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Q15

How do the melting of the Arctic ice and glaciers of the Antarctic differently affect the weather patterns and human activities on the Earth? Explain.

UPSC Civil Services Mains 2021 · GS I · 15 marks · Indian Heritage and Culture

Indian culture will cover the salient aspects of Art Forms, literature and Architecture from ancient to modern times.

Core demand of the question

- How do the melting of the Arctic ice and glaciers of the Antarctic differently affect the weather patterns and human activities on the Earth? Explain
- Keep a 15-mark length

Revision summary

- **Arctic melt is mainly sea ice:** **albedo feedback**, possible jet changes, new shipping.

It barely raises sea level while the ice still floats.

- **Antarctic glacier melt is land ice:** global sea level and slower ocean circulation change.

Coastal Asia feels Antarctica as centimetres of sea, the Arctic as weather and geopolitics.

Both need mitigation; they are not interchangeable headlines.

Introduction

Both poles are melting under greenhouse heat, but they are not twins. Arctic melt is mostly floating sea ice on an ocean. Antarctic melt is mostly land ice on a continent. Weather and human effects split on that difference.

Body

Arctic sea ice

- Melting sea ice does **not** raise sea level much (Archimedes), but it opens the **albedo** wound: dark water drinks more sun, so the Arctic amplifies warming.
- **A weaker, wavier polar jet is a live research debate:** possible stickier cold spells and heat domes in mid-latitudes, including Europe, the US, and north India via changed westerlies.
- **Human activity:** **Northern Sea Route** shipping, new fisheries, oil dreams, and Inuit and Siberian livelihood loss; militarisation of the Arctic Ocean.

Antarctic land ice and ice shelves

- Land ice that slides into the sea **does** raise global sea level. West Antarctic and peninsula glaciers, plus **Thwaites**, are the long-term coastal risk for Mumbai, Dhaka, and small islands.
- Meltwater and freshwater lids can alter **AMOC** and southern westerlies, a slower, deeper climate lever than a single Arctic summer.

- Ozone-hole and vortex stories are separate; Antarctic weather impact on India is mainly via sea level and global circulation, not a local blizzard.
- **Human activity:** research stations, krill and toothfish, and tourism; no Arctic-style sea route across the continent.

Contrast table in words

- **Arctic:** fast local warming, shipping, indigenous crisis, possible jet-stream wobble; little direct sea-level from ice that already floated.
- **Antarctic:** slower political theatre, larger sea-level endgame, Southern Ocean biology; less immediate new shipping.

Shared

- Both change fisheries and geopolitics. **Paris** mitigation is the common human reply.

Flow diagram

Arctic sea ice -> Albedo jet debate
Arctic sea ice -> New sea routes
Antarctic land ice -> Sea level
Antarctic land ice -> Southern Ocean AMOC

Conclusion

Arctic melt reshapes mid-latitude weather bets, shipping, and polar peoples without much sea-level from floating ice. Antarctic glacier melt is the sea-level and deep-ocean story. Policy must hold both files.

Facts & figures

Albedo feedback

Ice reflects sun; open water absorbs it, amplifying Arctic warming.

Northern Sea Route

Seasonal Arctic shipping lane along Russia as ice retreats.

Thwaites Glacier

West Antarctic glacier watched as a sea-level tipping element.

AMOC

Atlantic overturning that freshwater from ice melt may weaken.

IPCC SROCC

Special report on ocean and cryosphere that separates sea ice from land ice effects.

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