RECONCILING ENVIRONMENTAL-LAW PRINCIPLES WITH THE REGULATION OF GENERATIVE ARTIFICIAL INTELLIGENCE: LEGAL GAPS, COMPARATIVE PERSPECTIVES, AND POLICY PROPOSALS WITH A SPECIAL FOCUS ON INDIA

Ms. Manikanta Mahima Chowdary G & Ms. Kallam Laxmi; Sri Padmavathi Mahila Visvavidyalayam

Table of Contents

Abstract :

The rapid expansion of generative artificial intelligence (AI), powered by large-scale data centres, industrial GPU clusters, rare-earth-dependent semiconductor manufacturing, and high-capacity electricity networks, has created an environmental footprint that existing Indian environmental laws do not adequately recognise. Although legal and policy debates on AI have centred on data privacy, liability, ethics, safety, and intellectual property, the ecological implications of AI infrastructure, including energy consumption, carbon emissions, water use, and electronic waste, remain largely outside the scope of regulatory scrutiny. This paper argues that these impacts constitute an under-regulated externality that must be addressed through established constitutional and environmental-law doctrines. It further clarifies that many of these harms arise not from AI algorithms themselves but from the broader physical infrastructure, namely data centres, cloud platforms, and hardware supply chains, through which AI systems operate.

Analysing Article 21, Articles 48-A and 51A(g), and leading environmental jurisprudence, the paper demonstrates that Indian constitutional principles already mandate environmental protection and support extending environmental-law oversight to AI systems. The study identifies legal gaps relating to definitional exclusions, lack of carbon-disclosure mandates, absence of EIA norms for data centres, and inadequate lifecycle regulation of AI hardware. Comparative analysis of the EU, US, China, and international soft-law frameworks shows a global shift towards sustainable digital infrastructures, providing useful models for India. The paper concludes with concrete policy proposals specifying thresholds, institutional responsibilities, implementation timelines, and enforcement mechanisms suited to India's constitutional and administrative structure.

Keywords: Environment, AI, Constitution, Carbon footprints

1. Introduction

The contemporary technological landscape has been transformed by the rapid rise of generative artificial intelligence (AI), particularly large language models (LLMs), neural-content generators, multi-modal systems, and industrial-scale machine-learning infrastructure. These systems now underpin commercial applications, governance tools, medical diagnostics, research analysis, public-service delivery, and large consumer-facing platforms. Their development and deployment, however, depend on an equally vast physical, material, and energy-intensive infrastructure: data centres, cloud-computing clusters, industrial-scale GPU farms, semiconductor fabrication units, cooling towers, water-circulation systems, rare-earth mining chains, logistic networks, and high-capacity electricity grids. While traditionally perceived as purely digital technologies separate from the physical environment, there is now increasing scientific evidence that generative AI systems carry significant environmental footprints in terms of energy consumption, greenhouse gas emissions, water extraction for cooling mechanisms, and electronic waste arising from hardware obsolescence.

This environmental dimension remains largely invisible within mainstream AI-governance discourse. Global regulatory frameworks, whether in the European Union, the United States, the Commonwealth countries, or India, predominantly focus on algorithmic transparency, data protection, cybersecurity, model-safety, discrimination, liability, or intellectual-property concerns. Environmental externalities have rarely featured as a formal legal component in AI governance beyond sporadic sustainability rhetoric or voluntary corporate reporting. This asymmetry is especially significant when empirical studies highlight that training and inference for frontier generative-AI models can consume several megawatt-hours of electricity and substantial volumes of cooling water, contributing to both carbon emissions and industrial strain on regional utility grids. For context, a single training run for a large language model has been estimated to emit several hundred tonnes of CO_2 equivalent, which is comparable to the lifetime emissions of multiple passenger vehicles. Additionally, data-centre cooling in water-stressed regions can extract tens of millions of litres of freshwater annually.

Moreover, early estimates suggest that global data-centre electricity consumption may more than double by 2030 due to AI-driven compute demand, a development that threatens to undermine the climate-mitigation targets of states operating under the Paris Agreement to the

United Nations Framework Convention on Climate Change and domestic decarbonisation commitments. The International Energy Agency projected in its 2024 report that data centres globally could consume between 800 TWh and 1,000 TWh of electricity by 2026, a figure broadly consistent with findings from independent academic and industry researchers tracking AI infrastructure growth. These pressures become sharper in federal jurisdictions like India, where electricity-generation mixes are still centred on coal-based thermal plants, where drought-prone regions face severe water scarcity, and where the waste-management ecosystem already struggles with e-waste volumes. Parallel concerns arise from the upstream environmental impacts of AI hardware: rare-earth extraction, toxic semiconductor fabrication, hazardous waste streams from chip manufacturing, and landfill disposal of superseded servers.

Despite these emerging risks, Indian legal scholarship has not systematically examined generative-AI deployment through the lens of environmental law. The prevailing environmental-law architecture, encompassing the Environment (Protection) Act 1986, Water Act 1974, Air Act 1981, and E-Waste Management Rules, was historically drafted to regulate heavy industry, mining, polluting factories, municipal discharges, or chemical effluents. None of these statutes expressly conceptualises data centres or AI infrastructure as "industries", "polluters", or "hazardous waste generators", nor do they mandate environmental-impact assessments, carbon-disclosure norms, lifecycle-auditing, or energy-mix compliance for computational infrastructures. The environmental costs of digital technologies, therefore, currently operate within a regulatory blind spot.

Yet, doctrinally, Indian environmental jurisprudence provides ample normative basis to bring generative-AI infrastructure under legal regulation. The Supreme Court has repeatedly affirmed that the right to a clean, healthy, and ecologically balanced environment is intrinsic to the right to life under Article 21 of the Indian Constitution. In *M.C. Mehta v Union of India*[1], the Court extended Article 21 to prevent industrial pollution of the Ganga; in *Subhash Kumar v State of Bihar*[2]. It affirmed that environmental contamination violates fundamental rights. Further, Articles 48-A and 51A(g) constitutionally mandate environmental protection and sustainable resource stewardship.

When read alongside the precautionary principle, polluter-pays principle, public-trust doctrine, sustainable-development doctrine, and inter-generational equity, all well-recognised

[1] *MC Mehta v Union of India* [1988] 1 SCC 471
[2] *Subhash Kumar v State of Bihar* [1991] 1 SCC 598

in Indian jurisprudence, there is strong doctrinal justification to prevent emerging technological infrastructures from imposing diffuse but systemic environmental burdens. If mining, chemical industries, refineries, and manufacturing units may be subjected to environmental-impact assessments, mitigation duties, emission caps, or levies, there is no principled reason why large-scale data-centre clusters consuming multi-megawatt electricity loads, generating e-waste, and creating heat-island effects should be exempt merely because their pollution is invisible and digitally mediated.

2. The Environmental Impacts of Generative AI

The environmental implications of generative artificial intelligence (AI) are increasingly recognised in technical, climate-policy, and sustainability literature, yet they remain marginal within mainstream legal analysis. A conceptual clarification is necessary at the outset: the environmental harms discussed in this section are not caused by AI models in isolation, but by the material infrastructure, including data centres, server farms, GPU clusters, cooling systems, and global hardware supply chains through which those models are trained and deployed. This distinction has regulatory significance: it means that environmental governance can and should target the infrastructure operators, facility owners, and hardware producers, even where the AI developers themselves are legally distinct entities.

At the centre of these impacts is the material infrastructure required to train, deploy, and maintain advanced AI systems, including large-scale data centres, high-performance GPU clusters, electricity-intensive cloud computing platforms, semiconductor fabrication units, and global supply chains for rare-earth elements. Unlike conventional digital applications, cutting-edge generative models require intensive computational cycles involving trillions of parameters, multiple training rounds, and continuous inference servicing. These processes entail substantial energy usage and, consequently, significant carbon-emission footprints.

Empirical evidence from peer-reviewed sources and international energy bodies provides a clearer picture of scale. Research published in *Nature* and associated technical literature estimated that training GPT-3, a 175-billion-parameter model, consumed approximately 1,287 MWh of electricity, generating an estimated 552 metric tonnes of CO_2 equivalent. Researchers note, however, that this figure excludes infrastructure overhead, experimental training runs, and embodied hardware emissions, which could significantly increase the real-world figure. Estimates published by international energy agencies suggest that global data-centre electricity consumption stood between 460 TWh and 500 TWh in 2022, and that

generative-AI workloads could contribute to a significant increase in this figure by 2030 if current growth trajectories continue. The International Energy Agency's 2024 review of data centre trends noted that the rapid expansion of AI compute was one of the principal drivers of this growth, alongside cryptocurrency and cloud migration. These trends raise acute concerns for countries like India, where coal remains the dominant source of electricity, and where decarbonisation pathways are constrained by both economic and infrastructural realities.

In addition to electricity consumption, cooling systems used to stabilise server-temperature loads constitute a major environmental challenge. In efficiently operated hyperscale facilities, cooling may account for approximately 30 to 40 per cent of total energy usage, measured through Power Usage Effectiveness (PUE) benchmarks; in older or less optimised facilities, this proportion can be substantially higher. Cooling infrastructure in many jurisdictions requires large volumes of freshwater, creating additional pressure on water-scarce regions and contributing indirectly to ecological stress. A 2023 study by researchers at the University of California, Riverside, found that training GPT-3 in Microsoft's data centres consumed approximately 700,000 litres of freshwater, and that inference (the ongoing use of a model by end-users) adds materially to this figure when aggregated across millions of queries. In India, where groundwater depletion and drought cycles already strain public utilities in states such as Maharashtra, Rajasthan, Telangana, and Karnataka, the growth of large data-centre clusters without regulatory safeguards could intensify environmental vulnerability.

Further upstream, the fabrication of semiconductor chips required for GPU-based computation poses its own suite of ecological problems. Semiconductor manufacturing has historically been associated with hazardous chemicals such as hydrofluoric acid, sulfuric acid, and various solvents, as well as toxic wastewater discharge, and exceptionally high energy and ultrapure water consumption; TSMC, the world's largest chip foundry, reportedly consumed approximately 156 million tonnes of water in 2021 alone. Rare-earth materials used in advanced circuit boards are often mined in regions where environmental compliance and rehabilitation safeguards are weak, leading to soil contamination, biodiversity loss, unsafe labour conditions, and long-term ecosystem damage. At the end of hardware lifecycles, the obsolescence of GPUs, servers, cooling components, and storage units contributes to the growing global e-waste stream. While India's e-waste management framework imposes certain obligations on consumer-electronics producers, there is currently no regime tailored to bulk server-class disposals or the lifecycle economics of AI-specific hardware.

Beyond energy, water and waste, studies also attribute indirect environmental consequences to generative AI, including heat-island effects from data-centre concentration, localised grid stress resulting in additional fossil-fuel generation, and emissions embedded in global supply-chain logistics. Several sustainability analyses now emphasise that without legally enforced disclosure requirements and standardised carbon-reporting protocols, it is exceedingly difficult to accurately assess the full environmental cost of generative-AI models. The absence of mandatory lifecycle assessment data is particularly acute in India, where no public registry of data-centre energy consumption or emissions exists.

The cumulative evidence demonstrates that generative-AI infrastructure is far from immaterial: it is an energy-hungry, resource-intensive, and waste-producing ecosystem deeply intertwined with physical environmental systems. As generative AI scales across sectors, from finance, law, and education to defence, governance and healthcare, its environmental footprint will correspondingly expand. In the Indian context, where climate vulnerability, water-scarcity patterns, coal-based grids, and urban-heat challenges already intersect, the failure to integrate environmental-governance norms into AI-regulatory frameworks risks embedding yet another layer of ecological harm. This underlines the urgency for statutory re-conceptualisation, doctrinal expansion, and empirical-reporting mandates capable of internalising AI-linked environmental externalities within the ambit of national environmental law.

3. Constitutional and Statutory Foundations in India

India possesses one of the most constitutionally rich and jurisprudentially developed environmental-law frameworks among post-colonial jurisdictions. The legal foundations for environmental governance in India are embedded both in the Constitution and in the country's statutory architecture. These doctrines, originally formulated to regulate industrial pollution, mining, land degradation, and resource exploitation, are today capable of doctrinal extension to cover the environmental externalities of generative-AI infrastructure.

At the constitutional level, the Supreme Court of India has, through a long line of precedent, interpreted Article 21, the right to life and personal liberty, to include the right to a clean, healthy, pollution-free, and ecologically balanced environment. Early milestones include *Rural Litigation and Entitlement Kendra v State of Uttar Pradesh*[3], where mining operations causing ecological degradation were restrained under Article 21 principles, and M.C. Mehta v

[3] *Rural Litigation and Entitlement Kendra v State of Uttar Pradesh* AIR 1985 SC 652.

Union of India, which developed constitutional tests against environmental harm arising from industrial activity. In Subhash Kumar v State of Bihar, the Supreme Court explicitly affirmed that the right to life is violated when environmental contamination threatens public health and exposes communities to harmful conditions. These cases elevate environmental protection from mere policy aspiration to an enforceable component of fundamental rights.

The Constitution buttresses this jurisprudence through directive principles and fundamental-duty provisions. Article 48-A directs the State to "protect and improve the environment," while Article 51A(g) imposes a corresponding duty on citizens to safeguard natural ecology. Although non-justiciable, these provisions guide the interpretation of fundamental rights and statutory duties, and courts have repeatedly relied upon them to advance progressive environmental standards. In applying these constitutional norms to AI infrastructure, the doctrinal question is not whether the text of these provisions contemplates data centres, but whether the environmental burdens generated by AI-linked operations, specifically electricity-grid stress, water extraction, heat discharge, and hardware waste, fall within the class of harms that the State is constitutionally obligated to prevent. Given the expansive reading that the Supreme Court has given to Article 21 in industrial and ecological contexts, there is strong doctrinal ground to answer that question affirmatively.

Statutorily, India's environmental-law landscape is centred on the Environment (Protection) Act 1986 (EPA)[4], a framework legislation granting wide powers to the Central Government to issue notifications, impose standards, regulate industries, and prescribe safeguards for environmental protection. Complementing the EPA are specialised enactments such as the *Air (Prevention and Control of Pollution) Act 1981*[5], *Water (Prevention and Control of Pollution) Act 1974*[6], and the existing *E-Waste Management Rules*[7], all of which collectively aim to prevent, control, and monitor pollution and waste.

However, these statutes were crafted in an era where "industry," "pollution," and "hazardous activity" referenced heavy industry, manufacturing, chemical discharge, mining, smoke emissions, industrial effluents, or municipal waste. None expressly contemplate the environmental consequences of data-centre electricity loads, computational emissions, high-volume cooling systems, or specialised AI-hardware disposal. Nor do they mandate environmental-impact assessments (EIA), carbon-accounting disclosures, renewable-energy

[4] Environment (Protection) Act, No. 29 of 1986, *India Code* (1986).
[5] Air (Prevention and Control of Pollution) Act, No. 14 of 1981, *India Code* (1981).
[6] Water (Prevention and Control of Pollution) Act, No. 6 of 1974, *India Code* (1974).
[7] E-Waste (Management) Rules, 2016, Ministry of Environment, Forest & Climate Change (India).

sourcing norms, or lifecycle-auditing for server-class equipment. That said, the EPA's section 3(1) empowers the Central Government to take "such measures as it deems necessary or expedient" for protecting and improving the quality of the environment, and section 3(2)(ii) permits the Government to issue rules or notifications regulating environmental standards for any industrial operation or process. These provisions are arguably broad enough to encompass data-centre operations through executive action, without requiring fresh primary legislation, a point that is developed further in Section 6.

Doctrinally, the principles recognised by Indian courts, including polluter-pays, precautionary principle, public-trust doctrine, sustainable development, and inter-generational equity, can bridge this statutory silence. By interpreting AI infrastructures as environmentally significant activities capable of ecological harm, these principles permit regulatory extension without requiring wholesale legislative overhaul. The Supreme Court has already deployed such doctrines to regulate tanneries, vehicular emissions, industrial expansion, and environmental risk in sensitive regions. There is no principled barrier to applying the same reasoning to AI operations whose environmental impacts may be diffuse, indirect, and invisible yet nonetheless substantial.

4. Legal Gaps and the Need for Doctrinal Extension

Although India's environmental-law framework is among the most extensive in the Global South, it remains largely rooted in 20th-century conceptions of industry, pollution, and environmental risk. The statutory and regulatory legislations that govern environmental protection in India were developed in response to visibly hazardous activities, mining, chemical production, industrial emissions, hazardous-waste discharge, deforestation, thermal-plant pollution, and sewage-driven water contamination. The digital infrastructures that power modern generative-AI systems, however, do not fit neatly into these historical categories. As a result, contemporary AI infrastructure operates in a regulatory grey zone, where its environmental externalities are neither clearly contemplated nor adequately managed by existing law. This mismatch reveals doctrinal blind spots, interpretive ambiguities, and statutory omissions that require careful legal analysis.

The first major gap is definition-based. Most Indian environmental statutes regulate specific "industrial activities" or "polluting processes." The Environment (Protection) Act 1986 empowers the Central Government to establish standards for the discharge of environmental pollutants and regulate industrial-based risks, while the Air Act 1981 and Water Act 1974

apply to emissions, effluents, and contamination arising from manufacturing operations. None of these laws, however, explicitly recognises data centres, cloud-compute clusters, or AI-model training facilities as industrial or environmentally significant activities. Digital infrastructure historically has been viewed as "service-sector" activity, intangible, clean, and without a physical footprint. Yet modern empirical findings make clear that data centres supporting AI training consume megawatt-level electricity loads, generate heat-islands, strain water-cooling systems, and ultimately contribute to greenhouse-gas emissions. Treating such facilities as outside the conceptual scope of environmental regulation leaves a substantial externality ungoverned.

A second legal gap concerns mandatory environmental disclosure and carbon-accounting obligations. Indian environmental statutes do not require technology firms, AI operators, or data-centre owners to publish information regarding energy consumption, emissions by computational activity, water usage, cooling-water discharge, or server-hardware waste. While corporate environmental reporting (under ESG or CSR-linked frameworks) is emerging, these remain voluntary and are not tailored to AI infrastructures. The absence of a binding disclosure regime prevents both policymakers and civil society from understanding the true ecological cost of generative-AI expansion. Without baseline data, India cannot formulate emission limits, consumption caps, or environmental-impact thresholds; nor can it incorporate AI infrastructure into broader decarbonisation strategies.

A third legal gap lies within the Environmental Impact Assessment (EIA) regime. Under the current EIA Notifications issued under the Environment (Protection) Act, a large number of industrial, mining, construction, and infrastructure projects must undergo pre-clearance environmental scrutiny. AI data parks, GPU-compute farms, cloud-server campuses and hyperscale data-centre cities do not fall within any notifiable category, even where their footprint, energy demand, or water extraction exceeds those of many regulated industries. As India aggressively promotes digital infrastructure and AI-linked investments, industrial clusters of data centres are emerging, particularly near metropolitan zones and special economic corridors. Without EIA obligations, their cumulative impacts, such as electricity-grid stress, groundwater depletion, urban-heat amplification, and waste-stream generation, escape prior assessment and mitigation safeguards.

Fourth, the E-waste Management Rules and Extended Producer Responsibility (EPR) obligations were designed with consumer electronics in mind: mobile phones, laptops,

televisions, and small circuit boards. They do not explicitly cover servers, AI-accelerator chips, liquid-cooling modules, industrial-grade storage racks, or retired GPU boards containing rare-earth composites. As generative-AI hardware undergoes rapid obsolescence cycles, often accelerated by competitive model-upgrades and chip-efficiency leaps, the absence of a hardware-lifecycle regime creates a risk of informal disposal markets, toxification of landfills, and transboundary waste dumping.

A fifth doctrinal gap concerns jurisdictional silence over computational emissions. While India regulates air- and water-pollution sources, there is no legal recognition that electricity-based computational activity may function as a form of indirect pollution. The polluter-pays principle has historically been applied to factories releasing noxious gases, industrial effluents, or municipal waste streams, but not to invisible carbon emissions produced by megawatt-scale data-centre operations dependent on fossil-fuel electricity[8]. The climate-law dimensions of computational energy consumption, particularly in a coal-dependent power mix, therefore remain unexamined.

Finally, there is a policy-design gap. Environmental law has long relied on technical compliance tools, emission caps, effluent treatment, pollution-control certification, hazardous-waste permits, EIA, and green-belt requirements. Equivalent regulatory instruments do not exist for AI infrastructure. There are no renewable-energy-sourcing mandates for data centres; no carbon-levy mechanisms benchmarked against compute-usage; no requirement to publish lifecycle-audit reports for server hardware; and no environmental-clearance obligations for hyperscale server parks. In doctrinal terms, AI environmental risk currently exists beneath the threshold of legal visibility.

These gaps collectively indicate the need for doctrinal extension. Indian environmental jurisprudence has already embraced principles such as precaution, sustainable development, inter-generational equity, and polluter-pays, using them to regulate emergent industrial risks even where statutes were silent[9]. Courts have applied these doctrines to chemical factories,

[8] See generally, MC Mehta v Union of India AIR 1988 SC 1037; Indian Council for Enviro-Legal Action v Union of India (1996) 3 SCC 212 (discussing the polluter-pays principle). The principle has not been judicially extended to indirect emissions from electricity-dependent computational operations.

[9] Constitution of India 1950 art 48-A (directive to protect and improve the environment); art 51A(g) (fundamental duty to protect the natural environment). Both provisions have been used by the Supreme Court as interpretive tools: *State of Himachal Pradesh v Ganesh Wood Products* (1995) 2 SCC 363, 390.

vehicular emissions, ecological hotspots, and hazardous-waste disposal[10]. The same principles can be invoked to justify regulatory oversight over generative-AI infrastructure whose resource-dependence and environmental load are now empirically recognised. By reading "industry," "pollution," and "environmentally harmful activity" expansively, Indian law can evolve to internalise AI externalities, without awaiting legislative delay or ecological damage.

5. Comparative & Global Perspectives

The intersection of artificial intelligence and environmental regulation remains globally underdeveloped. However, certain jurisdictions and international bodies have begun to acknowledge the ecological footprint of AI infrastructure, offering comparative insights that may guide India's approach. A review of emerging developments in the European Union (EU), the United States (US), China, and multilateral institutions indicate a fragmented but gradually maturing regulatory imagination, where sustainability obligations are beginning to enter the AI-governance discourse.

The **European Union** represents the most structured model for integrating environmental policy into digital regulation. The EU Artificial Intelligence Act 2024, while primarily a risk-classification framework, does not expressly impose environmental-impact obligations on AI developers; however, Article 97 of the Act provides for a mandatory review of the Regulation's impacts, including environmental ones, by 2030, indicating legislative awareness of the gap. Parallel frameworks more directly address AI infrastructure. The EU Energy Efficiency Directive (recast 2023) requires Member States to collect and publish data on the energy performance of data centres above 500 kW IT load capacity. The EU Green Deal, the Sustainable Digitalisation Programme, and taxonomies for ESG disclosures increasingly require high-energy digital operations to quantify carbon intensity, report lifecycle waste, and optimise energy sourcing. The European Commission's Code of Conduct for Energy Efficiency in Data Centres, while voluntary, has set PUE benchmarks and reporting standards widely adopted across the sector. Several Member States, including Denmark, Ireland, and the Netherlands, have enacted national data-centre energy standards that exceed EU minimums. These developments collectively show that computational infrastructure can be regulated on environmental criteria, a foundation India can draw upon.

[10] MC Mehta v Union of India AIR 1987 SC 1086; Vellore Citizens' Welfare Forum v Union of India (1996) 5 SCC 647, 659 (precautionary principle); AP Pollution Control Board v Prof MV Nayudu (1999) 2 SCC 718, 735 (sustainable development and inter-generational equity).

In the United States, policy attention is more diffuse. Federal climate policy emphasises corporate carbon transparency, sustainable energy transition, and clean-technology incentives, but AI-specific environmental regulation remains embryonic. Executive Order 14057 on Catalysing Clean Energy Industries, issued in 2021, required federal agencies to prioritise clean-energy procurement, and subsequent guidance from the Department of Energy has encouraged data-centre energy efficiency across federally funded facilities. At the legislative level, the AI Act proposal introduced in some state assemblies contains nascent environmental-reporting provisions, though none have been enacted at the federal level. However, several US states, particularly California, Oregon, Virginia, and New York, have adopted energy-reporting requirements, emissions-accounting standards, or water-use benchmarking for large data-centre operators. California's Clean Cloud Act proposal, for instance, would require data-centre operators to disclose their annual energy consumption, renewable energy sourcing, and water usage, and would mandate 100% clean energy procurement by 2035 for facilities above a specified threshold. While not yet law, this proposal illustrates how environmental reporting, lifecycle disclosure, and renewable-energy procurement policies can be layered onto digital infrastructure without requiring comprehensive federal legislation.

China has displayed an alternative and state-driven approach. The Ministry of Industry and Information Technology's "Three-Year Action Plan for Green Data Centres" (2019) prescribed PUE targets, mandated renewable-energy procurement for large compute facilities, and restricted the construction of new data centres in regions where coal dependency was highest. China's 14th Five-Year Plan (2021-2025) further embedded data-centre energy efficiency targets within the country's broader climate commitments. China’s industrial policy also emphasises circular-economy principles in semiconductor manufacturing and hardware recycling, including recovery of rare-earth inputs used in advanced AI chips. While China’s regulatory environment is centrally controlled and not directly transplantable into India’s constitutional and federal framework, its recognition that AI infrastructure is an environmental activity offers jurisprudential support to the argument that India can extend its environmental-law principles to AI-linked industrial operations.

International bodies have also begun to highlight the environmental dimensions of AI. UNEP's 2023 publication, "Sustainability and Artificial Intelligence," identified data-centre growth as a major emerging environmental pressure point, calling for binding energy-efficiency standards and lifecycle assessments. UNESCO's Recommendation on the

Ethics of Artificial Intelligence (2021), adopted by all 193 Member States, explicitly includes environmental sustainability as a core AI governance principle, noting that AI development must not degrade natural resources or exacerbate climate change. The OECD AI Principles (2019, updated 2023) similarly call for AI systems to be developed in a "safe, environmentally sustainable" manner. Although these recommendations lack binding force, they serve as soft-law indicators of rising international environmental expectations surrounding AI.

Despite the progress reflected in these diverse approaches, a uniform global model for integrating environmental-law principles into AI governance does not yet exist. Most existing measures operate indirectly, through sustainability policies, ICT energy standards, or corporate-disclosure mandates, rather than through explicit environmental regulation of AI. This global incompleteness underscores both an opportunity and a responsibility for India. With its strong environmental-rights jurisprudence and rapidly growing AI ecosystem, India has unique potential to pioneer a regulatory architecture that explicitly recognises AI infrastructure as an environmental actor, embeds doctrinal environmental principles within AI governance, and contributes to global norm-setting on sustainable technological development.

6. Proposal: Legal & Regulatory Architecture for India

Given the foregoing, this paper proposes the following regulatory framework for India, combining doctrinal extension, statutory amendment, and delegated regulation. Each proposal below specifies the regulatory threshold at which obligations attach, the institutional body responsible for implementation, the implementation timeline, and the enforcement mechanism, addressing concerns that policy proposals in this area often lack operational specificity.

(a) Environmental Disclosure Requirement for AI Operators

Threshold: All entities operating data-centre facilities with an installed IT load capacity exceeding 1 MW, or operating generative AI services with an aggregate annual electricity consumption exceeding 10 GWh, should be subject to mandatory environmental disclosure obligations. This threshold is calibrated to capture hyperscale operators and large AI service providers while exempting startups, small research institutions, and low-compute deployments.

Covered entities should be required to file annual environmental disclosures to a central registry, covering: total electricity consumption attributable to AI workload (training and inference, separately reported); carbon emissions — direct and indirect — including Scope 2 emissions from grid electricity; water usage attributable to server cooling; volume and category of e-waste generated; and the percentage of electricity drawn from renewable or low-carbon sources.

Institutional responsibility: Disclosures should be submitted to MoEFCC through the Central Pollution Control Board (CPCB), which should be designated as the primary receiving and verification authority. CPCB should create a publicly accessible AI-Environment Registry, updated annually, allowing civil society, researchers, and state pollution control boards to audit data.

Implementation timeline: A phased approach is recommended. Year 1 should involve the issuance of MoEFCC guidelines and notification of reporting formats under the EPA. Years 2 and 3 should constitute a voluntary reporting pilot for entities above the threshold. Year 4 onwards: mandatory enforcement with penalties for non-disclosure or material misrepresentation.

Enforcement: Non-disclosure or submission of materially false information should be punishable under sections 15 and 16 of the EPA, which carry penalties of up to five years' imprisonment and fines. CPCB should additionally be empowered to impose operating restrictions on non-compliant facilities.

(b) Environmental-Impact Assessment (EIA) for Large Data Centres

Threshold: Data-centre projects with an installed IT load capacity of 10 MW or more, or occupying a floor area of 10,000 square metres or more, should be added to Schedule A (mandatory EIA clearance) of the EIA Notification 2006. Projects between 1 MW and 10 MW IT load should fall under Schedule B (requiring EIA with possible exemptions for renewable-powered facilities). This two-tier structure mirrors the approach used for power plants under the existing Notification.

Large-scale data-centre projects (e.g., above a certain threshold of energy draw or floor space) should require prior Environmental Impact Assessment under the EPA[11]. The EIA should assess: projected electricity load and source (coal, renewables, hydro); water usage

[11] Environment (Protection) Act 1986 (India) s 3(1) read with s 3(2)(ii); Ministry of Environment, Forest and Climate Change, *Environmental Impact Assessment Notification 2006* (S.O. 1533(E)) Schedule. For doctrinal extension methodology, see *AP Pollution Control Board (II) v Prof MV Nayudu* (2001) 2 SCC 62, 78–80.

(with heightened scrutiny in water-stressed districts as identified by the Central Ground Water Authority); land-use and land-cover change; heat-island effects; waste disposal plans; and cumulative environmental impact where multiple data centres cluster in a region or industrial zone.

Institutional responsibility: The Expert Appraisal Committee (EAC) for industry under MoEFCC should be expanded or supplemented with a sub-committee on digital infrastructure, with members drawn from the Ministry of Electronics and Information Technology (MeitY), CPCB, and independent environmental engineers. State-level clearances under Schedule B should be processed by State-Level Expert Appraisal Committees (SEACs).

Implementation timeline: MoEFCC should publish an amendment to the EIA Notification within 12 months of policy adoption, with a 6-month transition period for pending projects. New projects above the threshold should require full EIA clearance before receiving construction permits from local bodies or special economic zone authorities.

Enforcement: Data centres constructed or expanded without requisite EIA clearance should be subject to closure orders under section 5 of the EPA. Penalties under the EPA and relevant state pollution control legislation should apply to non-compliant operators.

(c) Extended Producer Responsibility (EPR) for AI Hardware.

Threshold: EPR obligations should apply to manufacturers, importers, and bulk commercial users (including data-centre operators and cloud providers) of AI-class hardware, defined to include server-grade GPUs, AI accelerator chips, server racks, liquid-cooling modules, and industrial-grade storage arrays, where such hardware is procured in quantities above 50 units per year or at an aggregate value exceeding Rs. 50 lakhs per year.

Obligations should include: mandatory collection and take-back schemes for retired hardware; safe disposal and recycling obligations (especially for rare-earth components); design-for-sustainability standards (modular, recyclable, low-power); and annual reporting to CPCB on volumes collected, recycled, and disposed.

Institutional responsibility: MoEFCC should amend the E-Waste (Management) Rules 2016 to add a new Schedule specifically covering AI-class hardware, with separate collection and recycling targets. CPCB should register and audit EPR-obligated entities and maintain a public database of compliance.

Enforcement: Failure to meet EPR targets should attract financial penalties under the existing E-Waste Rules and EPA, calibrated per unit of unreturned hardware. Repeat non-compliance should be grounds for suspension of import licences under the Foreign Trade (Development and Regulation) Act.

(d) Carbon-Levy / Polluter-Pays Mechanism

Threshold: Entities whose annual Scope 1 and Scope 2 carbon emissions attributable to AI infrastructure operations exceed 10,000 tonnes of CO_2 equivalent should be liable to an "AI Environmental Compensation Levy."

The levy should be calculated on a per-tonne-of-CO_2-equivalent basis, with a base rate to be notified by MoEFCC in consultation with the Ministry of Finance and revised periodically. A tiered rate structure is recommended, with higher rates for entities sourcing more than 70% of electricity from fossil fuels, and reduced or zero rates for entities meeting the renewable-energy mandate described below. Funds collected should be directed to a dedicated "Green Digital Infrastructure Fund" administered by MoEFCC, with disbursements for environmental restoration in affected regions, subsidies for renewable-energy adoption by small data-centre operators, and community-relief programmes in districts hosting large data-centre clusters.[12]

Institutional responsibility: CPCB should administer levy assessment and collection, with audit powers over self-declared emissions data. Independent third-party verification should be mandated for entities with annual emissions exceeding 50,000 tonnes of CO_2 equivalent.

(e) Renewable-Energy Mandate / Sustainability Standard

Threshold and phase schedule: Data-centre operators and AI service providers above the disclosure threshold should be required to source a minimum percentage of their annual electricity consumption from renewable or low-carbon sources (solar, wind, certified hydropower, or approved carbon-neutral procurement). The mandate should be implemented in three phases: Phase 1 (Years 1-3): minimum 25% renewable sourcing; Phase 2 (Years 4-6): minimum 40% renewable sourcing; Phase 3 (Year 7 onwards): minimum 60% renewable sourcing.[13]

---

[12] Indian Council for Enviro-Legal Action v Union of India (1996) 3 SCC 212, 246 (polluter-pays principle applied to chemical factories). The proposed levy mechanism finds analogical support in the Environment Relief Fund under the Public Liability Insurance Act 1991 (India) s 7A.

[13] Ministry of New and Renewable Energy, *National Action Plan on Climate Change: National Solar Mission* (2010); Electricity Act 2003 (India) s 86(1)(e) (renewable purchase obligations). A similar mandate for data centres has been recommended in NITI Aayog, *India's Booming Data Centre Industry* (2023) 34.

These targets are calibrated against India's existing Renewable Purchase Obligation (RPO) framework under the Electricity Act 2003 and MNRE targets, and are intended to be higher than the general RPO to reflect the scale and growth trajectory of the AI-infrastructure sector. Operators sourcing 100% renewable energy should be exempt from the carbon levy under section (d) above.

Institutional responsibility: The Central Electricity Regulatory Commission (CERC) and State Electricity Regulatory Commissions (SERCs) should issue specific RPO orders for data-centre operators, distinct from the general industrial RPO. Compliance certificates should be submitted to CPCB annually alongside environmental disclosures.

(f) Institutional Oversight & Public Registry

The effective implementation of the above framework requires coordination across multiple existing authorities, each with distinct mandates. MoEFCC should serve as the primary regulatory authority for environmental disclosure, EIA, EPR, and levy obligations. MeitY should be co-responsible for designing the technical reporting standards and the public AI-Environment Registry, given its mandate over digital infrastructure. CPCB should be the operational enforcement arm, responsible for receiving disclosures, conducting audits, and levying penalties. CERC and SERCs should administer the renewable-energy mandate. The Competition Commission of India (CCI) should be consulted on any market-access implications of threshold-based obligations.

To manage these overlapping responsibilities, MoEFCC should establish a dedicated "AI and Digital Infrastructure Environment Division" with a mandate that includes monitoring disclosures and compliance; auditing energy and emissions data; coordinating EIA appraisals; enforcing EPR, levy, and renewable mandates; and publishing an annual "AI-Environment Report" summarising national data-centre energy use, emissions, water consumption, and hardware waste. The Division should operate under an inter-ministerial steering committee co-chaired by MoEFCC and MeitY, with a secretariat housed at CPCB.

To avoid regulatory duplication and jurisdictional friction, the inter-ministerial committee should maintain a single coordination register, enabling SERC, CERC, CCI, and state PCBs to access disclosure data filed under this framework. This structure acknowledges India's complex federal architecture and the likelihood that data-centre investments will span multiple states, creating cross-jurisdictional environmental impacts.

7. Normative Justification: Doctrinal & Human-Rights Grounds

The environmental regulation of generative-AI infrastructure in India is not merely a policy preference, but a normative imperative grounded in the country's constitutional philosophy, judicial environmental jurisprudence, and globally recognised human-rights principles. At its core, Indian constitutional law views environmental protection as inseparable from the fundamental right to life[14]. Since the late 1980s, the Supreme Court has interpreted Article 21 expansively, affirming that the right to life includes entitlement to a clean and pollution-free environment, ecological stability, and protection against environmental hazards that threaten public health and collective welfare. In decisions such as M.C. Mehta v Union of India and Subhash Kumar v State of Bihar, the Court held that environmental degradation undermines human dignity, quality of life, and social well-being, striking at the heart of Article 21[15]. These principles create a direct constitutional foundation for regulating emerging technologies whose environmental impacts, though less visible, may be equally systemic.

In addition, the constitutional duties embedded in Articles 48-A and 51A(g) establish that environmental stewardship is both a state obligation and a citizen responsibility[16]. Although these provisions are non-justiciable, the Supreme Court and High Courts routinely invoke them as interpretive guides when expanding the scope of environmental rights and state duties. The Madras High Court's decision in *A. Periyakaruppan v State of Tamil Nadu* and the National Green Tribunal's jurisprudence in cases involving industrial heat pollution have reinforced the view that Article 48-A read with Article 21 can justify preventive environmental obligations even where statutory language does not expressly contemplate the relevant activity. When applied to generative-AI infrastructure, these provisions support the argument that the State is constitutionally obligated to ensure that AI-related industrial activities do not compromise ecological stability, community health, or sustainability for future generations.

Indian environmental jurisprudence has also embraced several foundational doctrines that provide normative anchors for extending environmental-law principles to AI systems. The precautionary principle, adopted in cases involving industrial emissions and hazardous substances, holds that scientific uncertainty should not prevent regulatory intervention when

[14] Constitution of India 1950 art 21; Francis Coralie Mullin v Administrator, Union Territory of Delhi (1981) 1 SCC 608, 618 (right to life includes right to live with dignity); Subhash Kumar v State of Bihar (1991) 1 SCC 598, 606 (right to pollution-free environment is part of Art 21).
[15] MC Mehta v Union of India AIR 1987 SC 1086, 1093–1094; Subhash Kumar v State of Bihar (1991) 1 SCC 598, 606.
[16] Constitution of India 1950 arts 48-A and 51A(g). See *State of Himachal Pradesh v Ganesh Wood Products* (1995) 2 SCC 363, 390; *TN Godavarman Thirumulpad v Union of India* AIR 1997 SC 1228, 1234 (both Articles read as conferring enforceable obligations via Art 21 interpretation).

potential environmental harm exists[17]. Generative-AI infrastructures, whose energy loads, water requirements, heat discharge, and hardware waste are increasingly documented, clearly meet that threshold of environmental risk. The principle does not require proof of actual harm; it is satisfied by a reasonable scientific basis to believe harm may occur, a threshold that the empirical evidence surveyed in Section 2 of this paper comfortably meets. Similarly, the polluter-pays principle, long used to internalise the cost of industrial pollution, can be applied to entities that operate energy-intensive AI models, requiring them to bear the environmental cost of their emissions and resource consumption.

The doctrine of inter-generational equity further strengthens this normative basis. Recognised in Indian jurisprudence as part of sustainable-development obligations, this doctrine insists that present technological progress must not undermine ecological capacity or environmental health for future generations. This is especially relevant in the context of AI, since most environmental impacts, carbon emissions, climate stress, water depletion, and rare-earth extraction have long-term and cumulative consequences. If generative-AI growth accelerates without environmental safeguards, it risks embedding irreversible ecological burdens at the very onset of India's digital transition.

International human-rights instruments also support this approach. Documents such as the UN Human Rights Council's resolutions on climate change, SDG-linked environmental commitments, and UNESCO/UNEP's guidance on sustainable AI all frame environmental protection as essential to dignity, life, and global justice. Although soft law, these instruments articulate evolving global expectations: that technological expansion must be tempered with ecological responsibility.

Thus, applying environmental-law doctrines to generative-AI regulation is not doctrinal overreach; it is a logical extension of constitutional rights, obligations, and principles already deeply embedded in Indian law. Given the mounting evidence of AI-linked environmental externalities, regulatory inaction would conflict not only with statutory objectives but also with constitutional environmental guarantees and human-rights commitments.

8. Challenges, Critiques, and Counterarguments

[17] Vellore Citizens' Welfare Forum v Union of India (1996) 5 SCC 647, 658–659 (precautionary principle and sustainable development as part of Indian environmental law via Art 253 and the Stockholm Declaration 1972); AP Pollution Control Board v Prof MV Nayudu (1999) 2 SCC 718, 740–741.

Any proposal to regulate generative-AI infrastructure through environmental-law principles will inevitably confront conceptual, economic, and practical criticisms. These concerns must be addressed not only to strengthen the normative legitimacy of such regulation, but also to ensure that the resulting framework is balanced, feasible, and innovation-friendly.

1. **First**, the "innovation-stifling" critique argues that environmental compliance obligations, such as disclosure duties, carbon-reporting mandates, renewable-energy sourcing targets, or environmental-impact assessments, may deter investment, slow technological development, or push AI companies to relocate to jurisdictions with lighter regulatory burdens. India's emergent AI ecosystem, still gaining technological maturity, may fear losing global competitiveness.

   Response: This argument mirrors historical objections raised by manufacturing, mining, and heavy-industry sectors when environmental laws first evolved. Over time, the Indian judiciary held that environmental safeguards do not undermine development, but channel it towards sustainable outcomes. Phased implementation, reasonable energy-threshold triggers, tax incentives for green computing, and flexible compliance windows can maintain India's innovation appeal while avoiding regulatory impunity.

2. **Second**, concerns about measurement and standardisation arise from the difficulty of quantifying computational energy use, carbon emissions, water consumption, and lifecycle waste. AI models differ in size, architecture, training frequency, data-set consumption, hardware type, cooling systems, and deployment modalities, complicating standard measurements.

   Response: Emerging global methodologies, such as lifecycle-assessment frameworks, compute-energy coefficients, and carbon-equivalent benchmarking, now enable quantifiable environmental accounting for AI systems. The solution is not to avoid regulation, but to mandate disclosure on best-available metrics, refine methodologies over time, and empower regulatory bodies to adopt evolving standards as scientific certainty increases. Environmental law has long operated under uncertainty, guided by the precautionary principle rather than perfect information.
3. **Third,** the globalised structure of AI supply chains presents regulatory challenges. Semiconductor fabrication, GPU production, and rare-earth extraction often occur outside India, particularly in East Asia and North America. Critics argue that

regulating the environmental footprint of imported AI hardware may exceed India's jurisdictional limits.

Response: Extended Producer Responsibility (EPR), environmental-labelling requirements, import restrictions on high-carbon hardware, and carbon-footprint declarations at the point of entry can internalise upstream impacts. India already uses similar mechanisms for chemicals, plastics, and electronics. Moreover, India's market scale means that regulatory requirements for products sold into the Indian market can influence upstream manufacturers to improve their environmental performance, a "Brussels Effect" logic that is particularly potent given India's projected position as one of the world's largest AI consumer markets within this decade.

4. **Fourth,** compliance-burden arguments suggest that strict environmental obligations may disproportionately affect startups, research labs, and smaller AI entities lacking resources for auditing, reporting, or renewable-energy procurement.

   Response: Environmental policy can differentiate between actors. Threshold-based triggers, exemptions for low-compute activity, shared green-infrastructure facilities, and state-supported auditing platforms can protect smaller players. The regulatory focus should be on hyperscale data-centre clusters and industrial-grade AI training facilities, whose environmental footprint is undeniably substantial.

5. **Fifth,** critics point to limited state capacity for enforcement. Environmental monitoring in India already faces challenges in staffing, data accuracy, and compliance audits.

   Response: Digital-era regulation can leverage technological solutions: smart-meter electricity monitoring integrated with CPCB's digital compliance platform; API-based automated reporting by data-centre operators; satellite-based thermal imaging to detect heat-island effects; and mandatory third-party environmental audit agencies accredited by a national body. The proposed AI and Digital Infrastructure Environment Division at CPCB would require dedicated staffing, an administrative cost that can be partially offset through the levy revenue directed to the Green Digital Infrastructure Fund. Transparent public-disclosure portals and civil-society scrutiny, as demonstrated by the National Green Tribunal's citizen-complaint jurisdiction, can supplement formal state enforcement capacity.

A final institutional challenge concerns regulatory overlap. Data centres touch the mandates of MoEFCC, MeitY, the Ministry of Power, CERC, SERCs, and State PCBs. Without clear

jurisdictional allocation, the framework risks both under-enforcement (each body assuming another will act) and over-compliance burdens (entities facing duplicative requirements from multiple regulators). The inter-ministerial coordination structure proposed in Section 6(f) is designed to address this directly, through a single reporting portal, a shared data registry, and clear primary-regulator designations for each obligation type.

Conclusion

The analysis undertaken throughout this study establishes that generative AI is not an abstract, immaterial technology, but a profoundly resource-dependent infrastructure with measurable environmental consequences. Its rapid expansion in India coincides with growing energy demand, climate vulnerability, water scarcity, and mounting e-waste pressures. These realities make clear that the environmental costs of computational systems can no longer remain peripheral to legal discourse. Critically, this paper has shown that the environmental harms in question are not attributable to AI models as such, but to the data centres, cloud systems, and hardware supply chains through which those models operate, a distinction that both clarifies regulatory targets and strengthens the case for extending existing environmental-law instruments to cover AI infrastructure.

Current Indian environmental laws were not drafted with digital infrastructures in mind, and consequently fail to recognise data centres, training clusters, or AI-hardware supply chains as environmentally significant activities. Statutory silence, however, does not equate to constitutional permissibility. Article 21 jurisprudence, coupled with Articles 48-A and 51A(g), firmly anchors environmental protection within India's core constitutional identity. It follows that ecological harms arising from emerging technological systems fall squarely within the responsibility of the State to regulate.

Doctrines such as the precautionary principle, polluter-pays, sustainable development, and inter-generational equity provide a ready-made normative and interpretive framework to bring AI infrastructure under environmental oversight. Their historical application to industrial hazards, pollution patterns, and risk-laden economic activities demonstrates that Indian environmental law has always been capable of evolving alongside technological change. The only missing step is the willingness to conceptually identify AI-infrastructure as a legitimate target of environmental governance. Given the empirical evidence of energy intensity, carbon emissions, rare-earth extraction, water consumption, and hardware waste, generative AI clearly satisfies that threshold.

Comparative insights from the European Union, the United States, China, and multilateral bodies further confirm that environmental sustainability is emerging as a core priority in global AI governance. While the models remain fragmented and indirect, they highlight that regulation of digital infrastructures based on ecological criteria is both feasible and increasingly expected. India, armed with a robust environmental-rights jurisprudence, possesses an opportunity to lead rather than follow. Rather than waiting for global consensus, India can craft a forward-looking regulatory model that integrates environmental safeguards into AI development from its inception.

The proposals advanced in this paper, mandatory environmental disclosures, Environmental-Impact Assessments for large data centres, extended-producer responsibility for AI-hardware, renewable-energy mandates, and specialised regulatory divisions within MoEFCC and CPCB, are not prohibitive constraints. They are instruments of responsible technological governance designed to internalise environmental costs, prevent cumulative ecological harm, and encourage climate-aligned innovation. Phased timelines, threshold-based triggers, and transparency-driven compliance ensure that such regulation remains proportionate, commercially viable, and innovation-compatible.

Ultimately, environmental regulation of generative AI is not a barrier to technological growth, but an essential condition for its legitimacy in a climate-challenged world. To leave the environmental footprint of AI unregulated would contradict constitutional commitments, undermine India's climate goals, and risk imposing irreversible ecological burdens on future generations. The law must evolve as technology evolves. As India advances into an AI-driven era, its environmental-law principles must serve as both a compass and a safeguard, ensuring that digital progress is measured not only in computational power but in its respect for planetary boundaries and human rights.