



Sea Ice Loss and Climate Disruptions

For Prelims: [Arctic Sea](#), [Antarctic Sea](#), [Ocean Temperature](#), [Solar Radiation](#), [Ocean Salinity](#), [Ocean Circulation](#), [Jhelum](#), [Karewa](#), [Gujjar-Bakarwal](#).

For Mains: Sea ice loss and its impact on ocean and climate, Impact of retreating glaciers on India.

Source: [IE](#)

Why in News?

According to the **US National Snow and Ice Data Center (NSIDC)**, global **sea ice cover** combining [Arctic](#) and [Antarctic sea](#) ice dropped to **15.76 million sq km in February 2025**.

- According to NASA, between **1981 and 2010** the **Arctic sea ice shrank by 12.2% per decade**.
- In addition, **Jammu and Kashmir (J&K)** in India is adversely affected by **retreating of Himalayan glaciers**.

What is Sea Ice?

- **About:** Sea ice is **free-floating polar ice** that expands in winter, melts in summer, and partly persists year-round.
 - It is found mainly in the **Arctic Ocean** and **Antarctica Ocean**.
- **Features:** Sea ice forms from **frozen saltwater**, unlike **icebergs, glaciers, and ice sheets**, which originate on **land**.
 - As sea ice forms, most of the **salt is expelled**, making sea ice **less salty than seawater**.
 - The remaining **salt content** gets trapped in **tiny pockets**, giving the ice a **porous structure**.

Click Here to Read: [What are Glaciers?](#)

What are the Reasons for Drop in Arctic and Antarctic Sea Ice Cover?

- **Delayed Freezing:** Unusually [warm ocean temperatures](#) slowed the cooling process, **delaying ice formation**. E.g., slow ice formation around the [Hudson Bay \(northeastern Canada\)](#).
- **Marine Heatwaves (MHWs):** **Arctic MHWs** and heated **Gulf Streams** carry **excess heat** toward the Arctic and **intensify Arctic ice loss** by melting sea ice.
- **Ice-Breaking Winds:** Storms in the **Barents Sea and Bering Sea** fragmented ice, making it more **vulnerable to melting**.
 - Antarctic sea ice is particularly vulnerable to **ice-breaking winds** as it **floats in the ocean** that can be **easily broken by winds**, unlike landlocked Arctic ice. E.g., **Colossus A23a** is a **massive Antarctic iceberg** that has been floating in the **Southern Ocean**

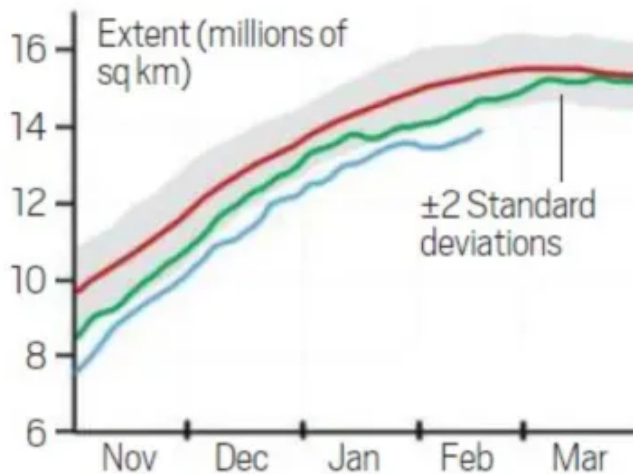
since 2020.

- **Thinning Ice:** Over the years, Arctic ice has become **thinner and more fragile**, making it more susceptible to breaking due to **storms and temperature fluctuations**.
 - Higher air temperatures led to the **melting of the edges of the Antarctic ice sheet** (ice shelves) which extend over the ocean.

//

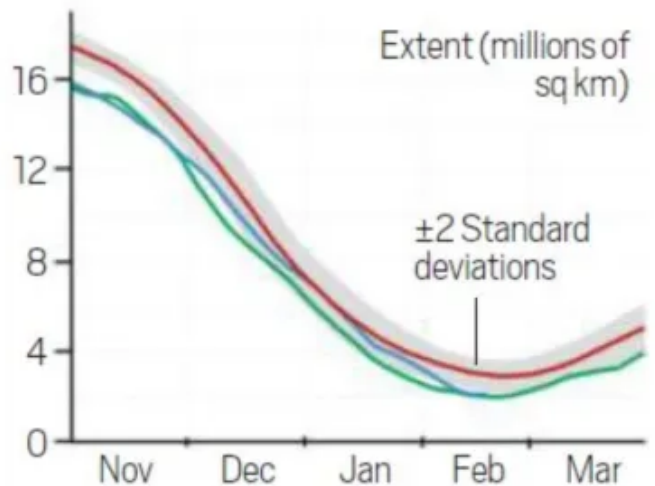
ARCTIC SEA ICE EXTENT

■ 2024-25 ■ 2011-12
■ 1981-2010 Average



ANTARCTIC SEA ICE EXTENT

■ 2024-25 ■ 2023-24
■ 1981-2010 Average



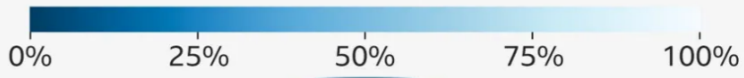
- **Higher Air Temperatures:** Regions like [Svalbard](#), [Norway](#), experienced **above-normal temperatures**, leading to additional sea ice loss.
 - Increased air and water temperatures towards the end of the southern hemisphere summer **accelerated ice melting** in the Antarctic region.

What are the Consequences of the Drop in Arctic and Antarctic Sea Ice Cover?

- **Increased Global Warming:** Less sea ice cover means that more water is getting exposed to the Sun and **more heat (solar radiation)** absorption by water, leading to a further rise in temperature of water.
 - **Polar sea-ice** has already lost around **14% of its natural cooling effect** due to the decline in bright and reflective ice since the early-to-mid 1980s.
- **Disruption of Global Ocean Circulation:** Melting sea ice releases **freshwater**, reducing **ocean salinity** and surface water density.
 - This **slows ocean circulation**, disrupting marine ecosystems and global climate patterns.
- **Loss of Climate Regulation:** Sea ice **cools the planet** by **reducing evaporation and heat loss** to the atmosphere by creating an **insulating cap** across the ocean surface. Less ice weakens this effect, speeding up **climate change**.
- **Extreme Weather Events:** Thinner ice and warmer temperatures **may increase the frequency and intensity of storms**.

Missing sea-ice around Antarctica and the Arctic

Sea-ice concentration, 12 February 2025



How J&K is Impacted by Retreating of Himalayan Glaciers?

- **About:** In India, **Jammu and Kashmir (J&K)** has abundant **ice reserves (glaciers)** melting of which have profound consequences on the region's **water resources, economy, agriculture, and ecology.**
- **Impacts:**
 - **Declining Water Levels:** Climate change has caused **reduced snowfall and glacier melting**, leading to a **75% drop in water levels** in **major rivers** and **springs** of the region.
 - **Disruption of Agriculture:** Rising temperatures hurt the **Rs 8,000-crore apple industry**, causing **early ripening, quality loss, and lower prices.**
 - Water shortages reduce irrigation, **affecting crop yields and food security.**
 - **Wetlands at Risk:** Glacial retreat is directly contributing to the **shrinking of wetlands like Wular**, which act as **natural climate buffers.**
 - **99.2%** of water bodies in J&K are in **rural areas**, and many are drying up or **becoming unusable.**
 - **Land Degradation:** Rapid glacier melting **increases runoff, weakening Karewa** sediments and causing soil erosion.
 - Karewas, plateau-like landforms in Kashmir Valley, have **fertile lacustrine (lake) soil** supporting **saffron and almonds.**
 - **Forced Migration:** Shrinking glaciers and declining pasturelands are forcing **Gujjar-Bakarwal communities** to migrate, leading to **loss of traditional livelihoods.**

Formation of Ice Caps on Earth

- The research, published in **Science Advances**, challenges the **assumption** that Earth will **naturally return to a cooler climate** if emissions are halted.
 - Historically, the planet has preferred **warm, high-CO₂ conditions.**
- The research has identified the following **factors** responsible for **formation of icecaps** on Earth.
 - **Low Volcanic CO₂ Emissions:** Reduced greenhouse gases **limited warming.**
 - **Increased Carbon Storage:** Forests **absorbed more CO₂.**
 - **Chemical Weathering:** CO₂ reacted with **rocks**, further reducing atmospheric carbon.
 - **Geography:** Widely dispersed continents and **large mountain ranges increased rainfall**, accelerating **carbon removal** and promoting **cooling and glaciation.**

Conclusion

The rapid decline in global sea ice is **accelerating climate change, disrupting ocean circulation, and increasing extreme weather events.** In India, particularly in Jammu and Kashmir, glacier melting is causing **severe water shortages, agricultural losses, wetland shrinkage, and forced migration.** Urgent climate action and sustainable policies are essential to mitigate these impacts.

Drishti Mains Question:

Examine the consequences of glacial melting on India's water security, agriculture, and livelihoods.

UPSC Civil Services Examination, Previous Year Question (PYQ)

Prelims

Q. 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 the 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)

Mains

Q. Why is India taking keen interest in the resources of the Arctic region? (2018)

Q. How does the cryosphere affect global climate? (2017)

PDF Refernece URL: <https://www.drishtias.com/printpdf/sea-ice-loss-and-climate-disruptions>

