WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Battling India's Climate Emergency

[1]Khushi Srivastava, [2]Dr Reshma Umair

[1]Law Student, Amity Law School, Amity University, Lucknow campus
[2]Faculty of Law, Amity Law School, Amity University, Lucknow campus

ABSTRACT

Climate change poses significant risks worldwide, with its effects disproportionately impacting vulnerable nations. India is one of the most climate-vulnerable countries, facing a growing number of extreme weather events such as heatwaves, floods, and cyclones. The country's dependence on agriculture, inadequate infrastructure, and socio-economic disparities make it especially sensitive to these climate hazards. This paper explores India's climate vulnerability in terms of exposure, sensitivity, and adaptive capacity. It also provides a comparative analysis with global trends, highlighting the disparities between developing and developed nations in their exposure to climate risks and their ability to adapt. The paper emphasizes the need for robust adaptation strategies tailored to regional contexts and global cooperation to address the growing challenges of climate change.

Key Words: Climate Vulnerability, Adaptation Strategies, Extreme Weather Events, India, Climate Change, Agricultural Sensitivity, Global Climate Risks, Adaptive Capacity.

Introduction

Climate change is a global challenge that is reshaping our world in profound ways. It is affecting everything from weather patterns to the stability of economies. Some countries are more vulnerable to these changes than others. Understanding climate vulnerability is crucial for developing strategies to cope with the effects of climate change. Vulnerability, in this context, refers to a country's exposure to climate hazards (like storms, droughts, or heatwaves), its sensitivity to these hazards (how badly it is affected), and its ability to adapt to the changes.

India is one of the most climate-vulnerable countries in the world. Its large population, diverse geography, and developing economy make it particularly susceptible to the impacts of climate change. This paper explores the specific ways in which India is vulnerable to climate change, compares it with global trends, and discusses the importance of adaptation strategies both within India and around the world.

Climate Vulnerability in India

Exposure to Extreme Weather Events

India is no stranger to extreme weather events, and in recent years, these events have become more frequent and intense due to climate change. The country has experienced significant heatwaves, floods, cyclones, and droughts, which have affected millions of people. Between 1993 and 2022, India saw over 400 extreme climate events, including severe cyclones in the Bay of Bengal and frequent heatwaves in the northern and western parts of the country.

In fact, 2024 marked a year where 93% of the country saw some form of extreme climate event, from deadly heatwaves to floods (India Today, 2025). One of the most worrying trends is the increasing intensity of heatwaves. In April 2025, temperatures in parts of Rajasthan crossed 46°C, well above the usual seasonal averages. These extreme temperatures are not only uncomfortable but dangerous, especially for vulnerable populations like the elderly and those working outdoors. They also have devastating impacts on agriculture, which is highly dependent on stable and predictable weather patterns.

India's coastal regions are also facing a significant threat from rising sea levels, which lead to more flooding and stronger cyclones. The cities along the eastern coast, such as Kolkata and Chennai, are particularly vulnerable. The Sundarbans, a vast coastal region shared by India and Bangladesh, is already experiencing the effects of sea-level rise, displacing thousands of people and threatening livelihoods that depend on agriculture and fishing.

Sensitivity to Climate Hazards

India's vulnerability to climate change is also exacerbated by how sensitive the country is to climate hazards. This sensitivity is largely tied to India's dependence on agriculture, which in turn relies heavily on the monsoon rains. Around 60% of India's population lives in rural areas, and many of them depend on farming for their livelihoods. This makes the country's agricultural sector extremely vulnerable to changes in rainfall patterns, as well as to heatwaves and droughts.

In recent years, unpredictable monsoon seasons have caused severe disruptions in agricultural production, affecting food security and livelihoods. The Indian Council of Agricultural Research (ICAR) has warned that climate change could lead to a 30% reduction in crop yields by 2050, particularly for

key crops like wheat and rice. This threatens not only food security but also the economy, as agriculture contributes significantly to India's GDP and employment.

Moreover, India's water resources are under increasing stress due to both climate change and over-extraction. Reduced rainfall in some areas and over-exploitation of groundwater resources are leading to severe water shortages. This not only affects drinking water supply but also agricultural irrigation and industrial uses.

Coastal regions face their own set of challenges. Rising sea levels are eating away at agricultural land and displacing communities. For example, the Sundarbans region in West Bengal has seen agricultural land lost to the sea, and many people are being forced to migrate to other parts of the country in search of livelihoods. These regions are at risk of not only environmental damage but also socio-economic collapse.

Adaptive Capacity

Adaptation is the process of adjusting to the negative impacts of climate change. While India has made some progress in adapting to climate risks, the overall capacity for adaptation remains low. This is largely due to the country's limited financial resources, weak infrastructure, and complex social structures. Poor communities, especially in rural areas, often lack access to the technologies and resources needed to cope with climate change.

The Indian government has made strides in addressing these issues. The National Action Plan on Climate Change (NAPCC), launched in 2008, outlines eight core strategies aimed at building climate resilience. These strategies focus on areas such as renewable energy, energy efficiency, water conservation, and sustainable agriculture. There have also been efforts to improve urban infrastructure, including water management systems and disaster preparedness programs.

However, the scale of these efforts often falls short, particularly in rural areas, where climate risks are most pronounced. Smallholder farmers, for example, may not have access to drought-resistant seeds or advanced irrigation systems. In many parts of India, basic infrastructure such as roads and healthcare facilities are also underdeveloped, making it harder for people to adapt to climate shocks.

Global Perspective on Climate Vulnerability

Exposure to Extreme Weather Events

India is not alone in its struggle with climate vulnerability. Worldwide, many regions are experiencing increasingly severe weather events. The global frequency of heatwaves, floods, droughts, and storms is on the rise, and climate change is expected to worsen these trends.

Countries in the Global South, particularly those in Southeast Asia, Sub-Saharan Africa, and parts of Latin America, are highly exposed to extreme weather events. These regions face a greater risk of storms, flooding, and droughts due to their geographic location and limited resources. For example, countries like the Philippines and Bangladesh are highly vulnerable to typhoons and cyclones, which often lead to loss of life, destruction of homes, and massive economic losses.

High-income countries, while less exposed to the most severe types of extreme weather, still face significant risks. For example, heatwaves in Europe and North America are becoming more common, and countries like the United States and Australia are experiencing devastating wildfires. These countries, however, generally have better infrastructure and resources to deal with such disasters, which makes them more resilient than poorer nations.

Sensitivity and Exposure

In terms of sensitivity, countries with large populations dependent on agriculture are more vulnerable to the effects of climate change. Africa, for example, is particularly vulnerable due to its reliance on agriculture, which is highly sensitive to changing rainfall patterns and temperatures. Similarly, many parts of Southeast Asia are at risk from rising sea levels, threatening coastal cities and communities.

On the other hand, wealthier countries with more diversified economies tend to be less sensitive to climate change. These countries have advanced infrastructure, better access to technology, and the financial resources to protect their populations from climate impacts. However, even in these countries, there are significant climate risks. For example, wildfires and hurricanes are becoming more frequent in the United States, and heatwaves are becoming more intense in Europe.

Adaptive Capacity

The ability to adapt to climate change is a critical factor in determining vulnerability. Wealthy nations typically have more adaptive capacity due to their financial resources, technological advancements, and stronger governance systems. Countries like Sweden and Germany, for example, have made significant investments in renewable energy, water management, and climate-resilient infrastructure, allowing them to cope more effectively with climate impacts.

In contrast, low-income countries, particularly those in Africa, Asia, and Latin America, struggle with limited adaptive capacity. These countries often lack the financial resources to invest in adaptation measures, and they also face challenges related to weak governance and inadequate infrastructure. International cooperation and support, including financial assistance and knowledge-sharing, are essential to help these countries build resilience.

Comparative Analysis

Aspect	India	Global Trends
Exposure to Extreme Weather Events	**Over 400 events (1993–2022)**	**Over 9,400 events (1993–2022)**
Fatalities	**~80,000 deaths**	**~765,000 deaths**
Economic Losses	**~$180 billion**	**~$4.2 trillion**
Vulnerability Ranking	**7th globally (1993–2022)**	**Varies by region**
Adaptation Expenditure	**5.6% of GDP (FY22)**	**Varies; higher in high-income countries**

Causes of Climate Vulnerability in India

Increasing Extreme Weather Events

India is seeing more extreme weather events than ever before. From scorching heatwaves to floods and cyclones, climate change has made these events more frequent and intense. For example, heatwaves in the summer months are getting worse, with temperatures crossing 45°C in many places. These extreme conditions pose a serious threat to public health, agriculture, and general well-being. Cyclones, especially in coastal regions, are becoming stronger, causing severe damage and loss of life.

Reliance on Agriculture

A large portion of India's population—around 60%—relies on agriculture for their livelihood. However, agriculture is highly vulnerable to climate change. Shifting rainfall patterns, prolonged dry spells, and rising temperatures affect crop yields. The unpredictability of monsoons makes it hard for farmers to plan, and key crops like rice and wheat are at risk. This is a major concern for food security, rural income, and the nation's economic stability.

Rising Sea Levels

With a coastline stretching over 7,500 kilometers, India is particularly susceptible to rising sea levels. Coastal cities like Mumbai, Chennai, and Kolkata face the growing threat of flooding, erosion, and other dangers as sea levels rise. In areas like the Sundarbans, people are already being displaced due to these changes, which also endanger biodiversity in the region. This is a clear example of how climate change is not just a future problem—it's happening now.

Water Shortages

Water scarcity is another pressing issue in India. The country is facing extreme water stress due to erratic rainfall, overuse of groundwater, and poor management of water resources. Prolonged droughts are a growing concern in several parts of the country, drying up rivers and reducing the water supply for both drinking and irrigation. This shortage creates a vicious cycle of crop failure, water insecurity, and increased poverty.

Inadequate Infrastructure and Urban Growth

As cities rapidly expand, many of them struggle to adapt to the changing climate. Poor infrastructure—especially in terms of flood management and drainage systems—means that cities like Mumbai, Delhi, and Chennai are ill-prepared to cope with intense rainfall and flooding. Similarly, rural areas often lack basic infrastructure such as roads, healthcare, and disaster response systems, making them especially vulnerable during climate-induced events.

Social Inequality

Climate change affects everyone, but not equally. Marginalized communities, particularly in rural areas, are much more vulnerable to the impacts of climate change. These communities have limited access to resources, knowledge, and technology to adapt to climate change. Women, too, are disproportionately affected, as they are often responsible for managing household resources like water and food. Addressing these social inequalities is essential to ensuring that climate adaptation efforts benefit all.

Deforestation and Land Degradation

Deforestation and poor land management practices are making India's climate vulnerability worse. Trees help regulate the water cycle, prevent soil erosion, and store carbon, but widespread deforestation and land degradation are reducing these vital services. Unsustainable farming practices like overgrazing and excessive irrigation are also degrading the land, leaving it less capable of absorbing rainfall or supporting agriculture.

Limited Disaster Preparedness

Although India has made strides in improving disaster response, many regions still lack adequate systems for managing climate-related disasters. Early warning systems are limited, and many communities aren't fully prepared to deal with extreme weather events. Inadequate resources, poor planning, and lack of awareness leave people vulnerable during floods, cyclones, and other disasters.

Solutions to Address Climate Vulnerability

Sustainable Agricultural Practices

A big part of tackling climate vulnerability in India is making agriculture more resilient. This can be done by:
Adopting climate-smart agriculture: This includes using drought-resistant seeds, improving irrigation practices, and reducing dependency on chemical fertilizers.
Encouraging crop diversity: Growing a variety of crops that are less sensitive to changing weather conditions can help reduce risks for farmers.
Agroforestry: Integrating trees into agricultural systems helps improve soil quality, reduce erosion, and create additional income opportunities for farmers.
Renewable Energy Investment
Moving towards renewable energy is a crucial part of reducing India's carbon footprint. Investing in solar and wind energy, both of which India has a lot of potential for, can help reduce reliance on fossil fuels. Additionally, energy-efficient technologies in homes, industries, and transportation can lower energy demand and help the country transition to a cleaner energy future.
Better Water Management

Water scarcity is a growing problem, but there are solutions. Some of these include:

- Rainwater harvesting: Collecting rainwater and using it for irrigation or household purposes can ease water pressure in drought-prone regions.
- Water-efficient irrigation: Techniques like drip irrigation can help farmers use water more efficiently, especially in areas where water is scarce.
- Watershed restoration: Protecting and restoring watersheds can help regulate water supply and recharge groundwater levels.

Climate-Resilient Infrastructure

To deal with more frequent floods and heatwaves, India needs stronger infrastructure:
Improved flood management: Urban areas need better flood management systems, including drainage systems that can handle heavy rainfall. Building green spaces in cities can help absorb excess water and reduce the heat island effect.
Disaster-resistant construction: New buildings and infrastructure should be designed to withstand extreme weather events. Retrofitting existing buildings to be more resilient is also a step in the right direction.
Early warning systems: India needs better systems for predicting cyclones, floods, and heatwaves to ensure communities can prepare and evacuate if necessary.

Protecting Coastal Areas

Coastal communities are particularly at risk from climate change. Some protective measures include:
Mangrove restoration: Mangroves act as natural barriers against storms and rising sea levels. Restoring these ecosystems along India's coastline can protect vulnerable areas.
Building coastal defenses: Seawalls and embankments can provide protection against flooding and erosion. However, these must be designed carefully to avoid disrupting local ecosystems.
Sustainable coastal development: Avoiding new construction in highly vulnerable coastal zones and developing areas with resilience in mind can reduce risks.

Improved Disaster Preparedness

India's disaster management systems need significant improvement. Some solutions include:
Community-based disaster training: Local communities should be trained in disaster preparedness, including evacuation plans and emergency response. Empowering people with the knowledge to protect themselves can save lives.
Emergency response infrastructure: Developing robust systems for delivering aid quickly and efficiently during disasters will help reduce damage and suffering.
Raising awareness: Public education about climate risks and disaster preparedness can make communities more resilient.

Social Protection for Vulnerable Communities

Helping vulnerable populations cope with climate change is critical:
Financial support: Providing social safety nets such as insurance, direct financial aid, and crop insurance for farmers can help people recover from climate impacts.
Access to information: Ensuring that marginalized communities have access to climate-related information, such as weather forecasts and climate-resilient agricultural practices, can help them prepare for climate-related risks.

Global Cooperation and Funding

Climate change is a global issue that requires a global response. India should work with other nations and international organizations to:

Secure climate finance: India can access funding from international bodies like the Green Climate Fund to support adaptation projects.

Collaborate on technology: Sharing knowledge, tools, and technology can accelerate efforts to mitigate and adapt to climate change. India can benefit from the experience and expertise of other countries in addressing climate risks.

Conclusion

India is one of the most vulnerable countries to climate change due to its exposure to extreme weather, sensitivity to climate hazards, and limited adaptive capacity. While the government has made progress in addressing these challenges through policies like the National Action Plan on Climate Change (NAPCC), more needs to be done, especially in rural areas where climate impacts are most severe.

Globally, climate vulnerability varies widely. Low-income countries, especially in the Global South, are more exposed to climate risks and have lower adaptive capacity, making them highly vulnerable to the effects of climate change. Wealthier nations, while less exposed, still face significant challenges, particularly from heatwaves, wildfires, and storms.

The global response to climate change must focus on enhancing adaptation and resilience, particularly in the most vulnerable regions. Climate finance, technology transfer, and capacity-building initiatives will be crucial in helping developing countries cope with the impacts of climate change and reduce their vulnerability.

REFERENCES

1. India Meteorological Department. (2020). Climate of India.
2. Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India. (2021).
3. World Bank. (2020). Retrieved from https://www.worldbank.org/
4. Sharma, A. K., & Soni, S. K. (2019). Agricultural Vulnerability to Climate Change in India: Key Challenges and Policy Solutions.
5. Ghosh, S., & Sarangi, G. (2018). Coastal Vulnerability and Adaptation Strategies in India: A Case Study of the Sundarbans.
6. National Disaster Management Authority (NDMA), Government of India. (2021).
7. Mishra, V., & Goel, A. (2017). Energy Security and Renewable Energy in India: Transitioning to Sustainable Energy Systems. Journal of Energy Policy, 42(1), 123-134.
8. Centre for Science and Environment (CSE). https://www.cseindia.org/
9. International Institute for Environment and Development (IIED). (2018).