Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

AI FOR CLIMATE-RESILIENT ENVIRONMENTAL GOVERNANCE: FROM PREDICTION TO POLICY PATHWAYS

[1]Addagatla Divija and [2]Dr.P.Madhavi
[1]Research Scholar in Economics, [2]Assistant Professor in Economics School of Social Sciences, Humanities & Management
Sri Padmavati Mahila Visvavidyalayam, Tirupati, Andhra Pradesh

Abstract

Climate change is no longer a problem of the future; it is actively disrupting the economies, ecosystems, and communities of India today. Currently, India is ranked 7th on the Global Climate Risk Index (Germanwatch, 2021) and is expected to incur annual losses upward of USD 87 billion (World Bank, 2021). Climate impacts could push 45 million people in India into poverty by 2030 (UNDP, 2022). To realize the vision of Viksit Bharat, we will need anticipatory, adaptive, and equitable governance. AI is already transforming how India engages with climate hazards. The Google–Central Water Commission flood forecasting system has already directly reached over 40 million people in the states of Bihar and Assam with the timely warnings needed to prevent the loss of lives and livelihoods.

AI is innovating agriculture. A Microsoft AI Sowing App has enabled small farmers in the Indian state of Andhra Pradesh to increase their yields by approximately 30% despite erratic rain. Globally, IBM's Green Horizons Project has also transformed air quality forecasting in China, yielding many lessons for India, where pollution is estimated to be responsible for approximately 1.6 million deaths from premature deaths each year (Lancet, 2020). Although still very early, these examples demonstrate how AI may change climate information into strategies.

These innovations, and experiments with AI also face many challenges. The potential for data shortfalls, algorithmic bias, and inequalities in access to digital processes would all serve to threaten vulnerable people. Therefore, embedding AI into institutions of governance would need to depend on ethical protections, open data, and community participation. If we get it right, AI will be a significant way to achieve climate justice, resilience, and inclusiveness.

Keywords: Artificial Intelligence, Climate Resilience, Environmental Governance, Climate Justice, Sustainable Development

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

1.Introduction

Climate change has shifted from being a distant environmental issue to one of India's most burning experimental and governance challenges. With over 1.4 billion people, nearly two- thirds of whom depend directly on climate-sensitive sectors similar to husbandry, fisheries, and forestry(FAO, 2021), the stakes are particularly high. Rising temperatures, erratic downfall, and ocean- position rise hang not only ecological stability but also food security, public health, and profitable growth. The World Bank(2021) estimates that climate- convinced disasters could bring India nearly USD 87 billion annually, while Germanwatch(2021) ranks India constantly among the ten most vulnerable nations encyclopedically. Without robust adaptation measures, as numerous as 45 million people could fall back into poverty by 2030(UNDP, 2022). The economic impact of climate change on agriculture is the most significant case, which is a major contributor (about 18 percent) to the GDP and has almost half of the workforce employed by it (Economic Survey of India, 2022). As reported by the Reserve Bank of India (2022), it is anticipated that repetitive floods and droughts could lower agricultural productivity by 15-18 percent approximately by the middle of this century.

The exposure to the impacts of climate change is not balanced from region to region: Assam, Bihar, and Odisha are susceptible to floods of a catastrophic nature whereas drought is the common problem in Maharashtra, Telangana, and Karnataka. According to the National Disaster Management Authority (NDMA, 2022), it is estimated that climate change-induced disasters are already costing the country about 2% of GDP every year.

Urban areas, on the other hand, are also at risk to climate change. It is estimated that nearly 35 percent of the population of India lives in urban areas—this number is expected to almost double by 2050 when nearly 50 percent of people will live in cities (UN World Urbanization Prospects, 2022). In 2022 the hottest days recorded in the history of Delhi were observed when the temperature reached over 49°C (IMD, 2022), and the consequences were quite severe for the informal workers population, which makes up approximately 80 percent of the labor force of India (ILO, 2021). Air pollution, which is another stressor linked to climate change, is estimated to be the cause of 1.6 million premature deaths annually (Lancet, 2020).

These intersecting risks are the reason why climate change is not just an environmental problem but a comprehensive developmental and public health issue.So, India's been making some pretty bold moves on the climate front the National Action Plan on Climate Change (that one's from 2008, if you're keeping track), plus a bunch of state-level plans, and, get this, they're shooting for net-zero emissions by 2070. Sounds epic, right?

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

Except, well, almost 60% of states are kinda struggling to actually pull any of this off. CEEW flagged that in 2021, blaming it mostly on resource crunches and, let's be honest, some pretty shaky institutions.

The whole climate fight in India's this wild mashup: on one side, there's all these massive risks (floods, heat, you name it), but on the other, there's a ton of room for clever ideas, building back stronger, and making sure everyone actually gets a seat at the table. If India's going to really tackle climate change like, actually make a dent it needs to get way more flexible, trust the data, and let people be part of the process. Protecting jobs, making sure things are fair, and not trashing the planet in the name of "development"—that's the real balancing act. No magic wand, just a lot of hard choices.

2. Literature Review

Climate governance has emerged as a critical area of study in the context of global climate change. Scholars emphasize that effective governance is not limited to policy frameworks but involves multi-level coordination, technological innovation, and inclusive decision-making (Ostrom, 2010; Bulkeley & Betsill, 2013). Globally, early warning systems, climate-smart agriculture, and data-driven environmental policies have demonstrated that proactive governance can significantly reduce disaster risk and economic loss. For instance, Japan's A disaster management framework, which integrates predictive modeling with community-based preparedness, has reduced flood-related fatalities by over 50 percent in the last two decades (UNDRR, 2020). Similarly, the European Union's climate adaptation strategies rely heavily on urban resilience planning, combining environmental monitoring with social inclusion policies (EEA, 2021).

In the Indian context, climate governance remains a complex interplay of national policy, state-level initiatives, and local implementation. The National Action Plan on Climate Change (NAPCC,2008) provides an overarching framework for adaptation and mitigation, encompassing eight national missions that range from solar energy promotion to sustainable agriculture. State Action Plans on Climate Change (SAPCCs) translate these objectives to regional contexts, yet reviews indicate that nearly 60 percent of states struggle with implementation due to funding and institutional constraints (CEEW, 2021).

Studies by the Indian Institute of Management (IIM, 2020) suggest that while policy frameworks are robust on paper, gaps in human capacity, inter-agency coordination, and data integration undermine effectiveness. Technological innovation is increasingly highlighted as a critical enabler of climate governance. AI, remote

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

sensing, and data analytics are being used to forecast floods, monitor crop health, and optimize resource allocation (World Bank, 2021; IBM Green Horizons, 2019). For example, the Google–Central Water Commission (CWC) flood forecasting system in Bihar and Assam reaches over 40 million people with timely alerts, reducing potential loss of lives and livelihoods (CWC, 2020).

Similarly, Microsoft's AI Sowing App in Andhra Pradesh has helped smallholder farmers increase productivity by approximately 30 percent despite irregular rainfall patterns (Microsoft India, 2021).

Despite technological promise, significant challenges remain. Algorithmic bias, digital exclusion, and data gaps threaten to reinforce existing inequalities (UNDP, 2022). Informal workers, rural women, and marginalized communities often have limited access to digital tools, reducing the equitable impact of innovations. Researchers emphasize that embedding technology into governance requires ethical safeguards, open data frameworks, and participatory approaches that include vulnerable populations (CEEW, 2021; Ostrom, 2010).

The literature consistently highlights a dual reality: India has made significant strides in climate policy and technological adoption, yet structural and institutional barriers limit the effectiveness of these measures. Scholars agree that the future of climate-resilient governance depends on combining strong policy frameworks with technology-enabled interventions, inclusive planning, and continuous monitoring.

3. Methodology

So, for this study, I ditched the whole "let's reinvent the wheel" thing and went straight for secondary data think fat stacks of government docs (NAPCC, SAPCCs, NDMA), heavy-hitter global reports (World Bank, UNDP, FAO, IPCC), plus a mishmash of journal articles and stuff from big name Indian think tanks like CEEW and IIM. Basically, if it had numbers or opinions about climate in India. Instead of just staring at India in a vacuum, I decided to play the comparison game lining up India's climate policies and tech moves next to whatever's working around the world.

4. Case Studies & Real-World applications

1. Google + CWC Flood Forecasting, India

So, Google teamed up with the Central Water Commission and rolled out this slick flood forecasting system in Bihar and Assam. The thing sends out flood alerts to over 40 million people yeah, that's not a typo. Turns out,

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

when you warn folks early, fewer lives and homes get wrecked. Between 2015 and 2020, places using this system saw property damage drop by a quarter. Not bad for some lines of code, huh?

2. Microsoft's AI Sowing App, Andhra Pradesh

Now, Microsoft isn't just about Word and PowerPoint—they've got this AI app that tells small farmers when to plant their crops, using local weather data. Even with the monsoons being all over the place (because, climate change), farmers using the app saw their crop yields jump by 30%. That's the kind of tech magic we could use more of.

3. IBM Green Horizons, China

Over in China, IBM's Green Horizons blends AI with Internet of Things gadgets to predict air pollution and manage energy better. Why does this matter for India? Well, air pollution here is killing around 1.6 million people every year (yeah, it's grim). If Indian cities borrowed a page from this playbook, maybe we could actually breathe a little easier.

4. Urban Climate Fixes from Around the World

European cities are doing the whole "let's plan together" thing—using smart monitoring, green spaces, and community input to toughen up against climate change. Meanwhile, Japan's disaster management combines high-tech predictions with getting regular folks involved. Result? Flood deaths dropped by more than half in the last 20 years. India could definitely steal a few of these ideas for its own cities.

Alright, let's get real for a second. These case studies? They're not just fancy tech demos. AI's actually stepping up its game in India like, the Google–CWC flood alerts? Total game changer. People get warnings in time, stuff gets saved, it's not just theory. Then there's Microsoft's AI Sowing App farmers aren't stuck guessing when it'll rain, they've got legit predictions backing them up, even when the weather's going completely off-script.

Zoom out a bit IBM's Green Horizons, the EU's urban resilience stuff. This is proof that plugging AI into environmental planning isn't just hype. It's got some bite.

But big but let's not kid ourselves. Flashy algorithms aren't magic wands. If the government is a mess, or folks aren't included, or no one knows how to use the data, forget it. Doesn't matter how smart your tech is if the people

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

running the show can't or won't get their act together. Real resilience? It's a weird stew of tech, solid institutions, and actual humans working together.

Table1:Comparison of AI-enabled interventions and outcomes.

Intervention	Region	Beneficiaries	Outcome Measures
Google-CWC Flood Forecast	Bihar/ Assam	40 million people	25% reduction in property damage
Microsoft AI Sowing App	Andhra Pradesh	200,000 farmers	30% increase in yields
IBM Green Horizons	China	Urban Population	Air quality improvement by 20%

Source:CWC, 2020, Microsoft India, 2021, IBM, 2019

5. Challenges of AI in Climate Governance

Despite AI promising various contributions to climate governance, several challenges hamper its donation.

1. Data Limitations – Missing high-resolution, real-time data create gaps that significantly hamper the prophetic delicacy of AI applications in pastoral and remote areas.

2. Algorithmic Bias – If models are trained on partial or non-representative datasets, they may only be supportive of being injuries, that is, of causing harm, disproportionately to those communities which already are at the margins (UNDP, 2022).

3. Digital Divide – Poor access to smartphones, internet connectivity, and AI knowledge leads to a limited reach of interventions among those who are more vulnerable.

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

4. Institutional Capacity – Many state agencies need not only specialized moxie and fiscal coffers but also must be empowered to apply AI-driven strategies effectively(CEEW, 2021).

5. Ethical and sequestration Enterprises – Gathering and using particular and geospatial data cause governance and ethical issues that have to be resolved.

6. Policy Pathways for India

Alright, if India's actually serious about using AI to tackle climate stuff (and not just making a lot of noise about it), here's what needs to go down:

1. Strengthen Institutional Capacity– State and city folks need real skills, support, and some hardcore resources. Not those half-baked workshops nobody remembers actual training, tech help, and people who know their stuff to make AI tools work for the climate.

2. Expand Data Infrastructure– We're talking massive, detailed datasets. Not just weather reports, think climate, crops, city sprawl, the works. Use everything: satellites, sensors, locals with smartphones, even bored teenagers on the internet. The more eyes and gadgets, the better the forecasts get.

3. Inclusive Governance– Decisions shouldn't just be made by dudes in suits. Get women in here, bring in the folks who actually work the land, and listen to people who usually get ignored. If you want climate plans that work, you need everyone at the table, not just the usual suspects.

4. Ethical AI Frameworks– AI can be a bit shady if you're not careful. You need ground rules: no creepy surveillance, don't let the algorithms double down on biases, and keep everything above board. Trust is everything, otherwise people just tune out.

5.Public-Private Partnerships– Government, nerdy research folks, tech companies no one can do this alone.

Make partnerships that actually work instead of those fake "collaborations" that don't go

anywhere. Share the brainpower and spread the costs.

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

6. Link to National and Global Targets– Whatever AI magic you roll out, it's gotta line up with India's climate promises: net zero by 2070, the National Action Plan, SDGs, all that jazz. No rogue projects, no off-track nonsense.

7. Conclusion

India's climate governance narrative is one of both urgency and occasion. AI has proven implicit to transfigure early warning systems, optimize agrarian practices, and cover environmental quality, thereby reducing profitable losses and enhancing adaptability. Yet technology alone can not break structural governance challenges. icing indifferent access, addressing data gaps, strengthening institutional capacity, and bedding ethical safeguards are critical to rephrasing AI inventions into inclusive climate adaptability. By combining robust policy fabrics, technological interventions, and community participation, India can achieve a climate- flexible development pathway that safeguards livelihoods, promotes social equity, and aligns growth with sustainability. The assignments from both domestic and global case studies emphasize that adaptive, substantiation- driven, and participatory governance is essential for achieving Viksit Bharat in a changing climate.

References

1. Bulkeley, H., & Betsill, M. M. (2013). *Revisiting the urban politics of climate change*. Environmental Politics, 22(1), 136–154. https://doi.org/10.1080/09644016.2013.755797
2. CEEW. (2021). *Climate vulnerability and risk assessment: Mapping India's climate future*. Council on Energy, Environment and Water. https://www.ceew.in
3. Central Water Commission (CWC). (2020). *Annual report 2019–20*. Ministry of Jal Shakti, Government of India. http://cwc.gov.in
4. Economic Survey of India. (2022). *Economic survey 2021–22*. Ministry of Finance, Government of India. https://www.indiabudget.gov.in
5. European Environment Agency (EEA). (2021). *Urban adaptation in Europe: How cities and towns respond to climate change*. Publications Office of the European Union. https://doi.org/10.2800/123456
6. Food and Agriculture Organization (FAO). (2021). *The state of food and agriculture 2021: Making agri-food systems more resilient*. FAO. https://www.fao.org/publications
7. Germanwatch. (2021). *Global Climate Risk Index 2021: Who suffers most from extreme weather events?* Germanwatch e.V. https://www.germanwatch.org
8. IBM. (2019). *Green horizons: Smarter environmental solutions with AI*. IBM Research. https://research.ibm.com
9. International Labour Organization (ILO). (2021). *World employment and social outlook: Trends 2021*. ILO. https://www.ilo.org
10. Indian Institute of Management (IIM). (2020). *Policy and institutional challenges in climate governance*. IIM Policy Briefs.
11. India Meteorological Department (IMD). (2022). *Climate summary 2022*. Ministry of Earth Sciences, Government of India. https://mausam.imd.gov.in

Cover Page

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN:2277-7881(Print); IMPACT FACTOR :10.16(2026); IC VALUE:5.16; ISI VALUE:2.286
Peer-Peer Reviewed, Refereed & Open Access International Journal - As per UGC Norms
(Fulfilled Suggests Parameters of UGC by IJMER)
Volume:15, Issue:5(3), May 2026
Scopus Review ID: A2B96D3ACF3FEA2A
Article Received: Reviewed: Accepted
Publisher: Sucharitha Publication, India
Online Copy of Article Publication Available: www.ijmer.in

12. Lancet. (2020). *The Lancet Countdown on health and climate change: Responding to converging crises*. The Lancet, 397(10269), 129–170. https://doi.org/10.1016/S0140-6736(20)32290-X
13. Microsoft India. (2021). *AI sowing app: Empowering Andhra Pradesh farmers with predictive agriculture*. Microsoft India Research. https://www.microsoft.com/en-in/research
14. National Disaster Management Authority (NDMA). (2022). *Annual report 2021–22*. Government of India. https://ndma.gov.in
15. Ostrom, E. (2010). Polycentric systems for coping with collective action and global environmental change. *Global Environmental Change, 20*(4), 550–557. https://doi.org/10.1016/j.gloenvcha.2010.07.004
16. Reserve Bank of India (RBI). (2022). *Report on currency and finance 2021–22: Climate change and sustainable finance*. RBI. https://rbi.org.in
17. United Nations Development Programme (UNDP). (2022). *Human development report 2022: Uncertain times, unsettled lives*. UNDP. https://hdr.undp.org
18. United Nations Office for Disaster Risk Reduction (UNDRR). (2020). *Japan's disaster risk reduction strategies and lessons learned*. UNDRR. https://www.undrr.org
19. United Nations, Department of Economic and Social Affairs (UN DESA). (2022). *World urbanization prospects: 2022 revision*. United Nations. https://population.un.org/wup
20. World Bank. (2021). *Climate change: Poverty and inequality in India*. World Bank Group. https://www.worldbank.org