



## Bacterial Communities in Microwave Ovens

[Source: Nature](#)

[Microorganisms](#) thriving in extreme environments like microwave ovens have been studied to understand their **evolutionary adaptations**.

### ▪ Key Findings:

- The **dominant** ones belonged to the ***Bacillus*, *Micrococcus*** and ***Staphylococcus genera***, which commonly live on **human skin** and surfaces that people frequently touch.
- A few bacteria types associated with **food-borne illnesses**, including ***Klebsiella*** and ***Brevundimonas***, also grew in household microwaves.
- **Laboratory** microwave ovens contained the **greatest genetic diversity** (variation in **genes** within a species) of bacteria.

- Microwave heating uses **electromagnetic waves (300 MHz to 300 GHz)** to generate **heat** and **inactivate** most microorganisms in food.

### ▪ Bacteria:

- **Bacteria** are **microscopic** living organisms that have only one cell. It has various shapes like **spheres, rods, and spirals**. They can be good or bad.
  - **Good Bacteria:** Some are **found in the intestines and help break down food** and prevent constipation and diarrhoea like ***Bifidobacteria***.
  - **Bad Bacteria:** Some of them cause diseases like **Typhoid fever by *Salmonella Typhi***.
- **Extremophiles** are organisms that can **survive** and even **thrive**, in the **harshest** of environments, including inside scorching **hydrothermal vents**, **sub-zero Antarctic ice** and the **crushing pressures** of Earth's crust.

Read More: [Metagenomics](#)

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## Omkarshwar Floating Solar Project

[Source: PIB](#)

Recently, **SJVN Green Energy Limited (SGEL)** commissioned a **90 MW Omkarshwar Floating Solar Project**.

- **SJVN Limited is a Mini Ratna Schedule 'A'** Central Public Sector Undertaking (CPSU) under the Ministry of Power, Government of India.
- **Omkarshwar Floating Solar Project**
  - Located in the **Omkarshwar Floating Solar Park** on river **Narmada** in **Khandwa, Madhya Pradesh**.
  - It is the **largest floating solar park in India**.
  - The project aims to significantly **reduce carbon emissions by 2.3 lakh tons of CO<sub>2</sub>**, supporting India's goal of achieving **net-zero emissions by 2070**.

- It will also help in **water conservation** by reducing water evaporation.
- India's **installed solar energy capacity** has grown significantly, reaching **85.47 GW** as of June 2024.
- As of May 2024, **renewable energy sources** have a **total installed capacity of 195.01 GW**, which includes **wind power at 46.65 GW**, **biomass/cogeneration at 10.35 GW**, **small hydropower at 5 GW**, waste-to-energy at 0.59 GW, and large hydropower at 46.92 GW.

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# Renewable Energy



India is the world's third largest producer of renewable energy.

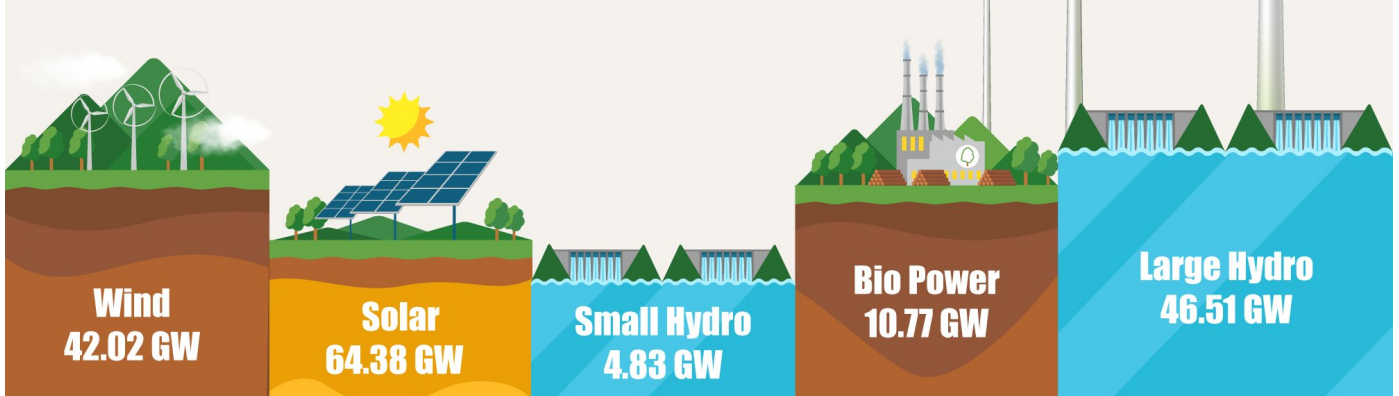
## Targets



- Achieve net zero carbon emissions by **2070**
- Produce **5 Million Tonnes** of green hydrogen by **2030**
- **57** Solar Parks aggregate capacity of **39.28 GW**
- Wind Energy offshore target of **30 GW** by **2030**



### Installed capacity of renewable sources of energy in India



Read More: [India Emerges as Third-Largest Solar Power Producer in 2023](#)

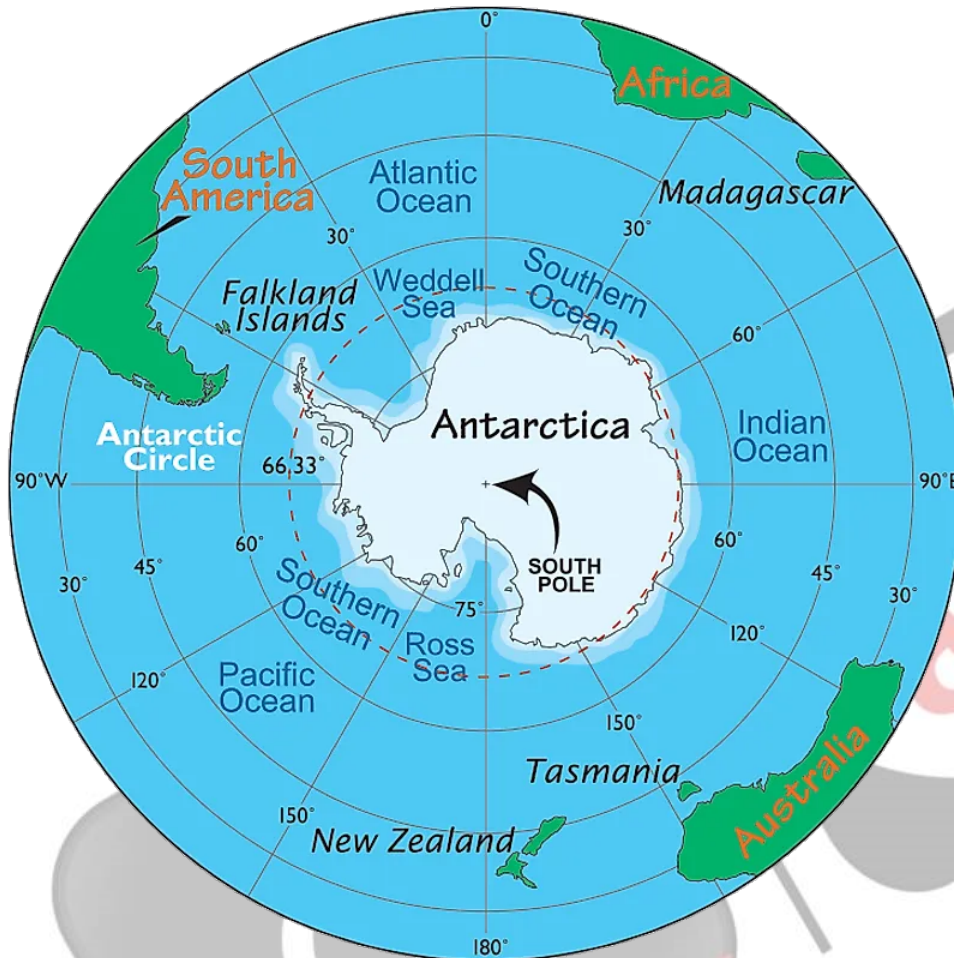
## Antarctica's Deep Winter Heatwaves

[Source: IE](#)

## Why in News?

Recently, Antarctica has been experiencing a significant **deep-winter heatwave**, marking the second instance of record-breaking temperatures in two years.

- Ground temperatures have risen by an average of 10 degrees Celsius above normal since mid-July 2024, with some areas experiencing increases of up to 28 degrees Celsius.



## What are the Causes of Deep-Winter Heat Waves in Antarctica?

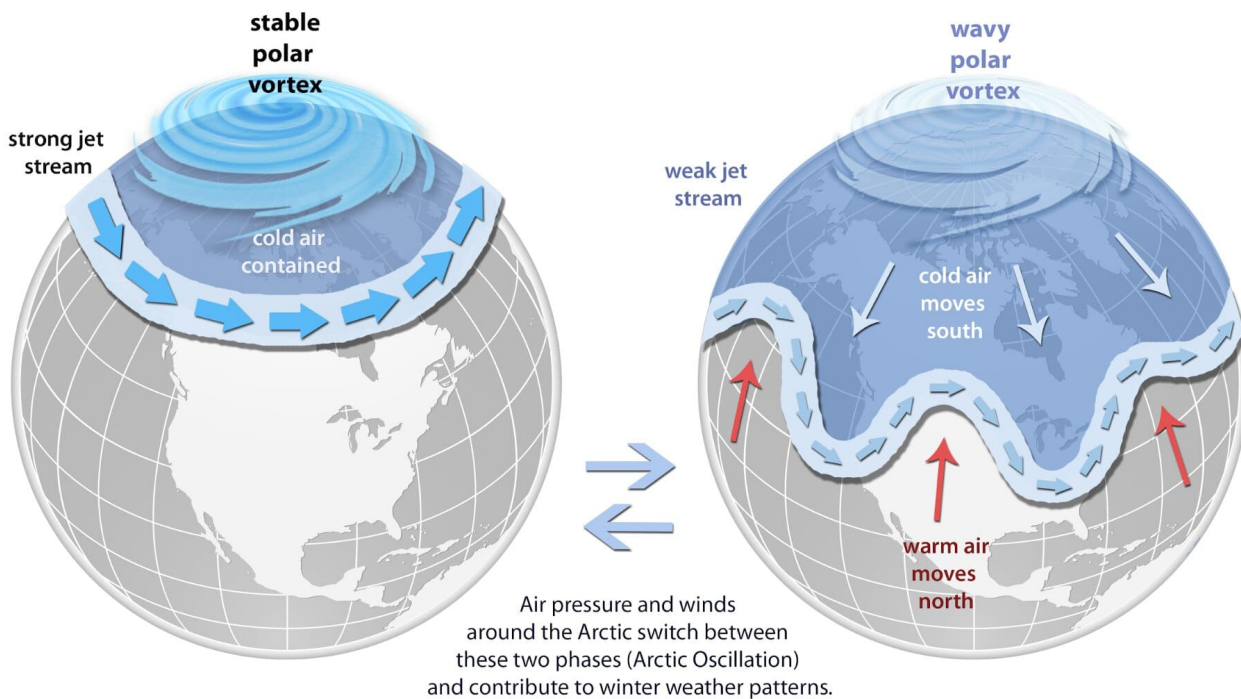
- **Weakening of the Polar Vortex:**
  - The **polar vortex** (also known as **polar pig**) is a large **area of low pressure** and **cold air** surrounding **both of the Earth's poles**.
    - The term "**vortex**" refers to the **counterclockwise flow of air** that helps keep the **colder air near the Poles**. It always exists near the poles, but **weakens in summer and strengthens in winter**.
  - **Higher temperatures** and **powerful atmospheric waves** (periodic disturbances in the fields of atmospheric variables) **disrupted the vortex**.
    - This allowed **cold air to escape and warm air from above to descend**. The arrival of this warm air led to a rise in temperatures in the region.
- **Reduction of Antarctic Sea Ice:**
  - Antarctic **sea ice** has reached historically low levels, **reducing its ability to reflect solar energy** and **act as a barrier between cold air and warmer waters**. This loss contributes to **rising global temperatures**.
- **High Rate of Global Warming:**
  - **Antarctica** is experiencing **warming at a rate nearly double** that of the global average, estimated at **0.22 to 0.32 degrees Celsius per decade**.



- As per [IPCC](#) estimates **Earth** as a whole is warming at the rate of **0.14-0.18 degrees Celsius per decade**.
- This **accelerated warming** is primarily driven by **anthropogenic climate change**, which exacerbates the effects of natural climate variability.
- **Impact of the Southern Ocean:**
  - The **warming Southern Ocean absorbs more heat** due to reduced sea ice, creating a feedback loop that **raises air temperatures over Antarctica** and increases the risk of extreme weather events.

## The Science Behind the Polar Vortex

The polar vortex is a large area of low pressure and cold air surrounding the Earth's North and South poles. The term vortex refers to the counterclockwise flow of air that helps keep the colder air close to the poles (left globe). Often during winter in the Northern Hemisphere, the polar vortex will become less stable and expand, sending cold Arctic air southward over the United States with the jet stream (right globe). The polar vortex is nothing new — in fact, it's thought that the term first appeared in an 1853 issue of E. Littell's *Living Age*.



## What are the Consequences of Heat Waves in Antarctica?

- **Accelerated Ice Melt:** Antarctica's rising winter temperatures are **accelerating ice mass loss**, with recent decades seeing a **280% increase** compared to the 1980s and 1990s.
  - In March 2022, a **heat wave caused a section of ice of around 1300 square kilometres** to collapse, highlighting the significant risk of rising global sea levels.
- **Global Sea Level Rise:** The Antarctic ice Sheet covers **98% of Antarctica** and contains **over 60% of the world's freshwater**.
  - A slight increase of a few feet in sea levels could result in the displacement of around **230 million people** residing **within 3 feet of existing high tide lines**, posing a significant threat to coastal cities and ecosystems.
- **Disruption of Ocean Circulation:** The influx of freshwater from melting ice alters the **salinity and density of ocean waters**, slowing down **global ocean circulation**.
  - A 2023 study revealed that this slowdown **weakens the ocean's capacity to store and transport heat, carbon, and nutrients**, which are essential for climate regulation. **Reduced ocean circulation decreases heat and CO2 absorption**, intensifying global warming and increasing the frequency of **extreme weather events** that affect **ecosystems** and human populations worldwide.
- **Ecosystem Disruption:** Temperature changes and **ice loss disrupt local ecosystems**,

**threatening species** dependent on stable ice, leading to biodiversity loss and altering global food webs.

◦ For example species like **polar bears** and **penguins** rely on **stable ice for survival**.

▪ **Feedback Loops:** Melting ice reduces sunlight reflection (**albedo effect**), increasing heat absorption by oceans and land, which accelerates further ice melt, creating a feedback loop that worsens climate change.

◦ **Albedo** is an expression of the **ability of surfaces to reflect sunlight** (heat from the sun).

# OCEAN WARMING

*The ocean absorbs most of the excess heat due to global warming caused by greenhouse gas (GHG) emissions, leading to rising ocean temperatures*

**Increase in Ocean Temperature**

**1.2°C** from 1950 to 2020

**Projected to Future Increase**

**1.7°C to 3.8°C** from 2020 to 2100

## Impact of Ocean Warming

- ⌚ **Sea Level Rise:** Warmer water expands, causing sea levels to rise
- ⌚ **Coral Bleaching:** Corals expel the algae (*zooxanthellae*) living in their tissues and turn completely white
- ⌚ **Ocean Acidification:** Ocean absorbs ~1/4<sup>th</sup> of total CO<sub>2</sub>, thus making it more acidic (non-metallic oxides - acidic in nature)
- ⌚ **Impacts on Marine Life:** Causes many marine species to shift towards the poles and disrupts food webs
- ⌚ **Impacts on Climate Patterns:** Influences atmospheric circulation patterns, such as El Niño and La Niña & extreme weather events

## Causes of Ocean Warming (due to Global Warming)

- ⌚ **GHG Emissions:** Fossil fuels burning releases CO<sub>2</sub> and GHG
- ⌚ **Deforestation:** Lesser trees → More CO<sub>2</sub> & GHG → Global Warming → Warming of Ocean
- ⌚ **Industrial Activities:** Emit various pollutants that contribute to greenhouse effect
- ⌚ **Agricultural Practices:** Produces methane and nitrous oxide – potent greenhouse gases
- ⌚ **Heat Absorption by Oceans:** Oceans absorb ~90% of excess heat generated by GHGs



## India's Initiatives for Antarctica

- [Antarctic Treaty](#)
- [National Centre for Polar and Ocean Research](#)
- [Indian Antarctic Act of 2022](#)

## UPSC Civil Services Examination, Previous Year Question (PYQ) :

**Q. With reference to the water on the planet Earth, consider the following statements:(2021)**

1. The amount of water in the rivers and lakes is more than the amount of groundwater.
2. The amount of water in polar ice caps and glaciers is more than the amount of groundwater.

**Which of the statements given above is/are correct?**

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (b)

PDF Reference URL: <https://www.drishtias.com/current-affairs-news-analysis-editorials/news-analysis/12-08-2024/print>

