

[Burning Issue] Nitrogen Pollution in India

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APRIL 29, 2019

#Burning Issues

Nitrogen Pollution

- While nitrogen is the dominant gas in the atmosphere, it is inert and doesn't react.
- However, when it is released as part of compounds from agriculture, sewage and biological waste, nitrogen is considered reactive.
- It may be polluting and even exert a potent greenhouse gas effect.
- Nitrous oxide (N₂O) is 300 times more potent than carbon dioxide but isn't as prevalent in the atmosphere.
- Other than air pollution, nitrogen is also linked to the loss of biodiversity, the pollution of rivers and seas, ozone depletion, health, economy, and livelihoods.
- Nitrogen pollution is caused, for example, by emissions from chemical fertilisers, livestock manure and burning fossil fuels.
- Gases such as ammonia (NH₃) and nitrogen dioxide (NO₂) contribute to poor air quality and can aggravate respiratory and heart conditions, leading to millions of premature deaths across the world.
- Nitrate from chemical fertilisers, manure and industry pollutes the rivers and seas, posing a health risk for humans, fish, coral and plant life.

Nitrogen: A limited necessity

- Nitrogen is essential to all life on Earth as it forms an important component of life-building and propagating biochemical molecules like proteins.
- But overuse in agriculture in the form of fertilisers and other fields have made this important element more bane than boon.
- Some of these forms of nitrogen like N₂O can have far reaching impacts for humanity.
- N₂O is 300 times more potent as a greenhouse gas than carbon dioxide (CO₂).

Nitrogen emission in India

- NO_x emissions grew at 52% from 1991 to 2001 and 69% from 2001 to 2011 in India.
- Agriculture is the largest contributor to nitrogen emissions.
- Non-agricultural emissions of nitrogen oxides and nitrous oxide were growing rapidly, with sewage and fossil-fuel burning – for power, transport and industry – leading the trend.

Nitrogen: The “new carbon” for India

- In 2017, a large team of Indian scientists had come out with The Indian Nitrogen Assessment (INA).
- India had become the third country/entity after the United States and the European Union to have assessed the environmental impact of nitrogen on their respective regions comprehensively.
- The INA shows that agriculture is the main source of nitrogen pollution in India. Within agriculture, cereals pollute the most.
- Rice and wheat take up the maximum cropped area in India at 36.95 million hectares (ha) and 26.69 million ha respectively.

Overuse of Fertilizers

- India consumes 17 Mt (million tonnes) of nitrogen fertiliser annually as per the data of the Fertiliser Association of India.
- Only 33 per cent of the nitrogen that is applied to rice and wheat through fertilisers is taken up by the plants in the form of nitrates (NO₃). This is called Nitrogen Use Efficiency or NUE.
- The remaining 67 per cent remains in the soil and seeps into the surrounding environment, causing a cascade of environmental and health impacts.

India is curious about it

- The Indian government is leading a resolution on nitrogen pollution in the UNEA in Nairobi that starts from this March 11.

- This is a historic event as India has never pushed for a resolution of such importance at any UN congregation before.
- And this has happened because India can now leverage its own nitrogen assessment and its strong support to South Asian and other regional assessments with a more inclusive approach.
- This would lead a process for faster global consensus and a more realistic programme of action.

How Nitrogen turned into pollutant from nutrient how it is affecting health and environment?

- **Nitrogen is an inert gas that's necessary for life.** But we're changing it into forms that are harmful, overloading the environment with it, and throwing the natural nitrogen cycle out of whack.
- **Nitrogen compounds running off farmland have led to water pollution problems around the world,** while nitrogen emissions from industry, agriculture and vehicles make a big contribution to air pollution.
- **Over 80% of the nitrogen in soil is not utilised by humans.** While over four-fifths of the nitrogen is used to feed livestock, only about six per cent reaches humans in case of non-vegetarian diet, as compared to the 20% that reaches the plate of a vegetarian.
- **Nitrogen becomes a pollutant when it escapes into the environment and reacts with other organic compounds.** It is either released into the atmosphere, gets dissolved in water sources such as rivers, lakes or groundwater, or remains in the soil. While it might lead to favourable growth of species that can utilise this nutrient, nitrogen as a pollutant is often detrimental to the environment and health.

Effects on health:

According to the World Health Organization, nitrate-contaminated drinking water can cause reduced blood function, cancer and endemic goiters. Surplus inputs of nitrogen compounds have been found to cause soil acidification. The lowering pH, as a result of the acidification, can lead to nutrient disorders and increased toxicity in plants. It may also affect natural soil decomposition.

Nitrogen pollution has a significant impact on the environment:

- **It creates of harmful algal blooms and dead zones in our waterways and oceans;** the algae produce toxins which are harmful to human and aquatic organisms (and indirectly affects fisheries and biodiversity in coastal areas).
- **Contamination of drinking water.** 10 million people in Europe are potentially exposed to drinking water with nitrate concentrations above recommended levels. This can have an adverse effect on human health.
- **Food Security:** Excessive nitrogen fertiliser application contributes to soil nutrient depletion. As the world needs to feed an ever growing population loss of arable land is major global problem.
- **The release of Nitrous Oxide is essentially a greenhouse gas** which is harmful to the environment.

About South Asian Nitrogen Hub (SANH)

- The South Asian Nitrogen Hub (SANH) is a major international research programme to tackle the challenge that nitrogen pollution poses in South Asia.
- The SANH will be established with funding from UK Research and Innovation (UKRI) under its Global Challenges Research Fund (GCRF).
- 18 Indian research institutions are part of a group of 50 which have received £20 million funding from the United Kingdom Government.
- The SANH will study the impact of the different forms of pollution to form a coherent picture of the nitrogen cycle.
- In particular, it will look at nitrogen in agriculture in eight countries – India, Pakistan, Bangladesh, Nepal, Afghanistan, Sri Lanka, Bhutan and Maldives.
- Its recommendations will support cleaner and more profitable farming, as well as industrial recycling of nitrogen, fostering development of a cleaner circular economy for nitrogen.

What are the challenges ahead?

- Nitrogen is crucial to food production in India, however, its excessive usage in agriculture has put us under serious risk.
- We cannot produce sufficient food to feed the entire nation without nitrogen, but at the same time, we cannot keep releasing a higher amount of nitrogen due to its polluting effects.
- Thus the challenge is to optimally utilize the nitrogen while reducing its negative impacts.

What is the way forward?

- Since the issue of nitrogen pollution starts to gain global attention, there have been innovations seeks to improve its efficiency by optimizing usage.
- A simpler method of minimizing nitrogen application in soil is **Precision farming** where small quantities of nitrogen are administered routinely rather than applying large doses uniformly across the field.
- **Zero Budget Natural Farming** which involves usage of locally available materials such as cow dung and cow urine to increase soil productivity and plant growth.
- Also, **tablets and coated forms of nitrogen**, when applies at the root level = release nutrients slowly to the crops.
 - Notably, Bangladesh has managed to improve the efficiency of nutrient uptake by plants by applying fertilizers through tablets.
 - A similar initiative has been taken in India with neem-coated urea.
- These methods combined with the organic fertilizers and optimal timing of application, sowing, and watering, have shown marked improvement over traditional efficiencies of nitrogen.

Developed regions such as the US and Europe have published detailed reports regarding nitrogen usage and pollution. However, India is nowhere near aggregating something similar to its own. Thus the Nitrogen pollution is the problem of improper management rather than inability. The costs of abating nitrogen pollution would be much lesser than the benefits to health and the environment.

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