

Climate Change in India [UPSC Notes GS III]

The effect of climate change has recently been seen in some cities of India like Delhi, Hyderabad, and especially Chennai where the city was facing a water crisis and was relying on alternative water sources such as distant, unreliable public water pumps, and costly private water tankers. Therefore, the topic is important in the [UPSC mains exam](#).

This article will abrest you with evidence of rapid climate change in India, its potential effect on the country, and how to cope with the climate change effects. [IAS Exam](#) aspirants can find more notes for UPSC Mains General Studies topics from the links given at the end of the article.

About Climate Change in India

- India has questioned the rush at the [United Nations](#) (UN) to declare climate change an international security issue, potentially giving the Security Council the right to take action on it, and pointed out the pitfalls in the approach.
- According to India, A "mere decision of the Council" to take over enforcement of climate change action would disrupt the [Paris Agreement](#) and multilateral efforts to find solutions.
- Climate change is a global threat to security in the 21st century. We must act now to limit future risks to the planet we share and the peace we seek.

What is Climate Change?

The periodic modification of Earth's climate brought about due to the changes in the atmosphere as well as the interactions between the atmosphere and various other geological, chemical, biological and geographical factors within the Earth's system is called Climate change.

Factors Affecting Climate Change

Natural Factors - affect the climate over a period of thousands to millions of years. Such as -

1. **Continental Drift** - have formed millions of years ago when the landmass began to drift apart due to plate displacement. This impacts climate change due to the change in the landmass's physical features and position and the change in water bodies' position like the change in the follow of ocean currents and winds. For [NCERT Notes on Continental Drift](#), visit the given link.
2. **Volcanism** - Volcanic eruption emits gasses and dust particles that lasts for a longer period causing a partial block of the Sun rays thus leading to cooling of weathers and influencing weather patterns.
3. **Changes in Earth's Orbit** - A slight change in the Earth's orbit has an impact on the sunlight's seasonal distribution reaching earth's surface across the world. There are three types of orbital variations – variations in Earth's eccentricity, variations in the tilt angle of the Earth's axis of rotation and precession of Earth's axis. These together can cause Milankovitch cycles, which have a huge impact on climate and

are well-known for their connection to the glacial and interglacial periods.

Anthropogenic Factors - is mainly a human-caused increase in global surface temperature. Such as -

1. **Greenhouse Gasses** - these absorb heat radiation from the sun resulting in an increase in Global Temperature. GHGs mostly do not absorb solar radiation but absorb most of the infrared emitted by the Earth's surface. Read more on [Greenhouse Gasses](#) on the given link. Global warming begins with the greenhouse effect, which is caused by the interaction between incoming radiation from the sun and the atmosphere of Earth.
 - Also, read about [Solar Radiation Management SRM](#) on the linked page.
2. **Atmospheric Aerosols** - these can scatter and absorb solar and infrared radiation. Solar radiation scatters and cools the planet whereas aerosols on absorbing solar radiation increases the temperature of the air instead of allowing the sunlight to be absorbed by the Earth's surface. Aerosols have a direct affect on climate change on absorption and reflection of solar radiation. Indirectly it can affect by modifying clouds formation and properties. It can even be transported thousands of kilometres away through winds and circulations in the atmosphere.
 - Read more on [Structure of Atmosphere](#) and
 - [Composition of Atmosphere](#) on the links provided.
3. **Shift in land-use pattern** - Most of the forests and land covers are replaced by agricultural cropping, land grazing, or for Industrial or commercial usage. The clearing of forest cover increases solar energy absorption and the amount of moisture evaporated into the atmosphere.
 - The lower the albedo (reflectivity of an object in space), the more of the Sun's radiation gets absorbed by the planet and the temperatures will rise. If the albedo is higher and the Earth is more reflective, more of the radiation is returned to space, leading to the cooling of the planet.

Evidence For Rapid Climate Change In India

- **Global Temperature Rise:** The planet's average surface temperature has risen about 1.62 degrees Fahrenheit (0.9 degrees Celsius) since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere. Most of the warming occurred in the past 35 years, with the five warmest years on record taking place since 2010.
- **Warming Oceans:** The oceans have absorbed much of this increased heat, with the top 700 meters (about 2,300 feet) of ocean showing warming of more than 0.4 degrees Fahrenheit since 1969.
- **Shrinking Ice Sheets:** The Greenland and Antarctic ice sheets have decreased in mass. Data from NASA's Gravity Recovery and Climate Experiment show Greenland lost an average of 286 billion tons of ice per year between 1993 and 2016, while Antarctica lost about 127 billion tons of ice per year during the same time period. The rate of Antarctica ice mass loss has tripled in the last decade.
- **Glacial Retreat:** Glaciers are retreating almost everywhere around the world — including in the Alps, Himalayas, Andes, Rockies, Alaska, and Africa.
- **Decreased Snow Cover:** Satellite observations reveal that the amount of spring snow cover in the Northern Hemisphere has decreased over the past five decades and that the snow is melting earlier.
- **Sea Level Rise:** Global sea level rose about 8 inches in the last century. The rate in the last two decades, however, is nearly double that of the last century and is accelerating slightly every year.

- **Declining Arctic Sea Ice:** Both the extent and thickness of Arctic sea ice has declined rapidly over the last several decades.
- **Extreme Events:** The number of record high-temperature events in the United States has been increasing, while the number of record low-temperature events has been decreasing, since 1950. The U.S. has also witnessed increasing numbers of intense rainfall events.
- **Ocean Acidification:** Since the beginning of the Industrial Revolution, the acidity of surface ocean waters has increased by about 30 percent. This increase is the result of humans emitting more carbon dioxide into the atmosphere and hence more being absorbed into the oceans. The amount of carbon dioxide absorbed by the upper layer of the oceans is increasing by about 2 billion tons per year.

Climate Fragility Risks in India

“A New Climate for Peace: Taking Action on Climate and Fragility Risks”, an independent report commissioned by members of the [G7](#), identifies seven compound climate-fragility risks that pose serious threats to the stability of states and societies in the decades ahead:

- **Local resource competition:** As the pressure on natural resources increases, competition can lead to instability and even violent conflict in the absence of effective dispute resolution.
- **Livelihood insecurity and migration:** [Climate changes](#) will increase the human insecurity of people who depend on natural resources for their livelihoods, which could push them to migrate or turn to illegal sources of income.
- **Extreme weather events and disasters:** Extreme weather events and disasters will exacerbate fragility challenges and can increase people’s vulnerability and grievances, especially in conflict-affected situations.
- **Volatile food prices and provision:** Climate change is highly likely to disrupt food production in many regions, increasing prices and market volatility, and heightening the risk of protests, rioting, and civil conflict.
- **Transboundary water management:** Transboundary waters are frequently a source of tension; as demand grows and climate impacts affect availability and quality, competition over water use will likely increase the pressure on existing governance structures.
- **Sea-level rise and coastal degradation:** Rising sea levels will threaten the viability of low-lying areas even before they are submerged, leading to social disruption, displacement, and migration, while disagreements over maritime boundaries and ocean resources may increase.
- **Unintended effects of climate policies:** As climate adaptation and mitigation policies are more broadly implemented, the risks of unintended negative effects—particularly in fragile contexts—will also increase.

Policy Analysis: The Need for an Integrated Agenda

The best way to diminish the threat posed by these climate-fragility risks is to mitigate climate change. However, changes to the climate are already underway, so we must take steps to manage and minimize these risks today. To break down the sectoral barriers that hamper efforts to address climate-fragility risks, we need to address key policy and institutional gaps in three areas:

- Climate change adaptation: programs help countries anticipate the adverse effects of climate change and take action to prevent, minimize, and respond to their potential impacts.
- Development and humanitarian aid programs help states and populations build their economic, governance, and social capacities and improve their resilience to shocks.
- Peace-building and conflict prevention programs address the causes and effects of fragility and conflict by reducing tensions and creating an environment for sustainable peace.

Why is climate change relevant to India?

India is among the countries most vulnerable to climate change. It has one of the highest densities of economic activity in the world, and very large numbers of poor people who rely on the natural resource base for their livelihoods, with a high dependence on rainfall. By 2020, pressure on India's water, air, soil, and forests is expected to become the highest in the world.

One of the most significant ways that climate change will impact the lives of people in India will be through its water resources. While water sustains life, it all too often wreaks havoc through devastating floods and [droughts](#). A changing climate will only aggravate these shocks.

Potential Effects of climate change in India

- **Extreme Heat:** India is already experiencing a warming climate. Unusual and unprecedented spells of hot weather are expected to occur far more frequently and cover much larger areas. Under 4°C warming, the west coast and southern India are projected to shift to new, high-temperature climatic regimes with significant impacts on agriculture.
- **Changing Rainfall Patterns:** A decline in [monsoon](#) rainfall since the 1950s has already been observed. A 2°C rise in the world's average temperatures will make India's summer monsoon highly unpredictable. At 4°C warming, an extremely wet monsoon that currently has a chance of occurring only once in 100 years is projected to occur every 10 years by the end of the century. Dry years are expected to be drier and wet years wetter.
- **Droughts:** Evidence indicates that parts of South Asia have become drier since the 1970s with an increase in the number of droughts. Droughts have major consequences. In 1987 and 2002-2003, droughts affected more than half of India's crop area and led to a huge fall in crop production. Droughts are expected to be more frequent in some areas, especially in north-western India, Jharkhand, Orissa, and Chhattisgarh. Crop yields are expected to fall significantly because of extreme heat by the 2040s.
- **Groundwater:** Even without climate change, 15% of India's groundwater resources are overexploited. Falling water tables can be expected to reduce further on account of increasing demand for water from a growing population, more affluent lifestyles, as well as from the services sector and industry.
- **Glacier Melt:** Most Himalayan glaciers have been retreating over the past century. At 2.5°C warming, melting glaciers and the loss of snow cover over the [Himalayas](#) are expected to threaten the stability and reliability of northern India's primarily glacier-fed rivers. Alterations in the flows of the Indus, Ganges, and Brahmaputra rivers could significantly impact irrigation, affecting the amount of food that can be produced in their basins as well as the livelihoods of millions of people

- **Sea level rise:** With India close to the equator, the sub-continent would see much higher rises in sea levels than higher latitudes. Sea-level rise and storm surges would lead to saltwater intrusion in the coastal areas, impacting agriculture, degrading groundwater quality, contaminating drinking water, and possibly causing a rise in diarrhea cases and cholera outbreaks, as the cholera bacterium survives longer in saline water. Kolkata and Mumbai, both densely populated cities, are particularly vulnerable to the impacts of sea-level rise, tropical [cyclones](#), and riverine flooding.
- Apart from this food and energy security are also major concerns. Water scarcity, health hazards among the masses, and migration and political conflicts are expected to grow.

India's response to Climate Change

- **National Action Plan on Climate Change (NAPCC):** outlines existing and future policies and programs addressing climate mitigation and adaptation. The Action Plan identifies eight core “national missions” running through to 2017: Solar Energy; Enhanced Energy Efficiency; Sustainable Habitat; Water; Sustaining the Himalayan Ecosystem; Green India; Sustainable Agriculture; and Strategic Knowledge for Climate Change. Most of these missions have strong adaptation imperatives.
- **National Clean Energy Fund:** The Government of India created the National Clean Energy Fund (NCEF) in 2010 for financing and promoting clean energy initiatives and funding research in the area of clean energy in the country. The corpus of the fund is built by levying a cess of INR 50 (subsequently increased to INR 100 in 2014) per tonne of coal produced domestically or imported.
- **Paris Agreement:** Under the Paris Agreement, India has made three commitments. India's greenhouse gas emission intensity of its GDP will be reduced by 33-35% below 2005 levels by 2030. Alongside, 40% of India's power capacity would be based on non-fossil fuel sources. At the same time, India will create an additional ‘carbon sink’ of 2.5 to 3 billion tonnes of Co2 equivalent through additional forest and tree cover by 2030.
- **International Solar Alliance:** ISA was launched at the [United Nations Climate Change Conference](#) in Paris on 30 November 2015 by India and France, in the presence of Mr. Ban Ki Moon, former Secretary-General of the United Nations.
- **Bharat Stage (BS) Emission Norms:** Emissions from vehicles are one of the top contributors to air pollution, which led the government at the time to introduce the BS 2000 (Bharat Stage 1) vehicle emission norms from April 2000, followed by BS-II in 2005. BS-III was implemented nationwide in 2010. However, in 2016, the government decided to meet the global best practices and leapfrog to BS-VI norms by skipping BS V altogether.

All these efforts need to be implemented well to mitigate the effects of climate change.

How can India cope with climate change effects?

An ‘adaptation’ approach is the way to go. For this, a big push must be given to the interlinking of rivers and the use of [GM crops](#). Climate action has globally been ‘mitigation-centric’ — most of the programs (such as a push for renewable energy and electric vehicles) are aimed at slowing down future global warming. ‘Mitigation’ is more important to developed countries, but for countries like India, the focus

should be on 'adaptation', or measures are taken to cope with the inevitable effects of climate change that has already happened, such as nasty storms, floods, and droughts.

'Adaptation' is like protecting yourself against a punch that will land. India has also been mitigation-centric; it is time to bring focus on 'adaptation'. And for adaptation, the time has come for two major steps.

- **The first is to give a big push to a 150-year-old idea** — inter-linking of rivers (ILRs). With floods and droughts likely to occur in different parts of the countries, possibly alongside each other, there is no option but to make ILR happen, and fast. Here are two components of it: the Himalayan and the Peninsular, with 14 and 16 links respectively. The idea is to build a dam on one river so that the water level rises at the head of the canal, allowing water to flow by gravity to the next river. India today has 5,100 large dams, which have walls at least 15 meters tall; ILR will require 3,000 more. The project will also involve building 15,000 km of new canals. If brought to fruition, ILR will bring 35 million hectares — over twice the size of Andhra Pradesh — of additional land into cultivation, and 34,000 MW more of hydroelectricity.
- **The other adaptive measure is genetically modified crops.** GM technology is a major component of 'climate-smart agriculture'. We would need drought-resistant crops, and crops that produce more on the same patch of land so that climate-impairing 'land use' is minimized. India has been saying 'no' to GM technology. However, GM technology has been in use globally for over two decades and millions of people have been eating GM foods for years.

World Bank on Climate Change

Climate change could push more than 100 million people into extreme poverty by 2030 by disrupting agriculture and fueling the spread of malaria and other diseases, the [World Bank](#) said in a report.

Frequently asked Questions about Climate Change in India

How is India affected by climate change?

One effect of climate change in India is the increase in heat waves. Heat waves' frequency and power are increasing in India because of climate change. The number of heat wave days has increased — not just day temperature, night temperatures increased also. 2018 was the country's sixth hottest year on record, and 11 of its 15 warmest years have occurred since 2004.

How can climate change in India be mitigated?

Increasing the fleet of electric vehicles and its charging infrastructure in India will be key to improve air quality in cities, enhance energy security by reduced dependence on imported crude, and is also a key solution to fight climate change. India has one of the lowest motorization rates in the world.

