AI: Climate's Double-Edged Sword

Clockwise from the left : Amit Kapoor & Darshana Gauratra

ARTIFICIAL Intelligence (AI) is increasingly becoming a core economic infrastructure. From private industry to government platforms, from agriculture advisories to power dispatch centres, AI systems are being embedded in the economic systems globally and in India.

Artificial Intelligence embodies a dual character as both a climate risk mitigator and a potential climate risk multiplier. Artificial Intelligence can be utilised as one of the most powerful tools to manage climate volatility. It sharpens our ability to forecast extreme weather events, manage energy systems and protect infrastructure. However, it depends on the compute infrastructure whose electricity appetite is rising at a pace that could strain grids, increase emissions and create environmental stress. The way India balances capabilities and resource constraints is one of the most consequential policy debates in this decade.

The economic case for AI in climate resilience is quite compelling. Climate volatility is no longer episodic; it is structural. Global disaster losses in 2024 exceeded $300 billion. The year 2025 was the third-warmest year on record globally. India experienced 331 out of 334 days of extreme weather events. Extreme rainfall events have become more frequent, disrupting urban infrastructure and supply chains and heat waves have distorted the electricity demand curve. Reducing that volatility has measurable economic value.

Traditional climate and weather forecasting rely on physics-based numerical models that are computationally intensive. High-resolution simulations require enormous compute capacity and generate massive volumes of data. Such simulations are necessary to estimate low probability but high-impact extreme events, yet running them at scale is costly and time-consuming. This is exactly where AI is beginning to alter the economics of climate modelling. Once trained, AI models can emulate complex simulations dramatically faster, allowing thousands of scenarios to be generated in the time it takes traditional systems to run a handful. At the recent AI Impact Summit held in New Delhi, one of the most consequential threads was climate resilience.

Technology platforms such as NVIDIA's Earth-2 initiative demonstrated how AI can compress what traditionally required hours of high-performance computing into near real-time outputs. It can simulate weather systems, run massive ensemble forecasts in seconds, and downscale climate projections to kilometre-level detail. Its FourCastNet model leverages neural operators and transformer architectures to produce medium-range weather forecasts dramatically faster than conventional systems, which is crucial for capturing tail-risk events. By enabling 1000-member ensemble forecasts, AI models can improve probabilistic estimation of heat waves, cyclones and extreme rainfall events.

Similarly, generative diffusion-based models such as Corrdiff are being deployed to downscale coarse global climate projections into kilometre-scale maps suitable for urban flood modelling and cyclone impact assessment. Artificial Intelligence-driven data assimilation tools can now even ingest satellite, balloon and station data to reconstruct atmospheric states within seconds. The open architecture of these models allows countries to build sovereign weather intelligence systems tailored to domestic data and policy needs.

At the urban scale, Earth-2 and Om-

Photograph by Jag CZ

Beyond energy demands, AI expansion has material implications for water, air quality and ecological stress. A 1MW data centre using traditional cooling requires water equivalent to the domestic water needs of approximately 528 Indians

niverse are used to create millimetre-accurate digital twins that simulate microclimates and wind patterns between buildings. With the combination of high-resolution simulations with real-time data visualisation platforms, cities would be able to model airflow between structures, assess heat island intensity, simulate storm water runoff and test flood pathways. The applications have also extended beyond research. Collaborations with global insurers such as AXA, AI ensembles are being used to estimate how climate change alters the frequency and severity of extreme events which is critical for disaster pricing and infrastructure planning.

India is also already pursuing AI. In 2025, in collaboration with the Ministry of Agriculture, AI- driven forecasting models were operationalised. It reached 38 million farmers with two week and seasonal advisories. Granular information on onset delays, rainfall variability and district-level extreme event probabilities was translated into actionable farm-level decisions. The indigenous Bharat Forecasting System of India's Meteorological Department offers 6 km resolution predictions to enhance weather prediction at the panchayat-cluster level. This is more than incremental efficiency. It is systemic risk reduction. It can translate into better disaster preparedness and lower loss exposure, lowering marginal cost of resilience planning.

However, this foresight runs on electricity. Globally, data centre electricity demand would approach 945 terawatt-hours by 2030. According to the International Energy Agency, AI electricity consumption will increase by about 15 per cent each year from 2024 to 2030, more than four times faster than the growth of electricity consumption from all other sectors. India's electricity demand is already on the rise due to industrialisation, electrification of transport and urbanisation. The peak demand has crossed 250GW and is expected to grow steadily in this decade.

Beyond energy demands, AI expansion has material implications for water, air quality and ecological stress. A 1 MW data centre using traditional cooling requires an estimated 26 million litres of water annually, equivalent to the domestic water needs of approximately 528 Indians. Artificial Intelligence-driven power demand also risks leading to higher SO – NOx, and PM 2.5 emissions. Indian urban centres are already burdened with water stresses and rampant air quality issues. Eventually, the climate dividend would be eroded and AI models for climate risk mitigation would pose a threat. This is double-edged and already in motion. India's development context makes the trade-off sharper. It can be viewed as a structural convergence between compute growth and climate risk.

India does not have the luxury of treating AI expansion, energy policy and climate adaptation as separate silos. They are heavily interdependent. The net climate impact of AI will not only be determined by how intelligently we power models and infrastructure, but also by how intelligently the models are used to mitigate climate risks. It can become India's most powerful stabiliser in a volatile climate future. The task now is to ensure that it strengthens resilience faster than it can increase the climate strain. BW

Amit Kapoor is Chair, & Darshana Gauratra is a researcher at the Institute for Competitiveness