Cryosphere

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News

1. Loss of Arctic sea ice is inevitable - Nature journal
2. 'Sea-ice free' summer can happen before 2030 if drastic emission control for reduction of temperature is not taken up.
3. Sea ice in Antarctica fell to the lowest this summer (Oct-Mar 2023)

Facts

1. Sea ice thinnest at mid-September,
   Thickest at March ❄
2. 90% sea ice melting due to anthropogenic factors

Importance of Arctic Sea ice

1. Influence on global climate
2. High albedo of ice - keeps polar regions cool, maintains earth's energy balance.
   - Diagram: Surplus - Deficit energy transfer
3. Crucial for biodiversity

Issues

1. Warming of Arctic Ocean
   - Feedback loop created
     Diagram : Melting ice -> decreasing albedo -> warming of Arctic ocean -> Further melting of ice
2. **Atlantification of Arctic**
   Warming of sea water leads to influx of saline waters to Arctic, esp. at Barrent Sea leading to aggravated melting.
3. Weakened polar jet stream
   Rising T, Heat waves in Europe, Unseasonal showers in North India
4. Biodiversity affected
   - Eg. Polar bears and Walruses require sea ice for hunting, breeding and migrating.
5. Distrupted food chain
   Eg. Changing prey base lead to mass mortality of Grey whales
6. Arctic population affected
   - Subsistence hunting of Yup'ik, Iñupiat and Inuit affected
7. **Thawing of Permafrost**
   - Release of methane
   - Collapse of overhead man made structures
     Eg. Enlarging **Bhatagaika crater** in Russia
     # ANTARCTICA specific
8. Rise in global sea level
   - Acc. to NASA, meltwater from Antarctica account for one-third of global average rise in sea level since 1993
9. Changes Oceanic Circulations
   - Affects global climate
   - Acc. to IPCC, Southern Ocean is crucial in transfer of heat from atmosphere to oceans. Increase in cold water distrupts circulation of water across globe
10. Change in T affects deep water nutrient flow
    Eg. Sea ice is home to algae that is fed by smaller crustaceans. Diminishing sea ice means less food to support Antarctic food chain
11. Altered migration patterns of marine species
    Eg. **Antactic Krill fishes** are expected move further south to manage T from warming ocean water
12. Freshly formed ice (forms again in winter) generally thinner, changes overall surface area into more fragile state.

Advantages

1. Commercial
   - Opening of **shipping lanes** in Arctic Ocean
   - Increased access to Arctic **natural resources**
     Eg. Hydrocarbons, Phosphate, Bauxite, Copper, Nickel, Iron ore

Way Forward

1. Recent studies - encouraging herbivores(caribou, musk oxen) diversity in Tundra could decrease impack of Climate change
   - Reason : Their different browsing behaviour affecting plant diversity