Source : www.thehindu.com Date : 2023-06-11

EXPLAINED

Relevant for: Geography | Topic: Distribution of key natural resources - Ocean Resources in world & India

June 11, 2023 02:20 am | Updated 02:20 am IST

Russian scientific vessel Severny Polyus is seen caught in the arctic ice some 440 km south of the north pole on June 6, 2023. Photo: Sysselmesteren Svalbard via AFP

The story so far: A recent study in the *Nature* journal says that the loss of Arctic sea ice is inevitable in the decades ahead, even if the world somehow gets its act together and sharply reduces carbon emissions.

The massive sheets of ice that pad the Arctic region play a major role in influencing global climate and the rise and fall in Arctic sea temperatures. During winter, the sea ice envelops most of the Arctic Ocean and in summer, a portion of it melts due to being exposed to longer periods of sunlight and elevated temperatures. Sea ice normally melts and is at its thinnest and most sparse in mid-September, when the area covered by ice is roughly half the size of the winter maximum. With the onset of winter and dipping temperatures, the ice begins to expand and thicken, all the way until March when it reaches its zenith.

The United States' Environment Protection Agency (EPA) explains the importance of sea ice thus: "Sea ice is light-coloured and therefore reflects more sunlight back to space than liquid water, thus playing a vital role in keeping polar regions cool and maintaining the earth's energy balance. Sea ice also keeps the air cool by forming a barrier between the cold air above and the relatively warmer water below. As the amount of sea ice decreases, the Arctic region's cooling effect is reduced, and this may initiate a 'feedback loop' whereby ocean warming caused by more absorption of solar energy leads to an even greater loss of sea ice and further warming."

Changes in sea ice can affect biodiversity and impact mammals such as polar bears and walruses, which rely on the presence of sea ice for hunting, breeding, and migrating. The reduction in ice cover also affects the traditional subsistence hunting lifestyle of indigenous Arctic populations such as the Yup'ik, Iñupiat, and Inuit, the EPA notes. On the other hand, reduced ice can present "commercial and economic opportunities" with the opening up of shipping lanes and increased access to natural resources in the Arctic region. This has already provoked global competition with several countries, including India, vying for greater influence in groups such as the Arctic Council that governs access to Arctic resources.

That the Arctic sea ice is decreasing is well-known and acknowledged in several reports of the Intergovernmental Panel on Climate Change (IPCC) and it is widely expected that the world will see its first 'sea-ice free summer' before 2050. This, however is under the assumption that global emissions will drive temperatures to beyond 4.5°C making the Arctic ice-free by 2081-

2100. There was uncertainty on whether this sea-ice-free scenario applied to situations where carbon emissions were curbed enough to ensure that temperature-rise was restricted to say 1.5°C or 2°C, as envisaged in the Paris Agreement. The recent Nature study confirms that there is no scenario under which the Arctic sea ice can be saved in summer. Moreover, if drastic reductions in emissions aren't undertaken, we could very well be seeing the first such summer in the 2030s. Ever since satellite records began to monitor the Arctic, the rate of loss has been nearly 13% every year.

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The researchers first estimated how much of the ice-melting was due to human-instigated, or anthropogenic factors and they found that this was as much as 90%, the rest of it caused by natural variability. They established that the climate models, which even the IPCC relied on, underestimated the rapidity of melting. When they corrected for this, it turned out that there were also likely to be ice-free Augusts and Octobers by 2080 in the emission scenarios where temperatures rose above 4.5°C. Roxy Mathew Koll, climate scientist at the Indian Institute of Tropical Meteorology, Pune told The Hindu that the studies projections were "reasonable for September" because regardless of pathways, the temperature change was quite similar until 2060 with little difference between high and low emissions pathways until then.

The diminished sea ice while warming the Arctic also leads to a weakening of the polar jet streams, which are currents of air that form when warm and cold air meet. This weakening has been linked to rising temperatures and heatwaves in Europe as well as unseasonal showers in northwest India. While the ice-free summer may be inevitable, reducing carbon emissions might mean being better able to adapt to climate 'tipping points.'

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