Arctic Warming

Why in news?

Recent studies show that the Arctic region is fast changing and the best of climate models may not be able to capture the rate of changes and predict it accurately.

What are the findings of the recent studies?

- **Finnish Meteorological Institute**- The Arctic is heating four times faster than the rest of the planet.
- The warming is more concentrated in the Eurasian part of the Arctic, where the Barents Sea north of Russia and Norway is warming at an alarming rate (seven times faster than the global average).
- **The American Geophysical Union and Geophysical Research Letters-** These studies indicate that the Arctic amplification is four times the global rate.

What do the previous studies say?

- **Earlier studies**- The Arctic was warming twice the global rate prior to the beginning of the 21 st century.
- **IPCC Report 2019**- The Inter-governmental Panel on Climate Change said that the Arctic surface air temperature has likely increased by more than double the global average over the last two decades.
- **AMAP 2021**- The Arctic Monitoring and Assessment Programme (AMAP) warned that the Arctic has warmed three times quicker than the planet.
- It has alarmed that the chance of the sea ice completely disappearing in summers is 10 times greater, if the planet is warmer by 2 degree Celsius above the pre-industrial levels.
- The report also said that the average annual temperature in the region increased by 3.1 degree Celsius compared to the 1 degree Celsius for the planet.
- **Recent studies**- The mean Arctic amplification implies four times faster heating than the rest of the planet.

What is Arctic amplification?

- Any change in the surface air temperature and the net radiation balance tend to produce larger changes at the north and south poles. This phenomenon is known as polar amplification.
- These changes are more pronounced at the northern latitudes and are known as the Arctic amplification.

Causes of Arctic amplification

- **Global warming**- The long-term heating of the earth's surface, expedited due to anthropogenic forces since pre-industrial times and has increased the planet's average temperature by 1.1 degrees Celsius.
- **Ice-albedo feedback**- Sea ice and snow have high albedo implying that they are capable of reflecting most of the solar radiation as opposed to water and land.
- As the sea ice melts, the Arctic Ocean will be more capable of absorbing solar radiation, thereby driving the amplification.
- **Lapse rate feedback**- The lapse rate or the rate at which the temperature drops with elevation decreases with warming.
- **Water vapour feedback**- The heat-trapping effect of water in the air validates the role of the gas as a critical component of climate change.
- **Ocean heat transport**- The ocean transports vast amounts of heat around the planet, helping to regulate regional climate.
- Enhanced ocean heat transport into the Arctic is linked to stronger future Arctic warming and polar amplification.

What are the consequences of Arctic warming?

- **Ice sheet is melting-** Greenlandic ice sheet holds the second largest amount of ice, after Antarctica.
- In 2019, this was the single biggest cause for the rise in the sea level, about 1.5 metres.
- **Changes in the nature of water**- The acidification of water, changes in the salinity levels, is impacting the biodiversity, including the marine species and the dependent species.
- **Increase in rainfall**- The warming is increasing the incidence of rainfall which is affecting the availability and accessibility of lichens to the reindeer.
- **Death of fauna**- The Arctic amplification is causing widespread starvation and death among the Arctic fauna.
- **Permafrost thawing**- The permafrost thawing releases carbon and methane, the major greenhouse gases responsible for global warming.
- **Disease outbreak-** The melt will release long-dormant bacteria and viruses that were trapped in the permafrost and can potentially give rise to diseases.
    - Example- Permafrost thaw leading to an anthrax outbreak in Siberia in 2016, where nearly 2,00,000 reindeer succumbed.

What is the impact on India?

In 2014, India deployed IndARC, India's first moored-underwater observatory in the Kongsfjorden fjord, Svalbard, to monitor the impact of the changes in the Arctic Ocean on the tropical processes.

- The link between the changing Arctic and Indian monsoons is growing in importance due to the extreme weather events the country faces, and the heavy reliance on rainfall for water and food security.
- A 2021 by a group of Indian and Norwegian scientists found that the reduced sea ice

in the Barents-Kara sea region can lead to extreme rainfall events in the latter half of the monsoons.
- The changes in the atmospheric circulation due to diminishing sea ice combined with the warm temperatures in the Arabian Sea contribute to enhanced moisture and drive extreme rainfall events.
- According to **World Meteorological Organization's, 'State of Global Climate in 2021',** sea level along the Indian coast is rising faster than the global average rate due to melting of sea ice in polar regions, especially the Arctic.

References

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