sphaerotilus & Pseudomonas. They are heterotrophs and require anaerobic condition.

Denitrification is useful for waste water treatment, aquatic habitats.

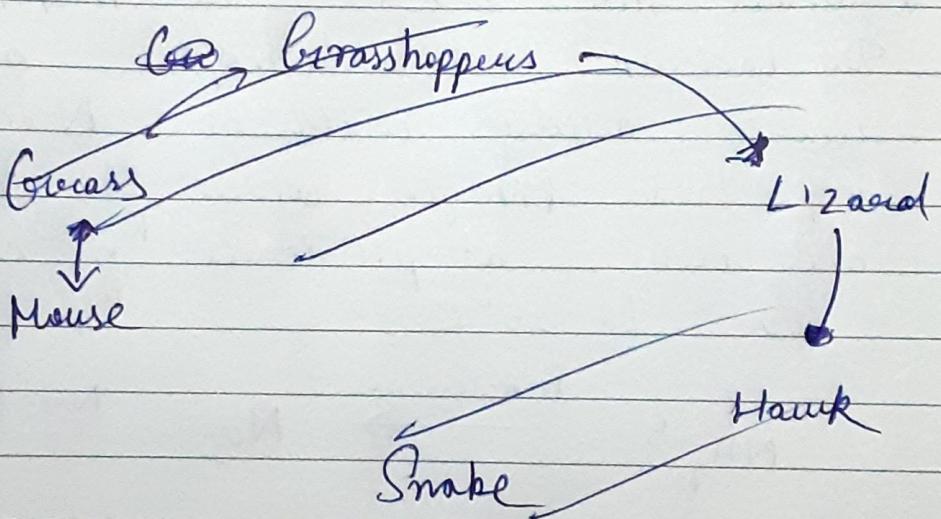
(10)

Date: ___ / ___ / ___

f)

Food Chain is a series of organisms dependent on each other as the next source of food.

A grassland food chain →



Grass → Deer → Tiger

An aquatic food chain →

Planktons → Small fish → Whales / Sharks

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Water Pollution and Measures to control it :-

NAME : Sagnik Das
COLLEGE ROLL NO : ENUGI/183/19
DEPARTMENT : ENGLISH
YEAR : 2020
SIGNATURE : Sagnik Das.

Content :-

Topic :-

Page number:-
1-2

1. Introduction →

2. Brief discussion → 3

a) Definition → 3-4

b) Source → 5

c) Causes. → 6

3) Source of water pollution

4) Measures → 7

5) Bibliography → 8

Acknowledgement

First of all, I am grateful to reverend Swami Shantayanandaji Maharaj our respected principal for giving me the chance to be a part of this interesting project. I'm also grateful to other respectable Maharsajs for blessing us to give our best and be the project within time.

I'm also grateful to the faculty of ENVS, Ramkrishna Mission Residential College Howlendarapur for giving us this golden opportunity to be complete this project and get ourself enriched. the studies that we had done for doing this project are really interesting and useful for our future studies.

Last but not the least I want to thank my fellow classmates and my most respected parents for being on my side and supply important documents. their constant support and concern had helped me to complete the project on time.

(signature of the teacher)

Sagnik Das
(signature of the student)

'Project Topic -'

Water Pollution and measures to control it :-

Introduction :-

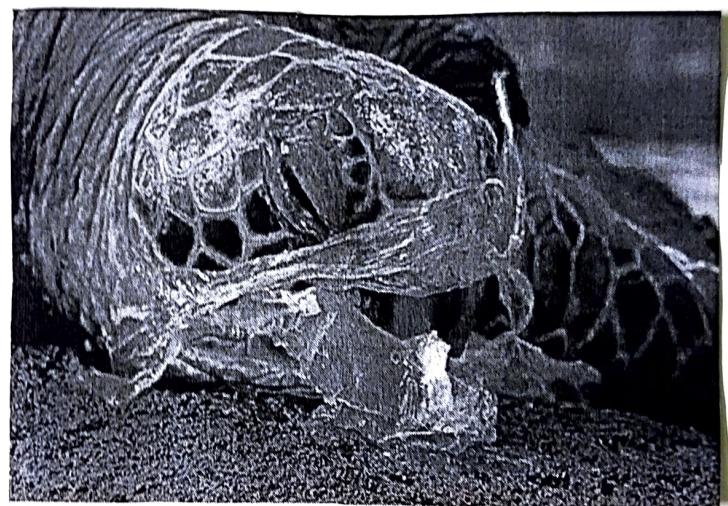
Water is typically referred to as polluted when it is impaired by anthropogenic contaminants. Due to these contaminants it does not support a human use, such as drinking water, or undergoes a marked shift in its ability to support its biotic communities. Natural phenomena such as volcanoes, algae bloom, storm, and earthquakes also cause major changes in water quality and the ecological status of water.

Water pollution is a major global problem. It requires ongoing evaluation and revision of water resource policy at all levels (international down to individual aquifers and wells). It has been suggested that water pollution is the leading worldwide cause of death and diseases. Water pollution accounted for the deaths of 1.8 million people in 2015.

The organization Global Oceanic Environmental Survey consider water pollution as one of the main environmental problems that can present.

a danger for the existence of life on earth in the next decades. One of the main concerns, is that water pollution, heat & phytoplankton who produce 70% of oxygen and remove a large part of carbon dioxide on earth. The organization proposes a number of measures for fixing the situation, but they should be taken in the next 10 years for being effective.

India and China are two countries with high levels of water pollution. An estimated 580 people in India die of water pollution related illness (including waterborne diseases) every day. About 90 percent of the water in the cities of China is polluted. As in 2007, half a billion Chinese had no access to safe drinking water.

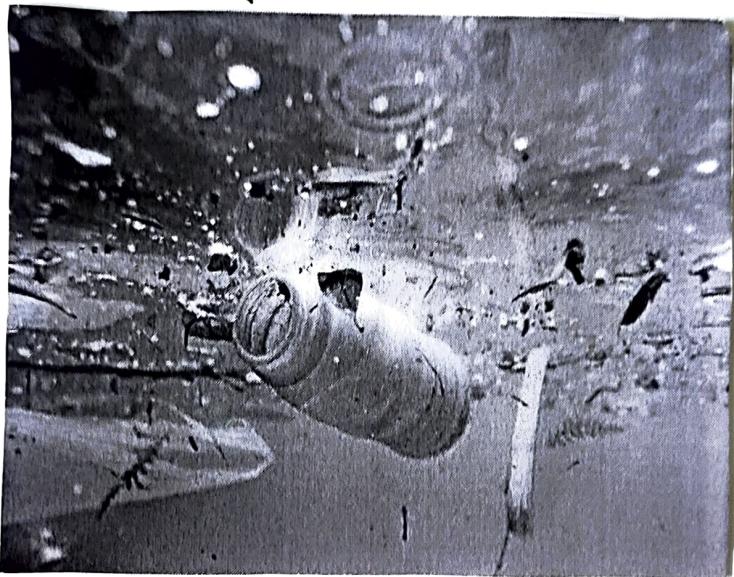


In addition to the acute problems of water pollution in developing countries, developed countries also continue to struggle with pollution problems. For example, in a report on water quality in the United States in 2009, 44 percent of unsewered stream miles, 64 percent of unsewered lake acres, and 30 percent of unsewered bays and estuarine square miles were classified as polluted.

→ X ←

Definition, Source and Causes :-

Water pollution is the contamination of water bodies, usually as a result of human activities. Water bodies include for example lakes, rivers, ocean, aquifers and groundwater. Water pollution results when contaminants are introduced into the natural environment. For example, 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. Point-sources have one identifiable cause of the pollution, such as a storm drain or a wastewater treatment plant. Non-point-sources are more diffuse, such as agricultural run-off. Pollution is the result of the cumulative effect over time. All plants and organisms living in or being exposed to polluted water bodies can be impacted. The damage individual species and impact the environment.

*the natural biological communities they are part of.

The causes of water pollution include a wide range of chemicals and pathogens as well as physical parameters. Contaminants may include organic and inorganic substances. Elevated temperatures can also lead to polluted water. A common cause of thermal pollution is the use of water as a coolant by power plants and industrial manufacture -ns. Elevated water temperatures decrease oxygen levels, which can kill fish and alter food chain composition, reduce species biodiversity, and foster invasion by new thermophilic species.

Water pollution is measured by analysing water samples. Physical, chemical and biological tests can be conducted. Control of water pollution requires appropriate infrastructure and management plans. The infrastructure may include wastewater treatment plants. Sewage treatment plants and industrial wastewater treatment plants are usually required to ~~protect~~ protect water bodies from untreated wastewater.

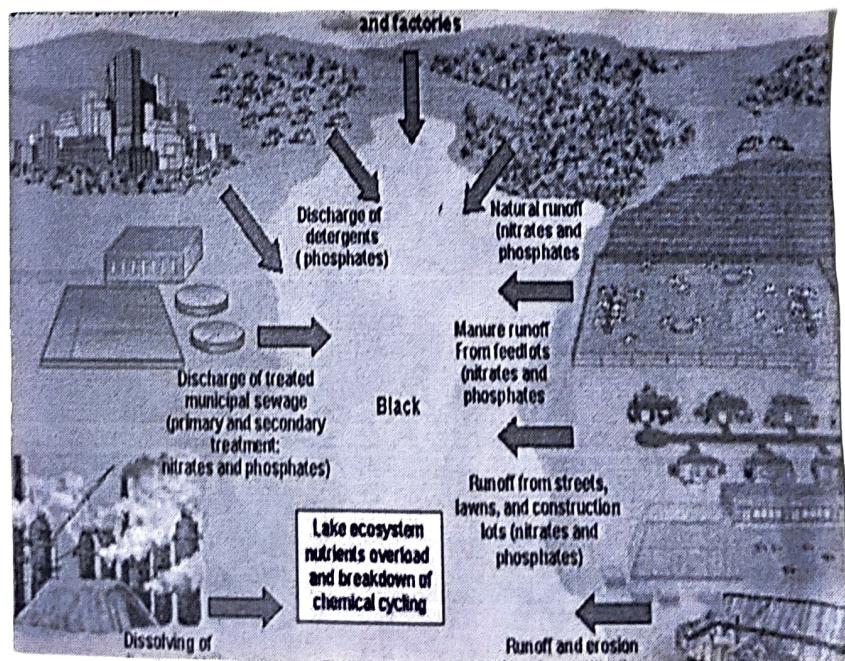
Agricultural wastewater treatment for farms, and erosion control at construction sites can also help prevent water pollution. Nature-based solution are another approach to prevent water pollution. Effective control of urban runoff includes reducing speed and quantity of flow. In the United States, best management practices for water pollution include approaches to reduce the quantity of water and improve water quality.

Sources of Water Pollution

There are two main sources of water pollution; point sources and non-point sources. Point sources include factories, wastewater treatment facilities, septic systems, and other sources that are clearly discharging pollutants into water sources. Non-point sources are more difficult to identify, because they cannot be traced back to a particular location. Non-point sources include runoff including sediment, fertilizer, chemicals and animal wastes from farms, fields construction sites and mines. Landfills are also a non-point source of pollution, if substances leach from the landfill into water supplies.

The United States Environmental Protection Agency (EPA) divides water pollution into the following six categories:-

- (i) Biodegradable waste
- (ii) Plant nutrients, such as phosphates and nitrates
- (iii) Heat-
- (iv) sediment-
- (v) hazardous and toxic chemicals
- (vi) Radioactive pollutants



Causes of Water Pollution :-

The causes of water pollution are as follows:-

- (i) Urbanisation
- (ii) Deforestation
- (iii) Damming of Rivers
- (iv) Destruction of wetland
- (v) Industries
- (vi) Mining
- (vii) Agriculture
- (viii) Energy use
- (ix) Accidental Water pollution

- the physical disturbance of land due to construction of houses, industries, roads etc
- bottom dwelling plants cannot photosynthesize as the sun's rays cannot reach them,
- Enhanced eutrophication may result due to the water spending a longer time in the dam
- pH of water, color of water, amount of nutrients
- Destroys the habitat of many birds and fish
- can increase the turbidity of water.
- increases soil erosion



Measures:-

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

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

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



Other than there are few simple steps which can be followed to save and conserve water.

- Conserve water by turning off the tap when running water is not necessary. This helps prevent water shortages and reduces the amount of contaminated water that needs treatment.
- Be careful about what you throw down your sink or toilet. Don't throw paints, oils or other forms of litter down the drain. Use environmentally friendly household products, such as washing powder, household cleaning agents and toiletries.
- Take great care not to overuse pesticides and fertilisers. This will prevent runoff of the material into nearby water sources.
- By having more plants in your garden you are preventing fertiliser, pesticides and contaminated water from running off into nearby water sources.
- Don't throw litter into rivers, lakes or oceans. Help clean up any litter you see on beaches or in rivers and lakes, make sure it is safe to collect the litter and put it in a nearby dustbin.



Bibliography :-

- (i) Andersson I, Bengtsson BH. Environment and human health. European environment agency.
- (ii) <https://www.mpcb.gov>
- (iii) Kharola, San R. Drinking water quality in rural India: Issues and approaches. wateraid. India water portal. 2008
- (iv) American journal of Environmental Engineering
- (v) British medical bulletin
- (vi) <http://www.in.gov/isdh/22963.htm>
- (vii) www.google.com
- (viii) <https://www.mnde.org/stories/>
- (ix) www.watertise.co.uk
- (x) www.iberdrola.com

—X—

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR ENVIRONMENTAL STUDIES

PROJECT TITLE:

Air pollution in cities and measures to
control it

NAME : SAGNIK GHOSH
COLLEGE ROLL NO : HIUG /006 /19
DEPARTMENT : HISTORY
YEAR : 2020
SIGNATURE : Sagnik Ghosh

ବାଯୁଧୂମି

ବିଷ୍ଣୁ ଓ ପାତାର :-

ଓଡ଼ିଶା ରେଖା ପର୍ଯ୍ୟନ୍ତକାରୀଙ୍କାରୀ - ଲେ (WHO) ମର୍ଦ୍ଦ
ବ୍ୟାହିକ ବାଯୁଧୂମି ମାତ୍ର କୁଟିଳା ଆଧୁନିକ ବିଜ୍ଞାନ
ମଧ୍ୟ କାହାର କାହାର ଅନୁଭବକ ପାତାରେ କୁଟି ରାତ୍ରି, ମେହି ଗୋଧୁମ
ରାନ୍ଧାର (air pollution) ରାତ୍ରି,

ବିଭିନ୍ନ ଅନିଯୁ - ଏହି ରାନ୍ଧାରର କର୍ମଚାରୀ
ମାତ୍ର ଏ ବାଯୁଧୂମି କିମିଟ ରହିଥିଲା, ଶ୍ରୀରାମ, ରାତି, ଶିଶୁ,
ଶିଶୁ ଦ୍ୱାରା ଏହି ବାଯୁଧୂମି ଏ ମାତ୍ର ଯାହିଁ ରହି ରାତ୍ରି,
ଶିଶୁର କୁଟି ଏ କୁଟି କାହାର ରାତ୍ରି ଏ କାହାର କୁଟି ଏ ଯାହାର
କୁଟି ରାତ୍ରି, ତାକେ ବାଯୁଧୂମି ରାତ୍ରି, ବ୍ୟାହିକ କାହାର କୁଟି ରାତ୍ରି,
ବାଯୁଧୂମି କୁଟି ଏ ବ୍ୟାହିକ କାହାର କୁଟି ରାତ୍ରି, କାହାନ କୁଟି ଏ ବ୍ୟାହିକ
ବ୍ୟାହିକ କୁଟି ଏ ବ୍ୟାହିକ କୁଟି ଏ ବ୍ୟାହିକ କୁଟି ରାତ୍ରି.

ବ୍ୟାହିକ ବାଯୁଧୂମିରେ :-

(1) ଅଞ୍ଚୁକାରୀକୁ ବାରୁ କିମିଟ କାହାର କୁଟି -
କ୍ରୋହି (SO₂), ଶାରୀ କ୍ରୋହି (CO), ଶାରୀଖାର କ୍ରୋହି
(S₂H) ।

(2) ବିଶେଷ କ୍ଷେତ୍ର ଏ ଉଚ୍ଚତା ବିଲ୍ଲିଯନ ଏ ମାତ୍ର ବାରୁ
କୁଟି କ୍ରୋହି,

(3) ବସନ୍ତ (Wildfire), ଶୁନ୍ଦିକାରୀ (Dust devil),

(4) ବ୍ୟାହିକ, ବ୍ୟାହିକ କୁଟି କ୍ରୋହି,

(5) ମାତ୍ରିକ (fungi) ଏ କ୍ରୋହି, ଗ୍ରାଫିକ (algae) ଏ କ୍ରୋହି,
ପ୍ରାଣୀଙ୍କର ଏ କ୍ରୋହିକାରୀ, ପାତାର କ୍ରୋହି (Pollen) କ୍ରୋହି
କୁଟି ଏ ବ୍ୟାହିକ କ୍ରୋହି,

ଅନୁଷ୍ଠାନିକ ପ୍ରକାଶକୁ :-

- (1) ଦୀର୍ଘମ ବ୍ୟାକିଳା, ଗୋଟିଏ,
ଫିଲେଟ୍‌ର୍ ଥିଲ୍, ମାନ୍‌ଯିଲ୍ (soot), ଧରି ଦେଇ,
- (2) ତଥି ସାମାଜିକ ହାତ ଓ ଚାପ, ଫିଲେ ପ୍ରକାଶ ଉତ୍ସବ (aerosols)
(e.g. ଫିଲେ ଫିଲେ ହାତ ହାତ),
- (3) ଅନ୍ତର୍ମାଧିକ ଉଚ୍ଚ ଫିଲେ ଲ୍ୟାମ୍, ପ୍ରାଣ - ମୃଦୁ ଅନୁଷ୍ଠାନ,
ଅନୁଷ୍ଠାନିକ କର୍ମଚାରୀ, ମାନ୍‌ଯିଲ୍, ମାନ୍‌ଯିଲ୍ କର୍ମଚାରୀ ଦେଇ,
କୌଣସି ହାତ ହାତ କର୍ମଚାରୀ କର୍ମଚାରୀ ଦେଇ କର୍ମଚାରୀ
ହାତ ହାତ, କର୍ମଚାରୀ କର୍ମଚାରୀ ଦେଇ କର୍ମଚାରୀ,
- (4) ଶୁଣାନ୍ତର କଥି କଥି ହାତ ହାତ କର୍ମଚାରୀ କର୍ମଚାରୀ
ଅନୁଷ୍ଠାନିକ କର୍ମଚାରୀ ହାତ ହାତ କର୍ମଚାରୀ ଦେଇ କର୍ମଚାରୀ,
- (5) ପ୍ରକାଶକୁ ହାତ ହାତ କର୍ମଚାରୀ କର୍ମଚାରୀ ଦେଇ (ପାରିଷ୍ଠକ୍ୟ
କର୍ମଚାରୀ ଦେଇ) (ପାରିଷ୍ଠକ୍ୟ କର୍ମଚାରୀ କର୍ମଚାରୀ ଦେଇ
କର୍ମଚାରୀ କର୍ମଚାରୀ ଦେଇ) ଦେଇ,

ମୂଳ ଅନୁଷ୍ଠାନ ପ୍ରକାଶକୁ :-

ଅନୁଷ୍ଠାନିକ କର୍ମଚାରୀ କର୍ମଚାରୀ

- (1) ମୂଳ ଅନୁଷ୍ଠାନ :- ଅନୁଷ୍ଠାନ ହାତ ହାତ କର୍ମଚାରୀ କର୍ମଚାରୀ
ଦେଇ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ ଦେଇ,
ଅନୁଷ୍ଠାନ ମୂଳ ଅନୁଷ୍ଠାନ ହାତ (PAPs), ଅନୁଷ୍ଠାନ ହାତ ହାତ ୨୦% ଲେ
କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ, ମାନ୍‌ଯିଲ୍
କର୍ମଚାରୀ, ମାନ୍‌ଯିଲ୍ କର୍ମଚାରୀ, ମାନ୍‌ଯିଲ୍ କର୍ମଚାରୀ, ମାନ୍‌ଯିଲ୍ କର୍ମଚାରୀ,
ମାନ୍‌ଯିଲ୍ କର୍ମଚାରୀ, ମାନ୍‌ଯିଲ୍ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ
(Suspended Particulate Matter) ଦେଇ,

- (2) ଦୀର୍ଘମ ଅନୁଷ୍ଠାନ :- କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ
କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ କର୍ମଚାରୀ

ગોરા માલ્યદાર ઝરણ (SAPs), રંધારા - પાંચાંશ, ગુજરાત, ભારત
નેત્રાંગણ, ગુજરાત સરકારી, અધિકારી કાર્યાલાય, એન્ડ્રોડ
કાર્યાલાય ડાયરી,

ગોરા પાંચાંશ જે આધુનિકતાની કોઈપણ વિષયનું
(ex. એન્ડ્રોડ) બનાવી રહીએ હોય તો, પાંચાંશ ઝરણ, એન્ડ્રોડ
ગોરા પાંચાંશ ઝરણ અને અન્યાંય એન્ડ્રોડ કોઈપણ વિષય
નેત્રી હોય,

(3) ગુરોવિના માલ્યદાર :- જે અન્ય માલ્યદારની આખરી વિષય
નેત્રી હોય ગોરા જે આધુનિકતાની અનુભૂતિ હોય હું, ગુરોવિના
માલ્યદાર ઝરણ (UAPs), રંધારા - પાંચાંશ, અધિકારી કાર્યાલાય,

ગોરાના નિયુ માલ્યદાર ના વિષય
આંદોલન ક્રમ અને કાર્યક્રમ ના વિષય,

(1) પ્રીતિનાના અને Smog :- એન્ડ્રોડ એન્ડ્રોડ-નું કોઈપણ એ. એન્ડ્રોડની
નું આધુનિકતાની વિષય નાથી જે પ્રીતિનાના નેત્રીની
નું એ એન્ડ્રોડ પ્રીતિનાના અને Smog હોય, આંદોલન કાર્યક્રમ,
વિષયની અનુભૂતિ ની વિષય પ્રીતિનાના કોઈપણ વિષયની નાથી
ના હોય,

(2) ક્રોક હાથ અને ગુરોવિના :- ક્રોક હાથ નાનાની જીવન
અનુભૂતિ ક્રોક હાથ નાથી નાથી, ગુરોવિના, ક્રોક હાથ નાથી નાથી, એ હાથ
નું આંદોલન 0.02 એન્ડ્રોડની જીવન 10 એન્ડ્રોડનીનું, માનવ જીવનની
એ હાથ નાથી અને એન્ડ્રોડની દ્વારા હાથ નાથી, એ હાથ નાથી
એ. એન્ડ્રોડ જીવન નાનાની જીવન (ફોલો), જીવન એન્ડ્રોડ જીવન નાથી એન્ડ્રોડ
જીવન, એવી અનુભૂતિ નાનાની જીવની, એવી એન્ડ્રોડ જીવન અનુભૂતિ
જીવન એવી નાનાની જીવન હાથ નાથી, નાનાની એન્ડ્રોડ જીવન અનુભૂતિ
આખરી જીવન નાથી, એવી એવી, એવી એન્ડ્રોડ જીવન નાથી-નાથી એવી

ବେଳେ ଦେଇ, କି ଅଧିକ ହୁଏ, ତାପି ଦେଇବି ୨୫, ଅଧିକରୀ
ଦେଇ ୨୫, ଅଧିକରୀ ମରିଯୁ ଶିଳ୍ପୀ, ଅଧିକରୀ ଅଧିକରୀ ଦେଇ
ଥାଇ, ପ୍ରେକ୍ଷଣ ଦୂରଦେଖିବା କାହାର ଲାଗୁଛି କାହାର
ଜ୍ୟୋତିଶ ରାତ୍ରି ଦେଇ ହୁଏ ହୁଏ ।

ଶାଖାଧିକାରୀ ବିଭିନ୍ନ ପ୍ରେକ୍ଷଣ :-

ପ୍ରେକ୍ଷଣ ବିଭିନ୍ନ ଶାଖାଧିକାରୀ ହୁଏ, କିମ୍ବା କିମ୍ବା ଏବଂ ଏବଂ
ଦେଇବି ୨୫ ।

ବିଭାଗ	ପ୍ରେକ୍ଷଣ	ଶାଖାଧିକାରୀ
କାର୍ଯ୍ୟ ମଧ୍ୟ ଶାଖାଧିକାରୀ	କାର୍ଯ୍ୟ ମଧ୍ୟ	କାର୍ଯ୍ୟ ମଧ୍ୟରେ, ଅଧିକରୀ କାର୍ଯ୍ୟରେ, ଅଧିକରୀର କାର୍ଯ୍ୟ, କାର୍ଯ୍ୟରେ
ଆବଶ୍ୟକ	ଆବଶ୍ୟକ	ଆବଶ୍ୟକ କାର୍ଯ୍ୟ, ଆବଶ୍ୟକ ମଧ୍ୟରେ, କାର୍ଯ୍ୟ, କାର୍ଯ୍ୟ,
କାର୍ଯ୍ୟ ମଧ୍ୟରେ ପ୍ରେକ୍ଷଣ	କାର୍ଯ୍ୟ ମଧ୍ୟରେ	କାର୍ଯ୍ୟ, କାର୍ଯ୍ୟ ମଧ୍ୟରେ କାର୍ଯ୍ୟ ମଧ୍ୟରେ କାର୍ଯ୍ୟ,
ଅନୁଭବ କାର୍ଯ୍ୟ	ଅନୁଭବ କାର୍ଯ୍ୟ	ଅନୁଭବ କାର୍ଯ୍ୟ, ଅନୁଭବ କାର୍ଯ୍ୟରେ କାର୍ଯ୍ୟ,
କୃମିକାରୀ	କୃମିକାରୀ ଏ ଶିଖିତକା କାର୍ଯ୍ୟରେ କୃମିକାରୀ	କୃମିକାରୀ କାର୍ଯ୍ୟ, କୃମିକାରୀ କାର୍ଯ୍ୟରେ, କାର୍ଯ୍ୟରେ,
କୁ, କାଳି ଏ ଅନ୍ୟାନ୍ୟ କାର୍ଯ୍ୟ କୃମିକାରୀ	କୁ, କାଳି ଏ କାର୍ଯ୍ୟରେ କାର୍ଯ୍ୟ କାର୍ଯ୍ୟରେ କୃମିକାରୀ	କୃମିକାରୀ,
ପାତ୍ରକାରୀଙ୍କ କାର୍ଯ୍ୟ	ପାତ୍ରକାରୀଙ୍କ କାର୍ଯ୍ୟ	କୃମିକାରୀ, କୃମିକାରୀ କୃମିକାରୀ କାର୍ଯ୍ୟ,

प्रदूषणके कोई तरह :-

- (1) आंशुलिक ग्राहक :- SO_2 व उच्चारी समान अवस्था में जल तेल, फिल्म इत्यादि में,
- (2) नमूदरण ग्राहक :- NO_x व एक ऐसा ग्राहक है, जिसके कारण वायर बढ़ता है, जिसका उत्तर एक अलग अद्भुत ग्राहक जल ग्राहक जल ग्राहक है जिसका उत्तर एक अलग अद्भुत ग्राहक है (HNO_3) होती है जो अमीर ग्राहक होता है,
- (3) चमड़ी ग्राहक :- चमड़ी ग्राहक जल ग्राहक है, जो अद्भुत व नमूदरण ग्राहक है जो अद्भुत व अद्भुत ग्राहक है (Photo-chemical smog) है, जिसके कारण अमीर होती है, जिसका उत्तर एक अद्भुत व नमूदरण ग्राहक है (oxidized) होता है जो अद्भुत व नमूदरण ग्राहक है, जो अद्भुत व नमूदरण ग्राहक है (CFCs) होता है जो अद्भुत व नमूदरण ग्राहक है,
- (4) ग्राहक ग्राहक :- CO_2 अद्भुत व नमूदरण ग्राहक है जो अद्भुत व नमूदरण ग्राहक है, जो अद्भुत व नमूदरण ग्राहक है,

जलग्राहक के कोई तरह :-

- (1) धूम्रपान विद्युत जल ग्राहक है जो अद्भुत व नमूदरण ग्राहक है,
- (2) ग्राहक ग्राहक (CO) - CO अद्भुत व नमूदरण ग्राहक है, जो अद्भुत व नमूदरण ग्राहक है, जो अद्भुत व नमूदरण ग्राहक है, जो अद्भुत व नमूदरण ग्राहक है,

କ୍ଷାରିକ ପରିପାଦଣାରେ ଯେଉଁଠାରେ ହୁଏ ଥିଲା, ତାହା
CO ଯେବେ କରିବାର କାମ ହେଲା,
-

(3) କୋର୍ଟିକୋର୍ଟେସ୍ (CO₂) - ଯେ ଯୁଗରେ ଆବଶ୍ୟକ ହେଲା
ଏହା କାମରେ 25,

(4) ସୁନ୍ଦର ଫ୍ରେଂକ୍ରିଟ୍ (SO₂) - ଯେ ଯୁଗରେ ଆବଶ୍ୟକ, ତାହା,
କୋର୍ଟିକ୍, କିମ୍ବାର ଆବଶ୍ୟକ, ଆବଶ୍ୟକ ହେଲା 25,
ଏହାର SO₂ -ରେ ଯେଉଁଠାରେ 200 ମିଳିମିଟି - ଯେ କାମ କରିବାର କାମ
କରିଲା ।

(5) ନାଇଟ୍ରୋଫିଲ୍ରେଟ୍ ଗ୍ରେଚ୍‌ର୍କ୍ସ୍ (NO_x) - ଯେବେ ଆବଶ୍ୟକ (NO - NO,
NO₂, N₂O କୌଣସି) ଏହାରେ କାମିକ ଆବଶ୍ୟକ 25,
ଯେ କାମରେ 25, ଉତ୍ସାହରେ ଆବଶ୍ୟକ 25, କୋର୍ଟିକ୍, ଏହା କାମରେ
ଆବଶ୍ୟକ 25, ବିଜ୍ଞାନିକ କାମରେ 25 ମଧ୍ୟରେ ଆବଶ୍ୟକ 25 ।

(6) ହୃଦୟକର୍ମକାରୀ ଗ୍ରେଚ୍‌ର୍କ୍ସ୍ (H₂S) - ଯେ ଯୁଗରେ ଆବଶ୍ୟକ, ଏହା
-କୋର୍ଟିକ୍, କୋର୍ଟିକ୍ରୋମିଟିର, କୋର୍ଟିକ୍ ଏବଂ କୋର୍ଟିକ୍ରୋମିଟିର
କୌଣସି 25 ଏବଂ 100 ।

(7) କେଟାରାଫିଲ୍ରେଟ୍ (C₂₀H₁₂) ଏହା ଯୁଗରେ 25, ଏହାରେ କିମ୍ବାର
ଆବଶ୍ୟକ ଆବଶ୍ୟକ କାମ କରିବାର କୋର୍ଟିକ୍ ଏବଂ କୋର୍ଟିକ୍ରୋମିଟିର ଏହାରେ
କାମରେ 25 ।

(8) ହୃଦୟକର୍ମକାରୀ ଫ୍ଲୋରିଡ୍ (HF) ଫ୍ଲୋରିଡ୍ କୋର୍ଟିକ୍ ଏବଂ 25,

(9) ହୃଦୟକର୍ମକାରୀ ଏବଂ କୁଣ୍ଡଳିକା କୋର୍ଟିକ୍, ଆବଶ୍ୟକ ଏବଂ କୋର୍ଟିକ୍ରୋମିଟିର
କାମରେ 25 ।

(10) ଶର୍କାର କର୍ତ୍ତାଙ୍କ ଦ୍ୱାରା, ଅନୁମତି ପାଇଁ ଏବଂ
ଶ୍ଵାସପ୍ରରକ୍ଷଣ (SPM_s) ଏବଂ, ମୀଟ୍, ସମ୍ବାଦ, TENS, ଗ୍ରାମିକ ଓ
ବ୍ୟାକ୍ ପାଇଁ ଏହା କର୍ତ୍ତାଙ୍କ ଦ୍ୱାରା ଏହା କର୍ତ୍ତାଙ୍କ ଦ୍ୱାରା
ଏହା ଏହା,

ବାଧି କରାଯାଇଥାରୁ ବାଧି କରାଯାଇଥାରୁ :-

କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ
200 ବାଧି କରାଯାଇଥାରୁ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ

(1)	କ୍ରମିକ ପାଇଁ ପରିପାର୍ଶ୍ଵ	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	50	ମୋଟପାଇଁ
(2)	ମାତ୍ରାକ୍ରମିକ ପରିପାର୍ଶ୍ଵ	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	40	ମୋଟପାଇଁ
(3)	ମାତ୍ରା ପରିପାର୍ଶ୍ଵ	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	2	ମୋଟପାଇଁ
(4)	ଶର୍କାର ଦ୍ୱାରା କର୍ତ୍ତାଙ୍କ (SPM)	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	60	ମୋଟପାଇଁ
(5)	ରୋଟେଟିଂ ଶ୍ଵାସପ୍ରରକ୍ଷଣ (RPM)	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	40	ମୋଟପାଇଁ
(6)	ଫ୍ରେଶ (Pb)	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	0.5	ମୋଟପାଇଁ
(7)	ଅଚ୍ଯନ୍ତ (CH ₄)	-	କ୍ରମିକ ପରିପାର୍ଶ୍ଵ	100	ମୋଟପାଇଁ

ବାଧି କରାଯାଇଥାରୁ କର୍ତ୍ତାଙ୍କ :-

(1) ମାନ୍ୟମାତ୍ରା, କର୍ତ୍ତାଙ୍କ ଏବଂ କର୍ତ୍ତାଙ୍କ ପାଇଁ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ
କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ କର୍ତ୍ତାଙ୍କ

କେବଳ ପରିମାଣ କରିବାର ପାଇଁ ଏହା କିମ୍ବା ଏହାର ଅଧିକ ପରିମାଣ କରିବାର ପାଇଁ ଏହା କିମ୍ବା

- (2) କେବଳ ଆଶ୍ଵରି ଅନ୍ତରି ଏହା ଉପରେ କିମ୍ବା ଏହାର
ଲକ୍ଷଣ ଅନ୍ତରି ଏହାର ଏହାର ଏହାର ଏହାର
ବ୍ୟକ୍ତିଗତ ଏହାର ଏହାର, ଏହାର ଏହାର ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର,
- (3) ଏହା କାମକି କୁଣ୍ଡଳ ଏହାର ଏହାର ଏହାର, ଏହାର
ଏହାର ଏହାର ଏହାର,
- (4) କାର୍ଯ୍ୟକାରୀ ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର,
- (5) କାର୍ଯ୍ୟକାରୀ ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର,
- (6) କାର୍ଯ୍ୟକାରୀ ଏହାର ଏହାର ଏହାର, ଏହାର - ଏହାର, ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର, ଏହାର -
ଏହାର, ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର, ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର,
- (7) କାର୍ଯ୍ୟକାରୀ ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର ଏହାର,
- (8) କିମ୍ବା, ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର CFC
ଏହାର ଏହାର ଏହାର ଏହାର,
- (9) କାର୍ଯ୍ୟକାରୀ ଏହାର, ଏହାର ଏହାର ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର ଏହାର
ଏହାର ଏହାର ଏହାର ଏହାର,

RAMAKRISHNA MISSION RESIDENTIAL COLLEGE



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE:

Solid and liquid Waste Management in
Hostel campus

NAME : Saikat Bera
COLLEGE ROLL NO : PHUGI / 131 / 19
DEPARTMENT : Physics
YEAR : 2020
SIGNATURE : Saikat Bera

CONTENTS

<u>Topics</u>	<u>Page No.</u>
1 Introduction	2
2 Objectives	3
3 Solid Waste management (SWM) in hostel campus	5-8
i) Different types and sources of solid waste in hostel campus	4-5
ii) Ideal methodology of SWM in hostel campus	5-7
iii) SWM in our campus	7-8
4 Liquid waste management (LWM) in hostel campus.	9-12
i) Sources of liquid waste of various types	9
ii) methodology of LWM	9-12
iii) LWM in our campus	12
5 Conclusion	12-13
6 References	13

INTRODUCTION

India is the second largest populated country in the world with a population of 1.25 billion. The annual rate of growth of urban population in India is 3.55 percent. Rapid growth in population, urbanization and industrialization has led to the increasing stress on the services sectors in the country. Particularly solid and liquid waste management sectors managed by local bodies has been under tremendous stress, due to the increasing generation of waste.

Per capita generation rate of municipal solid waste in India ranges from 0.2 to 0.5 Kg/day. In majority of urban areas of India, the solid waste management is chaotic as the waste is being collected through community bin system and disposed in low-lying areas outside the city ; either by compacting with layers-on-earth or without compaction. These low-lying areas affect the environment through gaseous emissions, leachate generation, mosquito breeding etc.

In India there are over 300 universities and 45,000 colleges of various types with their hostels. Thus in present days increasing number of hostels and academic institutions generate 6-8 tons of waste per week each, containing Solid waste, food waste, liquid waste, e-waste, gaseous waste, radioactive waste etc.. Every campus has their own methodology to manage these waste. Here I am showing how they solve waste problem, specially in my campus, Ramakrishna Mission Residential college in Narendrapur, West Bengal.

OBJECTIVES

There are following different objectives of my project on solid and liquid waste management in Hostel campus -

- 1 To characterize the waste generated and source of waste management generation in hostel campus.
- 2 To identify solid and liquid waste management practices existing in campus.
- 3 To examine the current solid and liquid waste management system of campus and describe.
- 4 To suggest about some different practices for better management of solid and liquid waste management in hostel campus.

SOLID WASTE MANAGEMENT IN HOSTEL CAMPUS

Solid Waste management (SWM) is one of the basic services in hostel campus, arranged and administered by the hostel authorities in the country to enhance cleanliness of the campus. The main objectives of SWM are the maintenance of clean and hygienic conditions and reduction in the quantity of solid waste, which is disposed off in the Sanitary Landfill Facility (SLF) of the area of recovery of material and energy from it. However mostly the service is inefficient and weak due to the lack of scientific methods and new sustainable approaches. The ever-growing global concern about environmental sustainability in hostel campuses has accelerated a dedicated SWM program on the campus to sensitize and build the consciousness of the campus occupants toward waste management.

The current study evaluates the solid waste profile and its management in hostel campus especially in our Narendra-Puri college campus and how to make it a 'zero-waste' campus.

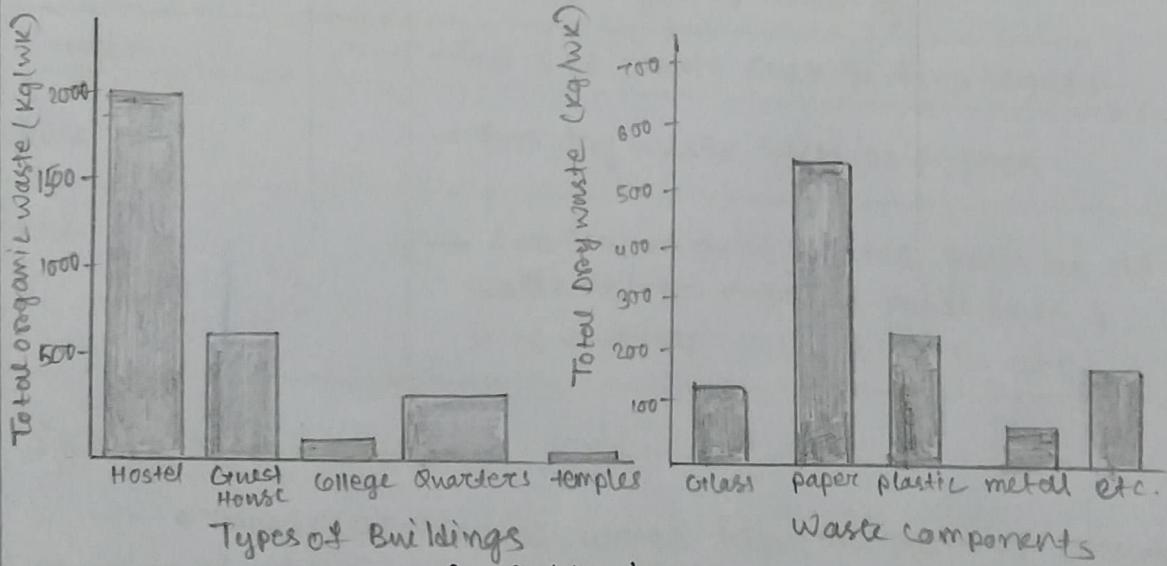
Different types and sources of Solid Waste in hostel campus :

The following table shows various types of solid waste generated in hostel campus and its sources —

Type of SW	Description	Sources (in campus)
Food Waste (Garbage)	Waste obtained as a result of preparation, cooking and serving of food, Market refuse etc.	Canteen, Dining hall, Student hostel etc.
Rubbish	<p>It includes two types :</p> <ul style="list-style-type: none"> i) <u>Combustible</u> (primarily organic) <ul style="list-style-type: none"> • Paper, cardboard, cartoon, wood, boxes, leathers, bedding, grass, leaves etc. and ii) <u>non-combustible</u> (primarily inorganic) — metals, stones, bricks, glass etc. 	whole campus premises, classes, rooms, kitchen, other commercial facilities etc., parks, gardens etc.
Ashes and residues	Waste obtained as fine residue from the cooking of food and heating of buildings, cinders, clinkers etc.	every burning objects.
Industrial waste and sludge and construction or demolition waste	It includes SW from industrial processes and building construction or demolition etc.	Buildings under construction and demolition.
chemical and radioactive waste.	It includes acids, other pollutants, radioactive particles etc. These are one of most hazardous waste generated from lab experiments.	chemical laboratories, biological laboratories etc.

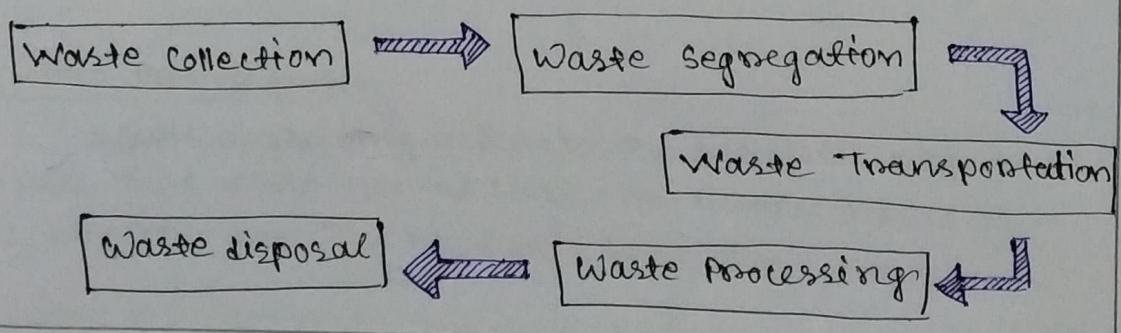
Types of Waste	Description,	Sources (in campus)
E-Waste.	It includes all types of electronic waste such as part of damaged computers, discs, wires etc. which can contain radioactive parts also.	Computer laboratories

But in most of the cases of SWM, Solid waste are classified in two categories — ① Organic waste and ② Dry waste. Expected quantity of these waste in our campus is shown below—



Ideal methodology of SWM in hostel campus :

Following figure demonstrates the steps of SWM as listed and advised by the Central Pollution Control Board (CPCB) in 2000 :



Hence I am discussing every step in details —

① Waste Collection -

- Collection from each facility,
- Door to door or students' room based collection ,

② Waste Segregation -

After collection and before waste processing we have to segregate waste into three different categories viz. Wet / Dry / Hazardous / E-waste etc. Generally, different colour bins are used for discarding different types of wastes.

Colour of the bin	What type of trash go in
Green	→ for wet waste such as food scraps
Blue	→ for dry waste such as papers
Red	→ for Hazardous wastes such as old batteries or expired medicines ; Plus e-waste such as DVDs etc .

③ Waste Transportation -

- Transportation of waste from the point of collection to point of processing.
- Waste must be transported under covered conditions to avoid littering
- Exposure of the waste to the public should be minimized .

④ Waste Processing -

Waste processing refers to the activities required to ensure that waste has the least practicable impact on the environment. The next page some of this process —

1 The 3-R's):-

Refuse : It is total ban the use of certain stuff such as use-and-throw carry bags etc.

Reuse : There are some item which we can reuse such as paper files, cloth bags, water jugs, plastic bottles etc.

Recycle : There are some recyclers, scrap dealers of various waste-products who take e-waste and others discarded items etc. for price and regenerate them to use.

2 Composting organic waste.

3 Anaerobic digestion (AD) : Breaking down of biodegradable material in absence of oxygen by microorganisms.

4 Emerging energy technologies5 Rubber recycling etc.6 Waste disposal :

Waste disposal is the proper disposal of a discarded or discharged material in accordance with local environmental guidelines or laws. Disposal includes burning, burial at land fill sites or at sea, and recycling.

SWM in our Campus :

RKMRC is an autonomous institution, The methodology in our campus is shown in next page—

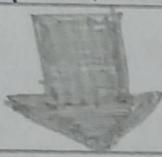
[See next page]

Waste Collection

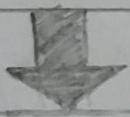
- The cleaning staff in every facility, clean floors and toilets daily. They collect wastes from bins manually throw the waste in the concrete bins provided near the facility.
- Gardeners clean and maintain the designated area and throws the garden waste in the concrete bins.
- There are total 80 (approximated) in RKMRC campus

Waste Segregation

- Segregation in color-coded dustbin only at few facilities in the campus.

Waste Transportation

- Collection tractor collects the waste from large cemented and plastic dustbins twice a week.
- Waste is openly transported to the dumping site by a tractor.

Waste processing

- No processing of waste in RKMRC campus

Waste disposal

- Some of the garden waste are burnt by the gardeners in the compound area, especially during winters.
- Waste is disposed on a municipality designated landfill site outside city.

LIQUID WASTE MANAGEMENT IN HOSTEL CAMPUS

In hostel camps, liquid waste means all types of wastewater. Wastewater are that water which is adversely affected in quality due to human activity and contains urine, faeces, food materials, oil, dissolved soap and other chemical and contaminants.

The main purpose of waste water recycling is to substitute the precious drinking water in applications which do not require drinking water quality.

Hostel campuses like RKMRC require huge amount of potable water for different purpose because in campus 4 boys hostel capacity around 800. In campus no. of trees and greenery is available so for maintaining the greenery and garden campus requires large quantity of water.

In hostel campuses the average discharge of a hostel is around 8000 to 9000 litres per day. Hence wastewater treatment is such an important factor. Sustainable wastewater treatment involves processing wastewater, ridding it of all contaminants, so that it can be used again. It also helps prevent pollution of our water bodies.

Sources of liquid waste of various types :

Some divide liquid waste in two categories —

① Grey water :

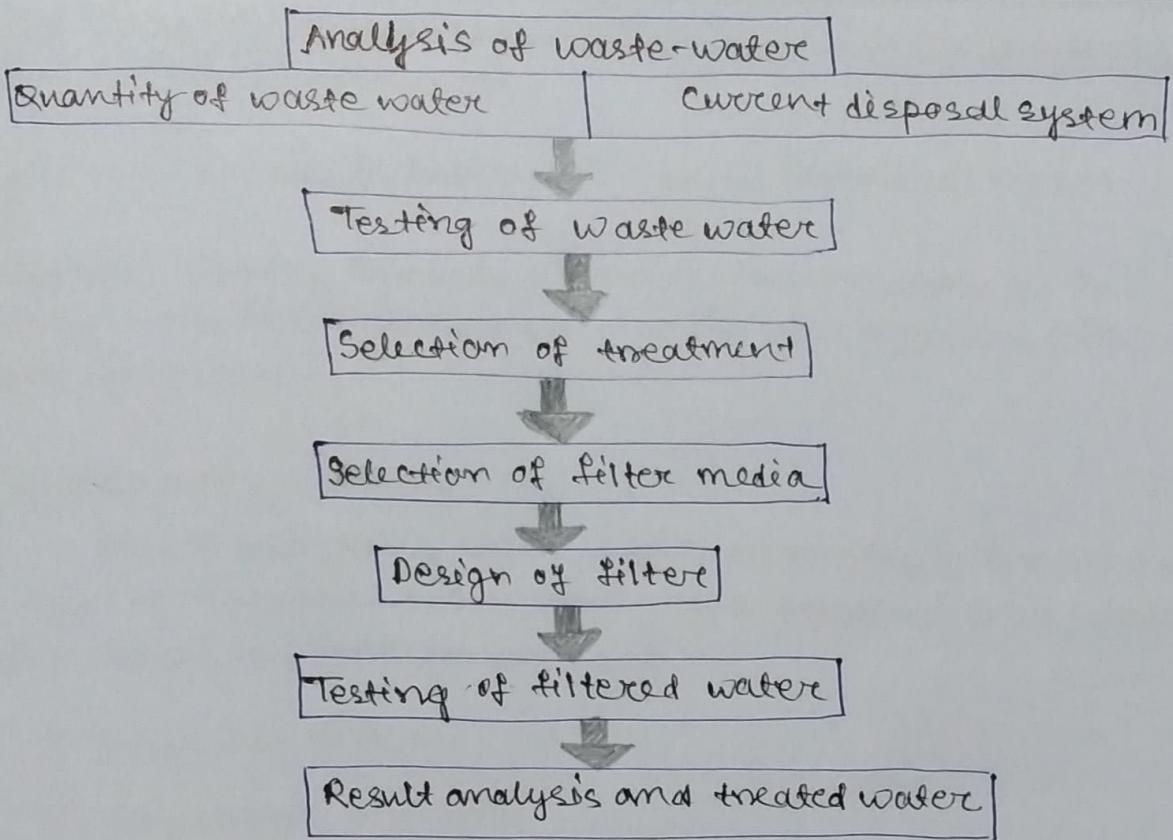
It includes water from showers, bathtubs, sinks, kitchens, dishwashers, laundry tubs and washing machines.

② Black water :

when it includes toilet water.

Methodology for liquid waste management (LWM) :

Detailed research plan carried out during the study is as per the follows :



Here I'm showing all steps in details —

1 Analysis of waste-water :

First we need to quantity of discharged waste and its current disposal system, quantity of waste-water can be calculated by direct discharge measurement or by using standard requirement of human for bath and washing clothes. In hostel campuses several pipes are used to collect bathroom water collection, kitchen or dishwasher's waste-water.

2 Testing of waste-water :

After waste-water collection we must find characteristics of this water and for selection of treatment. We need to find some parameters —

① BOD (Biological oxygen demand) which is measured by incubators.

② COD (Chemical Oxygen Demand) which is measured with the help of photo-spectrometer.

⑤ pH, TDS, EC are measured with their individual meter

⑦ Phenols, Benzene, Chloride, Nitrate, Hardness due to Ca and Mg, DO, Suspended solid which also measured with photo spectrometer.

3 Selection of treatment:

After analyzing wastewater next step is for selection of type of treatment. Generally for treatment of waste water following methods are used —

- i) Trickling filter
- ii) Anaerobic Digestion
- iii) Lagoons and wetlands
- iv) Rotating Biological Contractors (RBC)

But these methods require large land and cost is also high. Hence we prefer the sand filter and charcoal treatment.

4 Selection of filter media:

With respect to characteristics of waste-water the filter media is finalized. In filter three layers are provided of activated charcoal, sand and aggregate respectively.

i) Activated charcoal —

It is a form of carbon processed to have small, low-volume pores that increase the surface area available for adsorption or chemical reaction. Activated charcoal traps impurities in water including solvents, pesticides, industrial waste and other chemicals. It is used for particles of 15 microns.

ii) Sand —

Sand bed work by providing the particulate solids with

many opportunities to be captured on the surface of a sand grain. The sand of size 1mm to 1.5mm is used for this filter. All these happens by creating surface charges on sand and other particles.

iii) Aggregate -

~~River~~ River sands filter gravel is a hard, predominantly quartz aggregate. It is used as a support media of filter sand and coal in water filters. The size of aggregate used in this filter is 10 mm to 12.5 mm.

5 Design of filter:

For the above treatment we need three tanks of proper size -

- ① Collection and sedimentation tank
- ② Filtration tank
- ③ Storage tank where the filtered water is stored.

9 Result analysis of testing of treated water:

Now we check the same parameters of treated water as we have done before of wastewater to ensure the performance of model.

Liquid waste management in our campus:

In our campus black waters (toilet water) are disposed in soap tank and other grey water is disposed in ~~so~~ several large ponds.

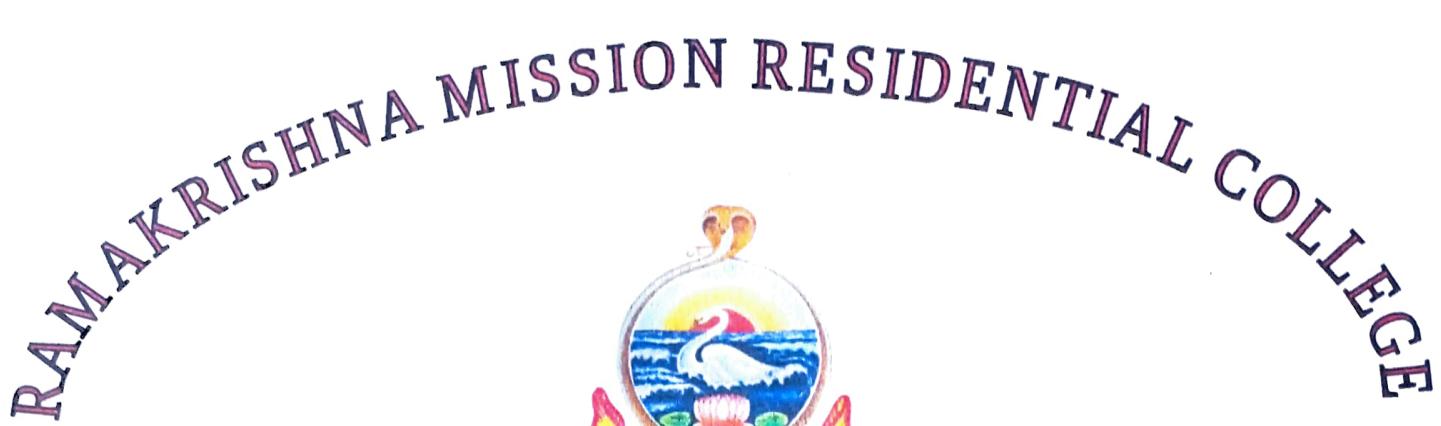
CONCLUSION

Thus from the previous study we clearly understand the importance of waste management. Waste management in our campus is little unsystematic and inefficient. A

Carefully chalked out system of waste segregation, collection, disposal and recycling etc. is required to be able to upgrade the esteemed campus to a 'zero-waste campus'. To achieve this goal, awareness must be spread regarding the reduction of waste-production, reuse, sanitary habits and careful handling of waste, by inculcating the value of waste as a resource, into the minds of all.

REFERENCES

- 1 IJERT, NCAEM - 2013 Conference proceedings
ISBN : 978-93-83758-09-8
- 2 Solid waste management, NIRDPB
- 3 Article in Management of Environmental quality An international journal - June, 2017



NARENDRAPUR

ENVIRONMENTAL STUDIES

PROJECT TITLE: Nitrogen Cycle.

and its importance for living beings

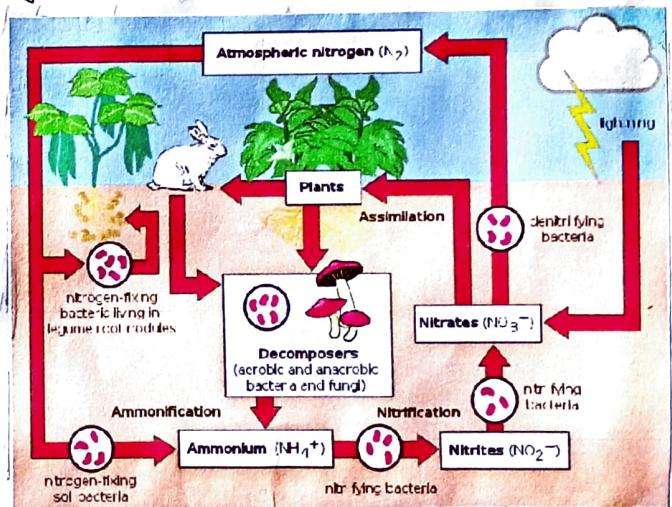
NAME : Sandip Kr. Kundu.
COLLEGE ROLL NO : ENUGI/248/19
DEPARTMENT : English
YEAR : 2020
SIGNATURE : Sandip Kr. Kundu.

NITROGEN CYCLE

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 nitrogen cycle include fixation, nitrification, ammonification and denitrification. The majority of Earth's atmosphere (78%) is nitrogen, making it the largest source of nitrogen. However atmospheric nitrogen has limited availability for biological use, leading to a scarcity of usable nitrogen in many types of ecosystems. The nitrogen cycle is of particular interest to ecologists because nitrogen availability can affect the rate of key ecosystem processes, including primary production and decomposition. Human activities such as fossil fuel combustion, use of artificial nitrogen fertilizers, and release of nitrogen in wastewater have dramatically altered the global nitrogen cycle. Human modification of the global nitrogen cycle negatively affect the natural environment system and also human health. Nitrogen is present in the environment in a wide

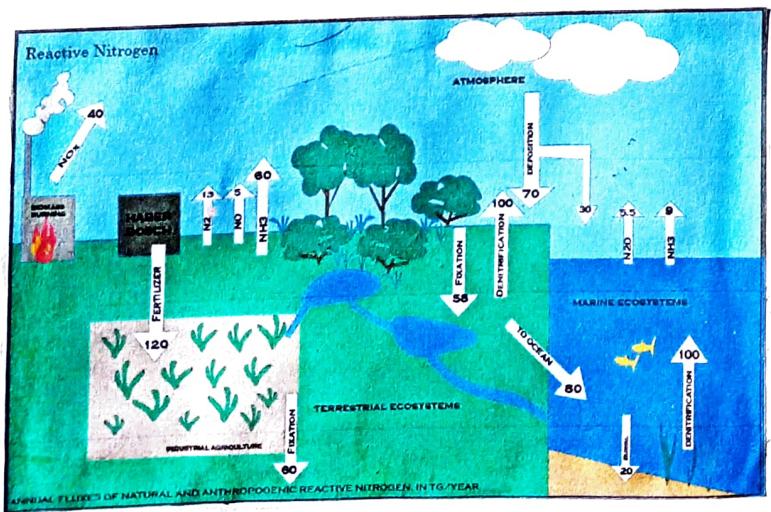
variety of chemicals forms including organic nitrogen, ammonium, nitrite, nitrate, nitrous oxide (N_2O), nitric oxide, or inorganic nitrogen gas. Organic nitrogen may be in the form of a living organism, humus or in the intermediate products of organic matter decomposition. The process of nitrogen cycle is to transform nitrogen from one form to another. Many of these processes are carried out by microbes, either in their effort to harvest energy or to accumulate nitrogen in a form needed for their growth. For example, the nitrogenous wastes in animal urine,



are broken down by nitrifying bacteria in the soil to be used by plants. The diagram alongside shows how these processes fit together to form the nitrogen cycle.

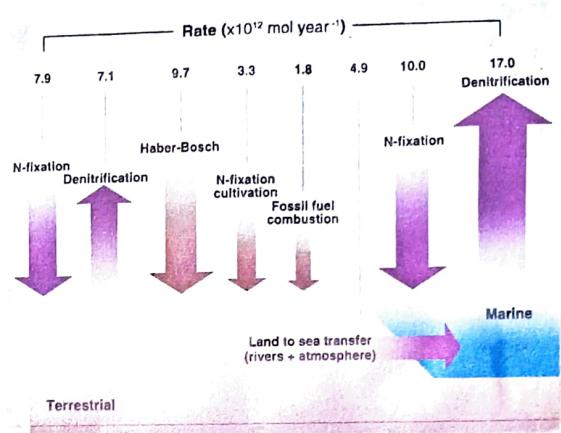
Nitrogen Fixation

Nitrogen gas is converted into nitrates, and nitrites, through atmospheric, industrial and biological processes is called Nitrogen fixation. Atmospheric nitrogen must be processed or fixed into an usable form to be taken up by plants. Most fixation is done by free living or symbiotic bacteria known as diazotrophs. These bacteria have the nitrogenase enzyme that combines gaseous nitrogen with hydrogen to produce ammonia which is converted by bacteria into other organic compounds. Most biological nitrogen fixation occurs by the activity of Mo-nitrogenase found in a wide variety of bacteria and some archaea. An example of free living bacteria is Azotobacter. Symbiotic nitrogen-fixing bacteria such as Rhizobium usually live in the root nodules of legumes. Here they form a mutualistic relationship with the plant, producing ammonia in exchange for carbohydrates. Because of this relationship, legumes will often increase the nitrogen is produced industrially using the Haber-Bosch process, which uses high temperatures, and pressures to convert nitrogen gas and a hydrogen source into ammonia.



Nitrification

The conversion of ammonium to nitrate is performed primarily by soil-living bacteria and other nitrifying bacteria. In the primary stage of nitrification, the oxidation of ammonium is performed by the bacteria such as the Nitrosomonous species, which converts ammonia to nitrates. Other bacterial species such as the Nitrobacters, are responsible for the oxidation of the nitrates into nitrites. It is important for the ammonia to be converted to nitrates or nitrites because ammonia gas is toxic to plants. Due to their high solubility and because soils are highly unable to retain anions, nitrates can enter groundwater. Elevated nitrate in groundwater, elevated nitrate in ground water is a concern for drinking water use because nitrate can interfere with blood oxygen level in infants and cause methemoglobinemia or blue-baby syndrome. When groundwater recharges stream flow, nitrate-enriched groundwaters can contribute to eutrophication, a process that leads to high algal population and growth, especially blue-green algal population. While not directly toxic to fish life like ammonia, nitrate can have indirect effects on fish if it contributes to this eutrophication. Nitrogen has contributed to severe eutrophication problems in some water bodies. Since 2006, the application of nitrogen fertilizers has been increasingly controlled in Britain and the United States. This is occurring along the same lines as control of phosphorus fertilizers, restriction, of which is normally considered essential to the recovery of eutrophied water bodies.



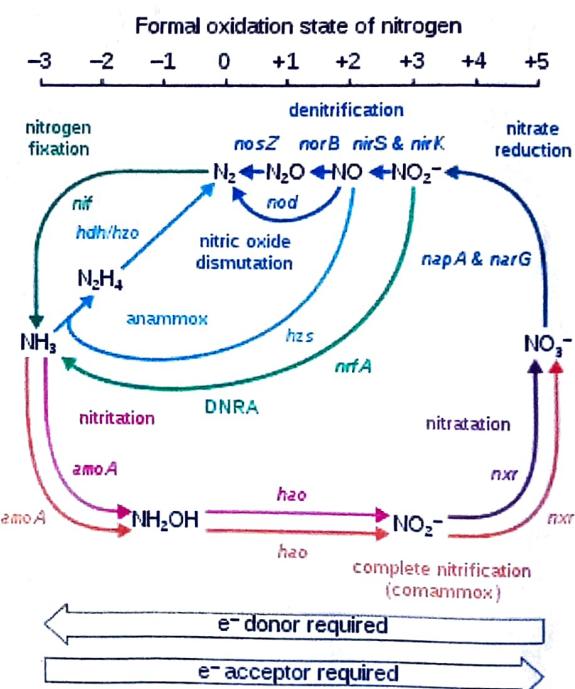
Assimilation

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. The plant provides amino acids to the bacteroids so ammonia assimilation is not required and the bacteroids pass amino acids back to the plants thus forming an interdependent relationship. While many animals, fungi and other heterotrophic organisms obtain nitrogen by ingestion of amino acids, nucleotide and other small organic molecules others heterotrophs, are able to utilise inorganic compounds such as ammonium as sole N sources. Utilisation of various N sources is carefully regulated in all organisms.

Ammonification

When a plant or animal dies or an animal expels waste, the initial form of nitrogen is organic. Bacteria or fungi convert the organic nitrogen within the remains back to ammonium, a process called ammonification, or mineralization. Enzymes are:-

- i) GS :- Gln Synthetase (Cytosolic & Plastid)
- ii) GOGAT :- Glu 2-Oxuglutamate aminotransferase.
- iii) GDH :- Glu Dehydrogenase.



Denitrification

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

Global Nitrogen Fertilizer Application

Global Fertilizer and Manure, Version 1



Other Processes

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

The nitrogen cycle is an important process in the ocean as well. While the overall cycle is similar, there are different players and modes of transfer for nitrogen in the ocean. Nitrogen enters the water through precipitation, runoff or as N_2 from

the atmosphere. Nitrogen enters the water through the atmosphere. Nitrogen cannot be utilized by phytoplankton as N_2 so it must undergo nitrogen fixation which is performed predominately by cyanobacteria. Without supplies of fixed nitrogen entering the marine cycle, the fixed nitrogen would be used in about 2000 years. Phytoplankton need nitrogen in biologically available forms for the initial synthesis of organic matter. Ammonia and urea are released into the water by excretion from plankton. Ammonium is thought to be the preferred source of fixed nitrogen for phytoplankton because its assimilation does not involve a redox reaction and therefore requires a little energy. These are a few notable and well known exceptions that include most Prochlorococcus and some Synechococcus that can only take up nitrogen as ammonium.

New vs regenerated nitrogen

Nitrogen entering the euphotic zone is referred to as new nitrogen because it is newly arrived from outside the productive layer. The new nitrogen can come from below the euphotic zone or from outside sources. Outside sources are upwelling from deep waters and nitrogen fixation. New production is an important component of the marine environment. One reason is that only continual input of new nitrogen can determine the total capacity of the ocean to produce a sustainable fish harvest. Harvesting fish from regenerated nitrogen areas will lead to a decrease in nitrogen and therefore a decrease in primary production.

