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Methane Hydrates in Krishna-Godavari Basin

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Why in News

Recently, a study on biogenic methane hydrate in the Krishna-Godavari (KG) Basin was conducted by the researchers at the **Agharkar Research Institute (ARI)**, an autonomous institute of the Department of Science and Technology, Government of India.

Key Points

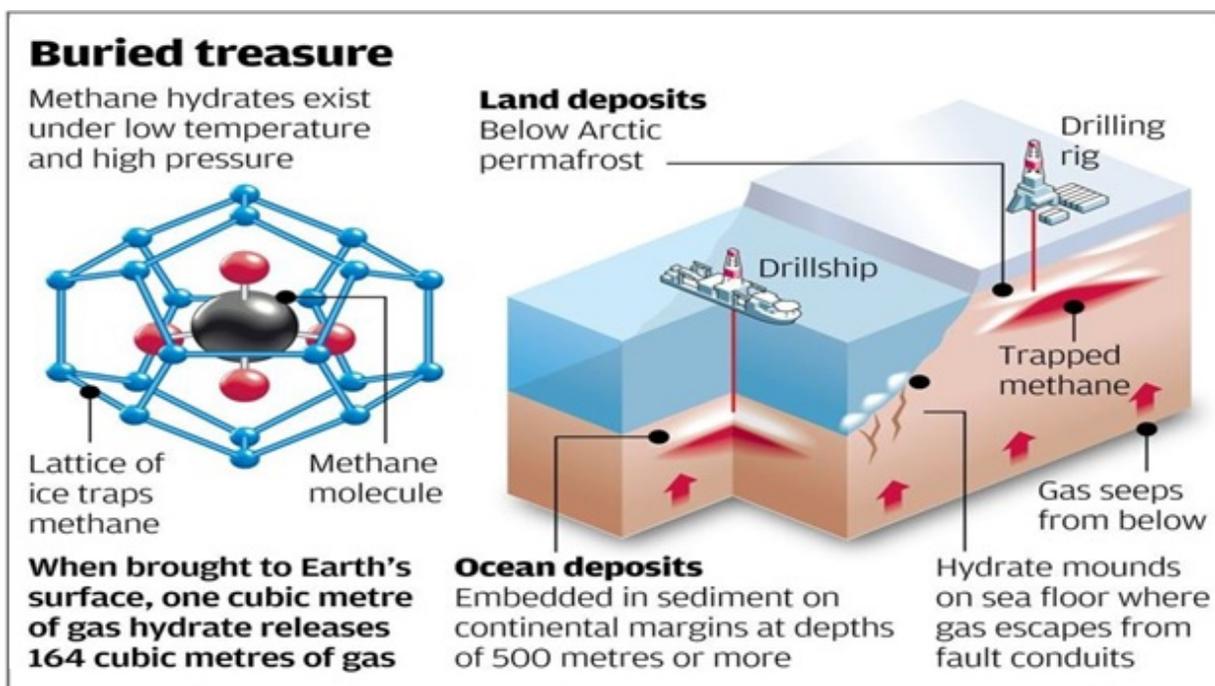
Biogenic Methane: It is the **methane produced from the metabolic activities of living organisms**. The research team has **identified the methanogens** that produced the **biogenic methane trapped as methane hydrate**, which can be a significant source of energy.

- **Methanogens:** These are microorganisms that produce methane as a **metabolic by-product in hypoxic** (low levels of oxygen) conditions. The ARI team has documented a **predominance of genus *Methanosarcina* in the KG basin**, followed by a few other genera *Methanoculleus*, *Methanobacterium*.
- **Methane hydrate** is formed when hydrogen-bonded **water and methane gas** come into contact **at high pressures and low temperatures such as in oceans**.

Methane Hydrate

- Methane hydrate is a **crystalline** solid that consists of a **methane molecule surrounded by a cage of interlocking water molecules**.
- Methane hydrate is an **"ice"** that only **occurs naturally in subsurface deposits** where temperature and pressure conditions are favourable for its formation.

- **Difficult to handle:** If the ice is removed from this temperature/pressure environment, it becomes unstable. For this reason, methane hydrate deposits are difficult to study and handle.
 - They cannot be drilled and cored for study like other subsurface materials because as they are brought to the surface, the pressure is reduced and the temperature rises.
 - This causes the ice to melt and the methane to escape.
- Several **other names** are commonly used for methane hydrate. These include: methane **clathrate**, hydromethane, methane ice, fire ice, natural gas hydrate, and gas hydrate.
- Most methane hydrate deposits also contain small amounts of other hydrocarbon hydrates. These include propane hydrate and ethane hydrate.



Significance of the Study:

- Methane is a clean and economical fuel.
- It is estimated that **one cubic meter** of methane hydrate contains **160-180 cubic meters** of methane.
- This study revealed **maximum methanogenic diversity in the KG basin**, which is one of the prominent reasons to confirm it to be the extreme source of biogenic methane **in comparison to the Andaman and Mahanadi basins**.
- Even the lowest estimate of methane present in the methane hydrates in the KG Basin is **twice** that of **all fossil fuel reserves** available worldwide.

Krishna-Godavari Basin

- An **extensive deltaic plain** formed by two large east coast rivers, **Krishna and Godavari** in the state of **Andhra Pradesh** and the adjoining areas of **Bay of Bengal** in which these rivers discharge their water is known as Krishna-Godavari Basin.
- The KG Basin is a **large basin of continental margin** located on the east coast of India.
 - Its land part covers an area of **15000 sq. km**
 - The offshore part covers an area of 25,000 sq. km up to 1000 m isobath.
- The basin contains about **5 km thick sediments** with several cycles of deposition, ranging in age from Late Carboniferous to Pleistocene.
- The major **geomorphological units** of the basin are upland plains, coastal plains, recent flood and delta plains.
- The site is known for the **D-6 block** with the biggest natural gas reserves in India. The first gas discovery was made in **1983** by ONGC.
- The basin is **home to the Olive Ridley Sea Turtle** (IUCN Status: Vulnerable).

Source PIB