



## Methane Emissions

**For Prelims:** Methane Gas, Related Initiatives

**For Mains:** Wetland emission and atmospheric sink changes explain methane growth in 2020.

### Why in News?

Recently a study has been published titled- "Wetland emission and atmospheric sink changes explain methane growth in 2020", which states that low nitrogen oxide pollution and warming wetlands likely **drove global methane emissions to record high levels in 2020.**

### What are the Findings?

#### ▪ Overview:

- Global methane emissions reached roughly 15 parts per billion (ppb) in 2020 from 9.9 ppb in 2019.
- In 2020, methane emissions from human activities decreased by 1.2 teragrams (Tg) per year.

#### ▪ Contributors:

- Methane emissions from **oil and natural gas decreased by 3.1 Tg per year** compared to 2019. Contributions from coal mining decreased by 1.3 Tg per year. Fire emissions, too, dropped by **6.5 Tg per year.**
  - Globally, fire emissions appear to have fallen in 2020 compared to 2019, the researchers wrote in the study.
- Contributions from the **agricultural sector went up by 1.6 Tg per year.**
- Wetland emissions **rose by 6.0 Tg per year.**

#### ▪ Causes:

- **Water-logged soils** make conditions ripe for soil microorganisms, **allowing them to produce more methane.**
- Nitrogen oxide levels fell by 6% in 2020 from 2019. Less nitrogen oxide pollution means less hydroxyl and more methane.
  - Nitrogen oxide enters the atmosphere from exhaust gasses of cars and trucks as well as electrical power generation plants.
  - Nitrogen oxide (NOx) **can impact methane levels.** In the troposphere — the upper part of the atmosphere — NOx combines with ozone to form hydroxyl radicals.
    - These radicals, in turn, remove 85 % of methane annually from the atmosphere.
  - The **contribution of hydroxyl radicals in removing methane decreased** by roughly 7.5 Tg per year.
  - Roughly **53 % of the methane growth can be attributed to lower hydroxyl sink**, and the remaining 47 % from natural sources, **predominantly wetlands.**

### What is the Significance of the Study?

- It can help unravel a puzzle concerning **why globally methane increased when many other greenhouse gases like carbon dioxide decreased** during 2020.
- The results have **significant implications for our ability to reliably predict methane changes in a future world** with lower anthropogenic emissions of pollutants like nitrogen oxides and also if we have a wetter world.

## What is Methane?

### ▪ About:

- Methane is the **simplest hydrocarbon, consisting of one carbon atom and four hydrogen atoms (CH<sub>4</sub>)**.
  - It is flammable, and is used as a fuel worldwide.
- Methane is a powerful **greenhouse gas**.
- Methane has more than **80 times the warming power of carbon dioxide** over the first 20 years of its lifetime in the atmosphere.
- The common **sources of methane are oil and natural gas systems**, agricultural activities, coal mining and wastes.

### ▪ Impact:

- **More Global Warming Potential:** It is nearly 80-85 times more potent than carbon dioxide in terms of its global warming capacity.
  - This makes it a critical target for reducing global warming more quickly while simultaneously working to reduce other greenhouse gases.
- **Promotes Generation of Tropospheric Ozone:** Increasing emissions are driving a rise in **tropospheric ozone air pollution**, which causes more than one million premature deaths annually.

## What are the Initiatives to Tackle Methane Emissions?

### ▪ Indian:

- **'Harit Dhara' (HD):** Indian Council of Agricultural Research (ICAR) has developed an anti-methanogenic feed supplement **'Harit Dhara' (HD)**, which can cut down cattle methane emissions by 17-20% and can also result in higher milk production.
- **India Greenhouse Gas Program:** The India GHG Program led by WRI India (non-profit organization), Confederation of Indian Industry (CII) and **The Energy and Resources Institute (TERI)** is an industry-led voluntary framework to measure and manage greenhouse gas emissions.
  - The programme builds comprehensive measurement and management strategies to reduce emissions and drive more profitable, competitive and sustainable businesses and organisations in India.
- **National Action Plan on Climate Change (NAPCC):** **NAPCC** was launched in 2008 which aims at creating awareness among the representatives of the public, different agencies of the government, scientists, industry and the communities on the threat posed by climate change and the steps to counter it.
- **Bharat Stage-VI Norms:** India shifted from **Bharat Stage-IV (BS-IV) to Bharat Stage-VI (BS-VI)** emission norms.

### ▪ Global:

- **Methane Alert and Response System (MARS):**
  - MARS will integrate data **from a large number of existing and future satellites that have the ability to detect methane emission** events anywhere in the world, and send out notifications to the relevant stakeholders to act on it.
- **Global Methane Pledge:**
  - At the Glasgow climate conference (UNFCCC COP 26) in 2021, **nearly 100 countries had come together in a voluntary pledge**, referred to as the Global Methane Pledge, to cut methane emissions by at least 30% by 2030 from the 2020 levels.
- **Global Methane Initiative (GMI):**
  - It is an international public-private partnership focused on reducing barriers to the recovery and use of methane as a clean energy source.

## UPSC Civil Services Examination, Previous Year Questions (PYQs)

**Q1. Which of the following statements is/are correct about the deposits of 'methane hydrate'? (2019)**

1. Global warming might trigger the release of methane gas from these deposits.
2. Large deposits of 'methane hydrate' are found in Arctic Tundra and under the sea floor.
3. Methane in atmosphere oxidizes to carbon dioxide after a decade or two.

**Select the correct answer using the code given below.**

- (a) 1 and 2 only  
(b) 2 and 3 only  
(c) 1 and 3 only  
(d) 1, 2 and 3

**Ans: (d)**

**Exp:**

- Methane hydrate is a crystalline solid that consists of a methane molecule surrounded by a cage of interlocking water molecules. It is an "ice" that only occurs naturally in subsurface deposits where temperature and pressure conditions are favourable for its formation.
- Regions with suitable temperature and pressure conditions for the formation and stability of methane hydrate- sediment and sedimentary rock units below the Arctic permafrost, sedimentary deposits along continental margins, deep-water sediments of inland lakes and seas, and, under Antarctic ice. **Hence, statement 2 is correct.**
- Methane hydrates, the sensitive sediments, can rapidly dissociate with an increase in temperature or a decrease in pressure. The dissociation produces free methane and water, which can be triggered by global warming. Hence, statement 1 is correct.
- Methane is removed from the atmosphere in about 9 to 12 year period by oxidation reaction where it is converted into Carbon Dioxide. **Hence, statement 3 is correct.**
- **Therefore, option (d) is the correct answer**

**Q2. Consider the following: (2019)**

1. Carbon monoxide
2. Methane
3. Ozone
4. Sulphur dioxide

**Which of the above are released into atmosphere due to the burning of crop/biomass residue?**

- (a) 1 and 2 only  
(b) 2, 3 and 4 only  
(c) 1 and 4 only  
(d) 1, 2, 3 and 4

**Ans: (d)**

**Source: DTE**

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