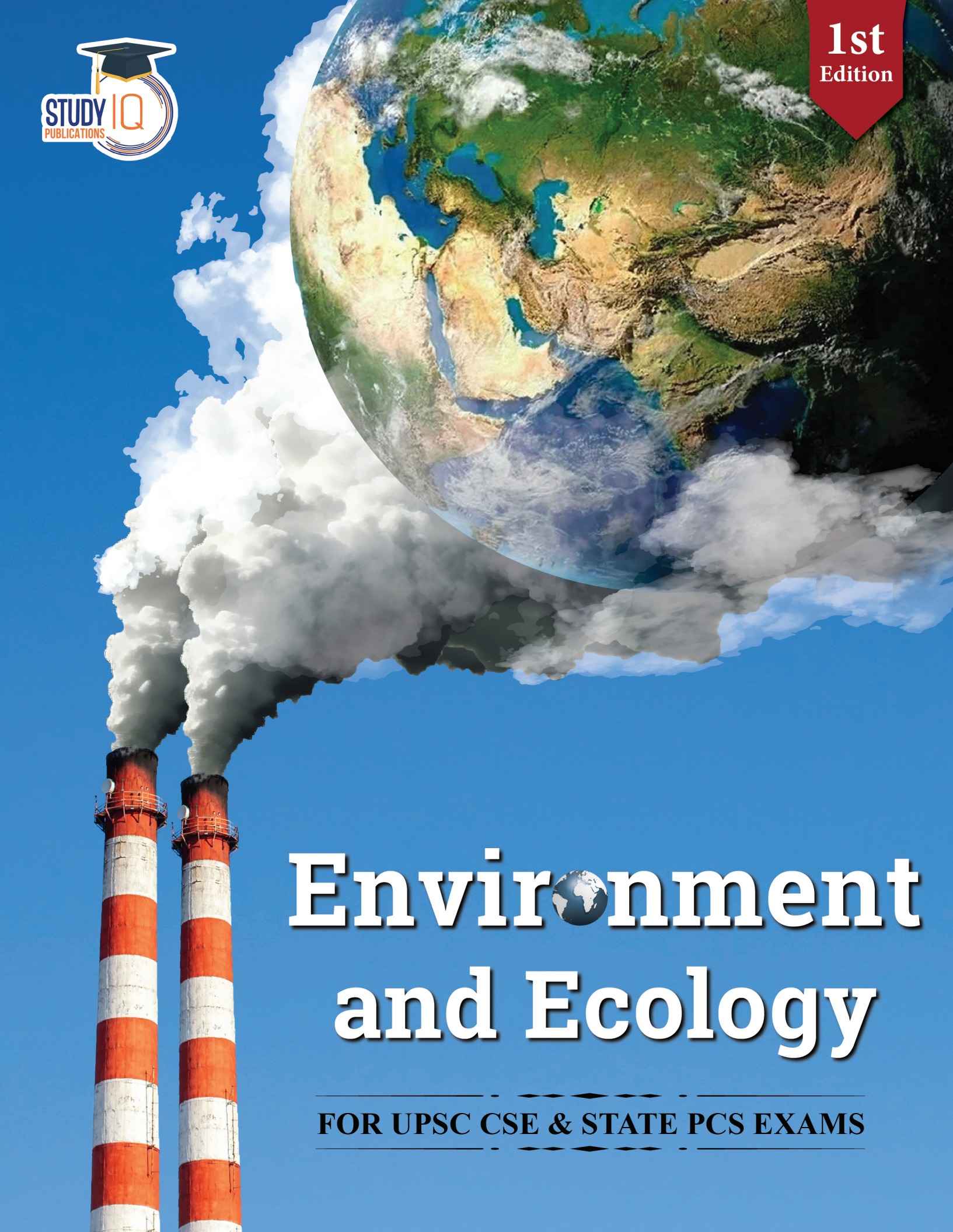




Environment and Ecology

FOR UPSC CSE & STATE PCS EXAMS

From the Founder's Desk

Dear Aspirants,

We would like to humbly thank you for the great response we had from our history, economy and geography books.

Taking inspiration from the overwhelming positive response of our books, we are taking another leap towards our mission to democratize quality education for everyone. Study IQ Publications is delighted to present you with the first edition of our book 'Environment and Ecology'.

This book was created keeping in mind, the concerns and challenges that students face during their Civil services preparation. Students are frequently confused about what to study, how much to study, the depth of knowledge required for any topic, and the type of questions asked by the commission. Above all, the absence of consolidated study material and the information silo from multiple sources hinder our student's preparations.

This book is an honest attempt to tackle these problems and improve students' knowledge base, saving their precious time during their preparation and eliminating many academic misunderstandings that they encounter.

Special Features of This Book

This book aims to make your preparation focused and relevant based on UPSC's current trend and pattern, revision-friendly, and up-to-date.

- The requirements of the UPSC Civil Services Examination are the exclusive focus of this book.
- We have taken great care to ensure that the materials are written in a clear and easy-to-understand, so that students may learn and recall the concepts to their advantage.
- Wherever necessary, we've incorporated diagrams and infographics on various environmental topics to make learning interactive and easy.
- We have also included important current affairs topics of the last 2 years along with case studies and best practices on various topics.
- We have incorporated the relevant previous year's questions at the end of each chapter so that the students can test their knowledge while understanding the trend of the question.

With all sincerity and humility, the Study IQ team wishes you the best in your preparation, and we are hopeful that this book will help you in your journey.

Happy Learning!!

Dr. Gaurav Garg
Co-Founder, Study IQ Education

Mohit Jindal, IIT-Bombay
Co-Founder, Study IQ Education,
Mentoring UPSC CSE Aspirants for past 7 years

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SAMPLE PAGES

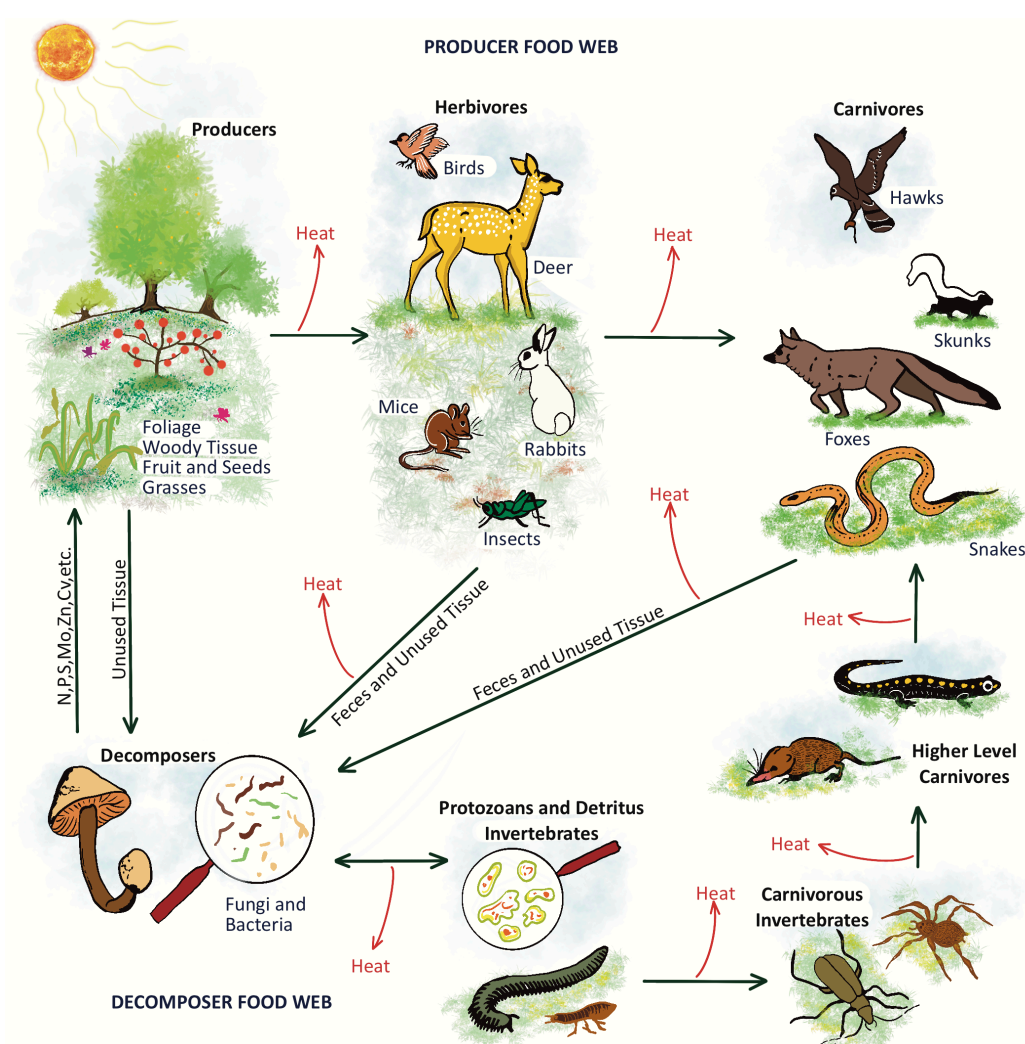
Food Web

Ecosystem is a very complex structure that consists of a number of food chains. These food chains do not exist in isolation but interact with each other and often

depend on each other. One animal may be a member of several different food chains. A food web shows the complex and interconnected network of a number of food chains in an ecosystem.

Difference between Food Chain and Food Web

Food Chain	Food Web
It depicts the linear flow of food energy	It shows the interconnecting food chains in an ecological community.
It is a single unit.	It consists of several food chains
It may consist of 4 - 6 trophic levels.	It consists of many numbers of trophic levels
It increases the instability of an ecosystem.	It increases the stability of an ecosystem
It does not improve the adaptability and competition amongst the organisms.	It improves the adaptability and competitiveness of organisms
The whole food chain can be disturbed if a disturbance occurs in a single trophic level.	The whole food web won't be disturbed if a disturbance occurs in a single trophic level.
Higher trophic level members can only feed upon a single type of organism in their lower trophic level	Higher trophic level members can feed upon several types of organisms in their lower trophic levels.

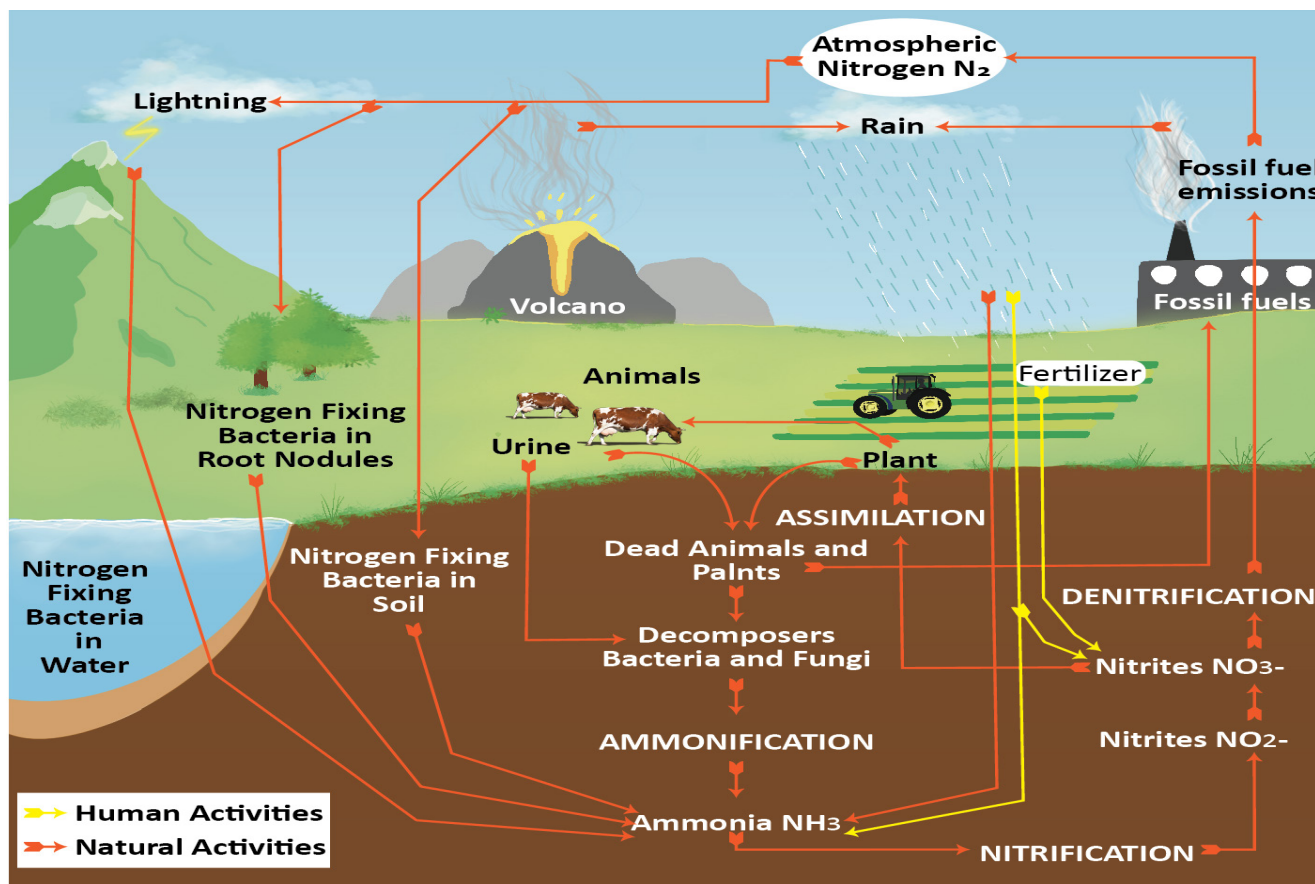


Two Types of Food Webs in a Forest

- **Assimilation:** By the process of assimilation, the nitrogen fixed by plants is converted into organic molecules such as proteins, DNA, RNA etc. These molecules make the plant and animal tissue.
- **Ammonification:** Living organisms produce nitrogenous waste products such as urea and uric acid. By the process of ammonification, these waste products and the dead remains of organisms are converted back into inorganic ammonia by certain soil bacteria. Examples of ammonifying bacteria

include bacillus, proteus, clostridium, pseudomonas and streptomyces.

- **Denitrification:** The process by which nitrates are converted back into gaseous nitrogen is called denitrification. Denitrification occurs because in deep layers of soil, oxygen is not available and the soil bacteria use these nitrogen compounds instead of oxygen. Examples of denitrifying bacteria include Pseudomonas, Thiobacillus denitrificans, Serratia, Achromobacter, and Micrococcus denitrificans.



Nitrogen Cycle

Key Facts about Nitrogen

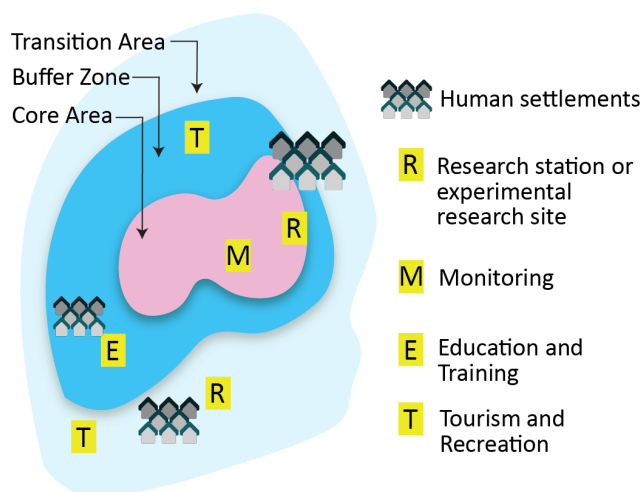
- Nitrogen makes up 78% of the air, by volume.
- It is colorless, odorless and tasteless in gaseous form.
- Looks the same as water when in liquid form.

Significance of Nitrogen

- Important for plants and animals to survive
- Core component of amino acids, nucleic acids, DNA and RNA
- Basic building block of proteins

Human Impact on the Nitrogen Cycle

- **Excessive use of Fertilizers:** Fertilizers containing nitrogen compounds such as ammonia and nitrate are used to increase crop yield. Excessive use of fertilizers leads to excess of nitrogen in soil. Excess nitrogen can leach into waterways and cause eutrophication, leading to harmful algal blooms and dead zones.
- **Burning of fossil fuels:** It releases nitrogen oxides into the atmosphere. Nitrogen oxides contribute to air pollution and cause acid rain.



Biosphere Reserve Zonation

- **Transition Area:** It is the outermost zone. Cropping, forestry, fishery and other activities are allowed here.

Biosphere Reserves in India

Designation: The Indian National MAB Committee identifies and recommends potential sites for Biosphere Reserve designation, adhering to UNESCO's guidelines and criteria. The reserves that meet the criteria are then admitted into the international network by the International Coordinating Council (ICC) of the MAB Programme, upon the country's request.

National Biosphere Reserve Programme: It is being implemented by Government of India since 1986. The major objectives of the programme are as follows:

- To conserve the diversity and integrity of plants and animals within natural ecosystems;
- To safeguard genetic diversity of species on which their continuing evolution depends;
- To provide areas for multi-faceted research and monitoring;
- To provide facilities for education and training; and
- To ensure sustainable use of natural resources through most appropriate technology for improvement of economic well-being of the local people.

Biosphere Reserves in India



Oceanic Acidification

Ocean acidification refers to a reduction in the pH (Increasing acidic nature) of the ocean over an extended period of time. caused primarily by uptake of carbon dioxide from the atmosphere.

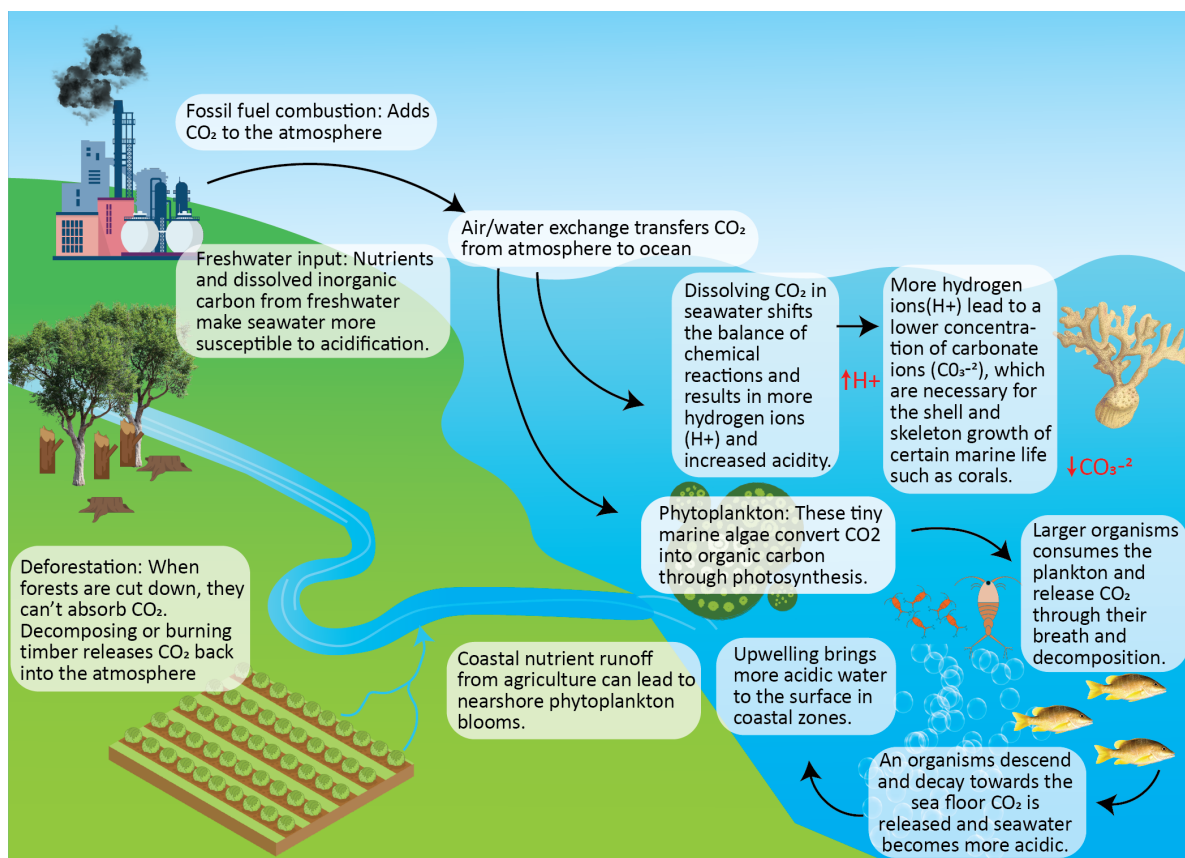
For millions of years, the exchange of carbon dioxide between the surface of the ocean and the atmosphere remained constant. The ocean is slightly basic. Prior to the Industrial Revolution of the 18th to 19th centuries, the ocean's average pH was about 8.2. In the past 150 years, humans have greatly increased the amount of carbon dioxide in the atmosphere by burning fossil fuels and changing land-use practices. Currently the ocean's average pH is 8.1. Additionally, the ocean currently is about 30 per cent more acidic than in pre-industrial times.

According to the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report, by 2100 AD, the pH of the ocean could decrease to about 7.8. This will make the ocean 150 percent more acidic and affecting half of all marine life.

Evidences of Ocean Acidification

There is strong scientific evidence of ocean acidification and its impacts on the world's oceans. Some of the key evidence includes:

- **Declining pH:** Measured Ocean pH values have shown a consistent decrease over the last century, with a decrease of approximately 0.1 units, indicating a 30% increase in acidity.
- **Dissolving Shells:** Observations of declining shell and skeleton growth in some species of marine organisms, such as corals, molluscs, and some species of plankton, provide clear evidence of the impacts of ocean acidification on calcifying organisms.
- **Changes in Marine Ecosystems:** Changes in the distribution and abundance of some species of marine life, as well as shifts in the structure of marine food webs, suggest that ocean acidification is altering the functioning of marine ecosystems.
- **Model Predictions:** Computer models that simulate the impacts of ocean acidification on the world's oceans have consistently predicted declines in pH and the availability of carbonate ions, as well as changes in marine ecosystems, fisheries, and biodiversity.



Mechanism of Ocean Acidification