

# IPCC Special report on global warming

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**Manifest pedagogy:** Restricting temperature increase below 1.5 c is to key human sustenance. The impact of global warming is more rapid than expected, which can be reversed only by extraordinary steps. Only when everyone joins hand, the planet can be saved. The findings of the report could be asked both at prelims and mains stage.

**In news:** The Intergovernmental Panel on Climate Change (IPCC) has released a “special report” on oceans and cryosphere.

**Placing it in syllabus:** Global warming and it's impacts (explicitly mentioned)

## **Dimensions:**

- Global warming
- Global warming impact
- Recent IPCC report on ocean and cryosphere
- Why restricting global temperature rise to 1.5°c is significant?

## **Content:**

### Global warming:

Global warming is the phenomenon of increasing average air temperatures near the surface of Earth over the past one to two centuries. Climate scientists have since the mid-20th century gathered detailed observations of various weather phenomena (such as temperatures, precipitation, and storms) and of related influences on climate (such as ocean currents and the atmosphere's chemical composition).

These data indicate that the Earth's climate has changed since the beginning of geologic time and the influence of human activities since the beginning of the Industrial Revolution has contributed more towards global warming. According to scientific studies, in the last decade, the rate of Antarctica's ice mass depletion has tripled. Surface ocean waters today are roughly 30 percent more acidic than at the start of the Industrial Revolution. Scientists predict that the Arctic Ocean will barely have ice before 2050. For the last twenty years, sea levels rose at twice their rate during the last century.

Global warming occurs when carbon dioxide (CO<sub>2</sub>) and other air pollutants and greenhouse gases collect in the atmosphere and absorb sunlight and solar radiation that have bounced off the earth's surface. The pollutants in the air trap the heat and cause the planet to get hotter. This phenomenon is known as the **greenhouse effect**. The burning of fossil fuels to make electricity is the largest source of heat-trapping pollution and thermal power plants and vehicles emissions are by far the biggest polluters.

The impacts of global warming are being felt across the globe. Extreme heat waves have caused tens of thousands of deaths around the world in recent years. Antarctica has been losing about 134 billion metric tons of ice per year since 2002. Melting glaciers, early snowmelt, and severe droughts will cause more dramatic water shortages and increase the risk of wildfires.

### **Global warming impact on sea level rise and cryosphere:**

#### Sea level rise:

Climate change threatens coastal areas, which are already stressed by human activity, pollution, invasive species, and storms. Since 1901, global sea level has risen approximately eight inches. Coasts are sensitive to sea level rise, changes

in the frequency and intensity of storms, increases in precipitation, and warmer ocean temperatures.

Sea level rise could erode and inundate coastal ecosystems and eliminate wetlands and cause shoreline flooding. Rising atmospheric concentrations of carbon dioxide (CO<sub>2</sub>) are causing the oceans to absorb more of the gas and become more acidic. This rising acidity can have significant impacts on coastal and marine ecosystems including plankton, molluscs, and other shellfish.

Higher sea surface temperatures increase the risk of coral bleaching, which can lead to coral death and the loss of critical habitat for other species. Rising sea level increases the salinity of groundwater and pushes salt water further upstream. Higher salinity can make water non-potable and harms aquatic life.

Coastal areas are also vulnerable to increase in the intensity of storm surge and heavy precipitation. Storm surges flood low-lying areas, damage property, disrupt transportation systems, destroy habitat, and threaten human health and safety. Due to melting of snow, increases in spring runoff may also threaten the health and quality of coastal waters.

Some coastal areas, such as the Gulf of Mexico are experiencing "**dead zones.**" Dead zones occur when land-based sources of pollution (e.g., agricultural fertilizers) contribute to algal blooms. As increases in spring runoff bring more nitrogen, phosphorus, and other pollutants into coastal waters, many aquatic species could be threatened due to decrease in oxygen in water.

Warming coastal waters cause suitable habitats of temperature-sensitive species to shift poleward. Some areas have recently seen range shifts in both warm- and cold-water fish and other marine species. Pollock, halibut, rock sole, and snow crab in Alaska and mangrove trees in Florida are a few of the species

whose habitats have already begun to shift. Suitable habitats of other species may also shift, because they cannot compete for limited resources with the southern species that are moving northward.

### Cryosphere:

The cryosphere comprises of the Earth's ice – notably the Arctic, the Antarctic, and the world's glaciers. Historical records suggest that Arctic sea ice began to decline around 1900, with a more accelerated ice loss since the 1950s. Since 1979, satellite records have confirmed an overall decline in summer sea ice coverage of around 13% per decade. According to mainstream view of scientists, we would see ice-free summers in the Arctic ocean within the next few decades if global warming continues at the same pace.

The major body of land ice in the Arctic is the Greenland ice sheet. Nearer the coast, the ice sheet is thinning and shrinking, at an accelerating rate. Overall, the Greenland ice sheet has been found to be losing ice mass over the last twenty years, and this ice loss is becoming faster. The **2007 IPCC report concluded that the Antarctic ice sheet was most likely losing ice overall – with the Antarctic Peninsula (in the west of the continent) warming** and the eastern continental interior cooling slightly. Recent research is suggesting that the whole of Western Antarctic is warming in winter and spring.

Around the world, mountain glaciers are also losing ice mass. Example, a study of the Patagonian ice fields found that the rate of ice loss in the area has increased over the 20th century. The cryosphere locks water out of the water cycle for long periods of time. But with large-scale melting, a vast amount of water can be released back into the water cycle in a relatively short amount of time this contributing to global sea level rise. One recent study suggests that the Greenland and Antarctic ice sheets are likely to be the dominant

contributor to sea level rise in the 21st century, providing around half of all sea level rise over the next 40 years.

Given current melting rates, and taking thermal heat expansion of the oceans into account, total sea level rise is estimated to be around 32 cm by 2050. Melting ice also has implications for water supply, with many millions of people around the globe dependent on rivers fed by mountain glaciers. Example: In the Indus and Brahmaputra basins alone around 60 million people rely on glacial meltwater for their water supply.

**Permafrost** – ground frozen for at least two years contains large amounts of carbon, stored as frozen methane or organic material unable to decay in its frozen state. Researchers from the **National Snow and Ice Data Center (NSIDC)** estimate that if permafrost melt continues, around 190 gigatonnes of carbon could be released into the atmosphere by 2200, further warming the planet. Scientists are also warning that methane released from seafloor permafrost in the Arctic Ocean could enhance ocean acidification in that region over the next century.

Recent IPCC report on global warming:

According to the Intergovernmental Panel on Climate Change (IPCC) **Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)**,

- Destructive changes have already set in motion which could see a steady decline in fish stocks, an increase in the damages caused by superstorms, and hundreds of millions of people would be displaced by rising seas.
- Without deep cuts to man made emissions, at least 30% of the northern hemisphere's surface permafrost could melt by century's end, unleashing billions of tonnes of carbon and accelerating global warming even more.
- By 2050, many low-lying megacities and small island nations will experience "extreme sea level events" every year.

- Even if the world manages to cap global warming at two degrees Celsius, the global ocean waterline will rise enough to displace more than 250 million people.
- This could happen as soon as 2100, though some experts think it is more likely to happen on a longer timescale.

The 900-page scientific assessment is the fourth such document from the UN in less than a year, with **other reports focused on a 1.5-Celsius cap on global warming, the state of biodiversity, and how to manage forests and the global food system.**

The IPCC will consider the SROCC on 20-23 September 2019 during its 51st Session to be held in the Principality of Monaco. The report is due to be launched on 25 September 2019.

Why restricting temperature rise to 1.5°C is significant?

The **Paris Agreement** is an agreement within the United Nations Framework Convention on Climate Change (**UNFCCC**), dealing with greenhouse-gas-emissions mitigation, adaptation, and finance, signed in 2016. It's long-term **goal is to keep the increase in global average temperature to well below 2 °C above pre-industrial levels and to limit the increase to 1.5 °C.**

The behavior and technologies will need to shift across the board in order to achieve these emissions reductions. For example, by 2050, renewables are projected to supply 70-85 percent of electricity. Energy efficiency and fuel-switching measures will be critical for the transportation sector. Reducing energy demand and improving the efficiency of food production, changing dietary choices and reducing food loss and waste also have significant potential to reduce emissions.

The IPCC's **1.5 °C** special report on climate change highlights how climate action brings many benefits for shared prosperity and economic stability – **more jobs, increased energy access, access to sustainable transportation and health improvements.** The report finds that if the 1.5°C goal is to be met,

investments in low-carbon energy technology and energy efficiency will need to increase by roughly a factor of five by 2050 compared to 2015 levels.



The report notes the critical role of short-lived but highly potent climate pollutants, such as methane and hydrofluorocarbons (HFCs). While carbon dioxide dominates long-term warming, reduction of other pollutants can contribute to the 1.5 °C goal in the short term, with substantial co-benefits, such as reducing air pollution.

The report shows clearly that we will need to focus efforts not only on reducing emissions, but also removing and storing carbon from the atmosphere. Carbon removal is necessary for both moving to net-zero emissions and for producing net-negative emissions to compensate for any overshoot of 1.5°C. Everyone- countries, cities, the private sector, individuals – will need to strengthen their action, without delay.

Without transformation in society and rapid implementation of ambitious emissions cuts, limiting warming to 1.5°C while achieving sustainable development will be exceedingly difficult, if not impossible.