



Solar-based Desalination Technology

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Why in News?

To address [freshwater scarcity](#) worldwide, **scientists from IIT Bombay** have developed the **Dual-Sided Superhydrophobic Laser-Induced Graphene (DSLIG) evaporator**, which overcomes several limitations of previous [desalination systems](#) and holds potential for large-scale applications.

What are the Key Facts About the DSLIG?

Features	Description
Solar and Electric Heating Integration	▪ It utilises both solar and Joule heating (electric) to ensure efficient desalination, even during fluctuating sunlight conditions, ensuring consistent performance.
Superhydrophobic Surface	▪ The evaporator's surface exhibits lotus leaf-like behavior, repelling water and preventing salt deposition , enhancing long-term efficiency.
Material Composition	▪ Made from polyvinylidene fluoride (PVDF) and poly (ether sulfone) (PES) polymers, with PVDF contributing hydrophobicity and PES ensuring mechanical stability.

- **Significance:** DSLIG offers an environmentally sustainable alternative with its [low carbon footprint](#) and **high efficiency**, making it suitable for treating industrial wastewater and saltwater discharges.
 - This breakthrough **aligns with global efforts to promote [green technologies](#)** and reduce environmental impact.

Note

- **PVDF:** Tough plastic that is **resistant to flame**, electricity, and most chemicals.
- **PES:** It is an amorphous, transparent, pale amber high-performance thermoplastic and is the **most temperature-resistant transparent thermoplastic resin** available commercially.
- **Hydrophobicity:** It is a physical property in which **molecules and water repel each other**, and substances with hydrophobic molecules are called **hydrophobes**.

What is Desalination?

- **About:** Desalination is the process of **removing dissolved salts from seawater**, and in some

cases, **from brackish waters** (slightly salty waters of inland seas), highly mineralized groundwaters (such as geothermal brines), and municipal wastewaters.

- This process **makes these otherwise unusable waters suitable for human consumption**, irrigation, industrial applications, and other purposes.

▪ **Process:**

Desalination Process	Key Characteristics
Thermal Desalination: Water is heated to evaporate into steam, leaving behind impurities, which then condenses back into liquid water.	<ul style="list-style-type: none">▪ Energy-intensive process▪ Can treat water with high salt content▪ Produces very high purity water▪ Suitable for industrial applications
Membrane-based Desalination: Water passes through a semipermeable membrane that allows water molecules to pass through while blocking salts and other dissolved solids .	<ul style="list-style-type: none">▪ Common methods include Reverse Osmosis▪ Efficient than thermal desalination▪ Limited by membrane strength and salinity of the water

Note: The [National Institute of Ocean Technology \(NIOT\)](#) has developed the world's **first Low Temperature Thermal Desalination (LTTD) plant** in Kavaratti, Lakshadweep.

- There are **five desalination plants in operation in the Lakshadweep islands**.

UPSC Civil Services Examination Previous Year Question (PYQ)

Q. Where was the first desalination plant in India to produce one lakh litres freshwater per day based on low temperature thermal desalination principle commissioned? (2008)

- (a) Kavaratti
- (b) Port Blair
- (c) Mangalore
- (d) Valsad

Ans: (a)