Chapter 34
Impact of the Polar Ice Caps Melting on Ecosystems and Climates

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ABSTRACT

Research shows that the polar ice caps are rapidly melting at places. Presently, the melting ice caps are having a huge impact on the Earth's ecosystem, which leads to unpredictable disasters. Regional warming and melting ice caps are the reason for the imbalanced ecosystem, which results in rising sea levels, uncertain floods, fluctuating seawater temperature leading to the different storms like tornado, cyclone, etc. The number of glaciers in the Antarctic Peninsula and the Arctic region is gradually declining, and therefore, the harmony of the biodiversity is affected. Melting ice caps are becoming life-threatening for the habitats and also related to upcoming climate change. Therefore, it will create various difficulties on human civilization, flora and fauna, and the economy which will affect the food chain. In this chapter, the authors give a detailed discussion about the impact of melting ice caps on the ecosystem and the reason for it along with the measures that should be taken to reduce this emerging problem.

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INTRODUCTION

Presently, due to global warming, the world is facing an alarming situation. Human activities like urban development, deforestation, increase of the rate of population, industrialization, an increase of domestic waste, increasing the environmental pollution; emission the CO_2 and other greenhouse gases affecting the ozone layer. Therefore, the environmental ecosystems are getting affected and an alarming situation like the ice caps melting in Polar Regions is taking place. This results in damage of the marine ecosystem, increase in the seawater level, freshwater gradually decreasing and mixing with the sea salt water, agricultural fields getting hampered, low lands are affected, effecting the seasonal climate change, uncontrolled rain and hail storms resulting in floods, economical hazards, etc. Immediately humans need to check on this matter to stop and survive this alarming situation. Antarctica and Greenland are surrounded by massive ice shelves (Rignot et al., 2002) (Mouginot et al., 2014). Experts have noticed that the ice shelves moving (floating) act as the glaciers' barriers, which are flowing the streams of ice (Favier et al., 2014) (Shepherd et al., 2018). Every summer, a specific volume of melting ice water is formed which can indulge till the ice shelves start to decline (Rydt et al., 2020). Presently, the steady ice shelves are starting to fade as the temperature in Antarctica has raised by 3°C (Banwell et al., 2021) (Nowicki, et al., 2020). In 2002, the "Larsen B" ice shelf in the Antarctic was split up, therefore, the associated glaciers of the ice shelf started to melt into the ocean rapidly (MacAyeal et al., 2021). Globally, the sea level rises gradually due to the ice migration from land to sea. Basically the Arctic (North Pole) and Antarctic (South Pole) are the only refrigerators of the Earth, and they reflect heat into space (Arthur et al., 2020). A lesser amount of ice means a smaller amount of heat reflection, which means more heatwaves globally. However, it also associates more immense winters. Fig. 1 shows how the melting glaciers and ice caps affect the environment. Worldwide usual sea level has increased by about seven to eight inches since 1900 and the situation is becoming worse. Increasing seas' level threatens the coastal areas and minor island countries by worsening the coastal overflowing and causing sea storms, making unsafe the climate actions more than usual. In Greenland, the ice-caps of the ice shelves melting is the main analyst of upcoming sea-level increase; if it completely melts, the worldwide sea levels could increase by twenty feet. While there is a smaller amount of sea ice, the living animals which depend on it for existence must adjust or expire (Dunmire et al., 2020). Melting the ice and permafrost influences the distress for wildlife like walruses, polar bears, reindeer, snowy owls, arctic foxes, etc. It will create an unbalanced ecosystem. Human and wildlife are coming into the more common interaction – and frequently conflict – as wildlife intrude on Arctic groups, searching for shelter as their sea ice habitat vanishes (Rydt et al., 2020). Furthermore, the polar vortexes enlarged the heat waves, and the irregularity of climate instigated by melting ice produced important losses to harvests on which the worldwide food chains depend (Arthur et al., 2020). This unpredictability will endure the developed prices for civilians and rising crises for the biosphere's most susceptible compartments.

IMPORTANCE OF GLACIER

The ice behaves as a shield over the oceans and Earth (Joughin et al., 2019). The bright white regions act as a mirror to send the additional heat back to the galaxy, which helps to cool the planet globally (Schmeltz et al, 2002). It is observed that as the sunlight is mirrored off the ice, back into the galaxy, therefore the polar region remains colder than the equator (Rignot et al., 2011) (Joughin et al., 2002).