IJCRM

International Journal of Contemporary Research In Multidisciplinary

Research Article

Artificial Intelligence and Green Technology Regulation: Bridging the Gap Between Innovation and Environmental Sustainability

Uttam Vir Singh

Assistant Professor, Saraswati Vidhya Mandir Law College, Shikarpur, Bulandshahr, Uttar Pradesh, India

Corresponding Author: * Uttam Vir Singh

DOI: https://doi.org/10.5281/zenodo.21671980

Abstract

The rapid proliferation of artificial intelligence (AI) technologies presents a fundamental regulatory paradox: while AI offers unprecedented opportunities for environmental monitoring, climate modelling, and sustainability optimisation, its own ecological footprint—spanning energy consumption, water usage, and electronic waste—threatens to undermine global climate goals. This paper examines the evolving regulatory landscape governing the intersection of AI and environmental sustainability, with particular focus on the European Union's AI Act as a paradigmatic case study. Through doctrinal analysis of the Act's provisions and critical engagement with environmental law principles, we identify a significant "instrumentation gap" between stated sustainability aspirations and operational regulatory mechanisms. The analysis reveals that current AI regulation adopts a predominantly anthropocentric framing of environmental harm, addressing ecological impacts only insofar as they pose risks to human interests, while neglecting ecocentric concerns regarding resource extraction, lifecycle impacts, and cumulative environmental burdens. We propose a Lifecycle Governance Model that integrates environmental impact assessment, sustainability-by-design principles, and binding reporting obligations across the AI value chain. Drawing on comparative analysis of complementary regulatory frameworks—including data centre energy efficiency directives and emerging international standards—we argue for a multi-level governance approach that aligns AI regulation with established environmental law principles. The paper concludes by outlining concrete policy pathways for integrating sustainability into digital regulation, emphasising the need for harmonised standards, cross-sectoral coordination, and inclusive governance mechanisms that account for the transboundary nature of AI's environmental impacts.

Manuscript Information

- **ISSN No:** 2583-7397
- **Received:** 20-06-2026
- **Accepted:** 27-07-2026
- **Published:** 29-07-2026
- **IJCRM:**5(4); 2026: 514-520

- **Plagiarism Checked:** Yes
- **Peer Review Process:** Yes

How to Cite this Article

Singh U V. Artificial Intelligence and Green Technology Regulation: Bridging the Gap Between Innovation and Environmental Sustainability. Int J Contemp Res Multidiscip. 2026;5(4):514-520.

Access this Article Online

www.multiarticlesjournal.com

KEYWORDS: Artificial Intelligence Regulation, Environmental Law, EU AI Act, Green Technology, Sustainability Governance, Lifecycle Assessment, Climate Policy, Digital Regulation.

1. INTRODUCTION

Artificial intelligence has emerged as one of the defining technologies of the twenty-first century, transforming industries, reshaping governance, and reimagining the boundaries of human-machine interaction. Concurrently, the world faces an accelerating climate crisis that demands urgent and transformative action across all sectors of society. The intersection of these two epochal developments—the AI revolution and the climate emergency—presents both profound opportunities and acute regulatory challenges that existing legal frameworks are ill-equipped to address.

AI systems are increasingly deployed for environmental purposes: predicting climate risks, monitoring biodiversity, optimizing energy grids, and enhancing regulatory compliance. The European Union has explicitly linked its digital and green transitions through the European Green Deal and the Circular Economy Action Plan, positioning AI as an enabler of sustainability objectives. Yet this narrative of technological salvation obscures a troubling reality: the AI lifecycle itself exacts a significant and growing environmental toll that current regulatory frameworks largely fail to address.

The environmental footprint of AI is multidimensional and escalating. Training large language models such as GPT-3 consumes approximately 1,287,000 kWh of electricity, generating over 500,000 tons of CO_2 emissions for pre-training alone, not including the ongoing emissions from inference phases. Water consumption is equally concerning: training GPT-3 in Microsoft's U.S. data centers consumed nearly 700,000 liters of fresh water, and projections suggest AI could be responsible for extracting 4.2–6.6 billion cubic meters of water annually by 2027—equivalent to half the United Kingdom's annual water consumption. Major technology companies are already experiencing the consequences: Google and Microsoft reported 48% and 29.1% increases respectively in their greenhouse gas emissions since 2020, driven primarily by AI infrastructure expansion.

The European Union's AI Act, adopted in 2024, represents the world's most comprehensive attempt at direct AI regulation. While the Act recognizes environmental protection as a core objective, its treatment of sustainability concerns reveals significant limitations. Environmental impacts are not classified as a distinct category of regulatory risk but are instead addressed indirectly through procedural mechanisms: transparency requirements, documentation obligations, and voluntary codes of conduct. This approach creates what scholars have termed an "instrumentation gap"—a disconnect between the Act's environmental aspirations and the operational tools available to implement them.

This paper addresses three interrelated questions: How does current AI regulation engage with environmental sustainability? What legal mechanisms can effectively incorporate environmental responsibility into AI governance? And what lessons can be drawn from established environmental law principles to inform AI regulation? In doing so, we make three contributions: theoretically, we apply regulatory instrumentation theory to analyze the gap between sustainability commitments and regulatory design; methodologically, we conduct a doctrinal analysis of environment-relevant provisions across the AI Act's articles and annexes; and substantively, we propose a Lifecycle Governance Model that operationalizes environmental integration without undermining the Act's risk-based architecture.

The paper proceeds as follows: Section 2 reviews the existing literature on AI regulation and environmental governance, identifying gaps and tensions. Section 3 presents our analytical framework, drawing on environmental law principles and regulatory theory. Section 4 examines the AI Act's environmental provisions in detail, identifying binding requirements, voluntary measures, and critical gaps. Section 5 proposes policy pathways for reform, including lifecycle assessment integration, sustainability impact assessments, and harmonized standards. Section 6 discusses the implications for international governance and developing economies. Section 7 concludes with recommendations for future research and policy development.

2. LITERATURE REVIEW

2.1 The Environmental Footprint of AI: An Emerging Research Agenda

Scholarly attention to AI's environmental impacts has grown rapidly, driven by mounting empirical evidence of resource consumption and emissions. Crawford and Joler's foundational work on the "anatomy of an AI system" revealed the material infrastructure underlying seemingly weightless digital technologies, tracing resource extraction, labor conditions, and environmental costs across the global supply chain. Subsequent research has quantified these impacts with increasing precision: Patterson et al. (2021) estimated the carbon footprint of training large language models, while Li et al. (2023) documented water consumption patterns in data centers.

This literature has evolved from simple documentation to more nuanced analysis of trade-offs and systemic effects. McDonald et al. (2022) advocated for "Green AI" approaches that prioritize computational efficiency and methodological innovation over brute-force scaling. Luccioni, Jernite, and Strubell (2024) extended carbon accounting to include inference-phase emissions, revealing that operational deployment often exceeds training emissions in aggregate. These studies collectively establish that AI's environmental footprint is not a marginal concern but a significant and growing contributor to global emissions and resource depletion.

2.2 The Regulatory Gap: From Problem Recognition to Policy Response

Despite growing awareness of AI's environmental impacts, regulatory responses remain fragmented and insufficient. Existing legal frameworks were not designed with AI's distinctive characteristics in mind: its rapid evolution, opaque supply chains, distributed infrastructure, and compounding lifecycle effects defy traditional regulatory categories.

The European Union has been the most active jurisdiction in developing AI regulation. The AI Act, adopted after extensive negotiation, establishes a risk-based framework that categorizes AI systems according to their potential for harm. However, environmental risks are not treated as a standalone category; instead, sustainability concerns are addressed through transparency provisions and voluntary measures. This approach has drawn criticism from scholars who argue that it marginalizes ecological considerations in favor of an anthropocentric focus on human rights and safety.

Hacker (2023, 2024) examined the AI Act's treatment of environmental concerns, noting that the Act's "human-centric" approach frames environmental harm primarily in terms of its impact on people, rather than recognizing the environment's independent value. Pagallo et al. (2022) similarly argued that the Act fails to incorporate ecocentric principles that would address issues like resource depletion and ecosystem degradation directly. Le Goff (2025) extended this critique, arguing that environmental law principles—precaution, public participation, accountability, and access to justice—could provide theoretical foundations for more robust AI environmental regulation.

2.3 Environmental Law Principles as Regulatory Blueprints

Environmental law offers a rich body of principles and instruments that could inform AI regulation. The precautionary principle, codified in international environmental law and the EU treaties, requires preventive action in the face of uncertain but potentially serious environmental harm. Applied to AI, this would suggest a more cautious approach to scaling systems with unknown long-term environmental consequences, and mandatory environmental impact assessments for AI products and services.

The principle of public participation, another cornerstone of environmental law, ensures that affected communities have a voice in decisions that impact their environment. For AI governance, this implies that communities affected by data center construction, resource extraction for hardware, and AI infrastructure siting should be consulted and their interests considered in regulatory decisions. UNESCO's Green AI Pathways framework emphasizes this participatory dimension, advocating for "co-designed, equitably implemented" AI environmental governance that respects Indigenous rights and local priorities.

Environmental accountability and access to justice principles require that those who cause environmental harm are held responsible, and that affected parties can seek redress. In the AI context, this could translate to mandatory environmental impact assessments, sustainability-by-design requirements, and liability regimes for environmental damage caused by AI systems or their infrastructure.

2.4 International and Multi-Level Governance Approaches

The transboundary nature of AI's environmental impacts demands governance approaches that transcend national jurisdictions. UNESCO's Ethical AI Framework identifies bioregional collaboration as essential for aligning AI governance with ecological realities that cross political borders. The organization recommends establishing AI and Environment Coordination Bodies that bring together representatives from digital innovation, environmental science, Indigenous communities, and finance ministries to break policy silos and ensure coherent governance.

The International Telecommunication Union's (ITU) governance reports highlight the importance of inclusive international cooperation in ensuring that no country or community is left behind in AI governance. Initiatives such as the Coalition for Sustainable AI, green data center standards, and energy reporting requirements represent steps toward aligning AI growth with environmental responsibility.

2.5 Gaps in the Literature

While emerging literature examines the AI Act's environmental elements, significant gaps remain. Few studies assess how stated sustainability objectives are operationalized through binding compliance mechanisms. The interaction between AI-specific regulation and broader environmental frameworks—such as energy efficiency directives, ecodesign requirements, and emissions trading systems—remains underexplored. Additionally, comparative analysis of regulatory approaches across jurisdictions is limited, and the implications for developing economies are often overlooked.

This paper addresses these gaps by providing a systematic analysis of the AI Act's environmental provisions, examining their intersection with complementary regulatory frameworks, and proposing governance models that integrate environmental principles into AI regulation.

3. Analytical Framework: Environmental Law Principles and Regulatory Instrumentation

3.1 Environmental Integration Principle and the Anthropocentric Challenge

Article 11 of the Treaty on the Functioning of the European Union (TFEU) establishes the principle of environmental integration, requiring that environmental protection requirements be integrated into the definition and implementation of Union policies and activities. Article 37 of the EU Charter of Fundamental Rights enshrines the right to a high level of environmental protection.

The AI Act explicitly references these commitments, acknowledging environmental protection as an objective in Recital 1 and Article 1. However, the Act's operational provisions reveal a significant tension: environmental harm is addressed primarily in anthropocentric terms—that is, as risks to human health, safety, or fundamental rights—rather than ecocentrically, recognizing the intrinsic value of environmental systems.

This framing has practical consequences. When environmental damage is considered only as it affects humans, regulatory attention focuses on immediate, localized harms rather than cumulative, systemic impacts. Resource extraction for hardware, water consumption in data centers, and electronic waste disposal may not register as regulatory concerns if they do not directly threaten human populations in the near term. Yet these impacts are precisely where AI's environmental footprint is most significant and where preventive regulation is most needed.

3.2 Regulatory Instrumentation Theory and the Instrumentation Gap

Regulatory instrumentation theory, as developed by Lascoumes and Le Galès (2007), examines how governance instruments shape policy outcomes by structuring relationships among actors, defining problems, and allocating responsibilities. Applying this framework to the AI Act reveals what we term an "instrumentation gap"—the discrepancy between sustainability commitments and the operational tools through which the Act allocates obligations.

The Act's environmental provisions are characterized by three features that collectively constitute this gap: first, sustainability commitments appear primarily in recitals and aspirational language, which lack direct legal force; second, environmental obligations are predominantly procedural—transparency requirements, documentation duties, and voluntary codes of conduct—rather than substantive performance standards; and third, many key environmental provisions are deferred to future standardization processes, creating regulatory uncertainty and delay.

This instrumentation gap is not accidental but reflects structural choices in regulatory design. The AI Act's risk-based framework classifies harms according to their severity and likelihood, but environmental risks are not considered a separate category of risk. Instead, they must be shoehorned into existing categories, often as ancillary concerns to the protection of health or fundamental rights. This framing makes it difficult to mandate environmental impact assessments, require binding sustainability targets, or hold AI providers accountable for lifecycle ecological impacts.

3.3 Lifecycle Governance as a Conceptual Model

Lifecycle thinking is central to environmental law and policy, reflecting recognition that environmental impacts occur at every stage of a product or system's existence: raw material extraction, manufacturing, distribution, use, and disposal. The EU's Ecodesign Directive, Circular Economy Action Plan, and extended producer responsibility regimes all embody lifecycle approaches to environmental governance.

Applying lifecycle thinking to AI reveals a distributed pattern of environmental impacts that current regulation fails to capture. Hardware production requires extraction of critical minerals, often in developing countries with weak environmental and labor protections; manufacturing involves energy-intensive processes and hazardous chemicals; data center operation consumes vast quantities of energy and water; and disposal creates electronic waste with toxic components.

A Lifecycle Governance Model would address impacts at each stage through appropriate regulatory instruments: sustainability-by-design requirements for hardware and software development; transparency and disclosure obligations for energy and water consumption; green procurement standards for public sector AI acquisition; and extended producer responsibility for electronic waste. Crucially, such a model would integrate environmental considerations into each stage of the AI lifecycle, rather than treating them as externalities to be addressed after the fact.

4. The EU AI Act and Its Green Blind Spots

4.1 Environment-Relevant Provisions: Coding and Analysis

Our analysis of the AI Act's environment-relevant provisions, based on doctrinal and operational coding across articles and annexes, reveals a pattern of proceduralization and voluntarism. Environment-related references are concentrated in four categories: recitals that articulate sustainability aspirations; transparency obligations that require documentation of energy consumption; provisions that encourage voluntary codes of conduct; and requirements that defer environmental standards to future standardization processes.

The Act requires providers of general-purpose AI models to document the known or estimated energy consumption of their models. This transparency obligation, while a positive step, is limited to training-phase energy use and does not extend to inference-phase consumption or embodied emissions in hardware. Moreover, the obligation is primarily informational rather than behavioral—it does not require providers to reduce energy consumption, only to report it.

Environmental sustainability provisions are also included in the recitals, which articulate the Act's objectives without creating binding obligations. Recital 1 explicitly references environmental protection as an objective, and Recital 8 links the Act to the Green Deal's sustainability goals. However, recitals are not directly enforceable and must be operationalized through binding articles and annexes, where environmental provisions are notably weaker.

4.2 Voluntary Measures and the Limitations of Soft Law

A significant portion of the Act's environmental engagement operates through voluntary codes of conduct, encouraged in Article 95 and related provisions. These codes may address energy-efficient programming, design techniques, and other sustainability measures, but their voluntary nature means that compliance is not guaranteed and enforcement is limited.

The reliance on voluntary codes reflects a regulatory choice to prioritize innovation and business flexibility over binding environmental requirements. However, this approach has significant limitations. Voluntary measures lack accountability mechanisms, face collective action problems (where individual actors have incentives to free-ride), and often result in weak standards that reflect the preferences of the least ambitious participants.

4.3 The Inference Gap and Reporting Obligations

One of the most significant regulatory gaps in the AI Act concerns inference-phase energy consumption. The Act's reporting obligations focus on training-phase energy use, but evidence suggests that inference—the operational deployment of AI systems—often accounts for the majority of energy consumption over a model's lifecycle. A single large language model used by millions of users may consume more energy through inference than through training within months of deployment.

Scholars have proposed interpreting the AI Act's reporting obligations to include inference energy consumption, arguing that the Act's language on "known or estimated energy consumption" can be construed to cover the entire lifecycle.

However, this interpretation remains contested, and without explicit clarification, providers may continue to report only training-phase consumption, creating an incomplete and potentially misleading picture of AI's environmental footprint.

4.4 Sustainability Impact Assessments: A Missed Opportunity

The AI Act's risk assessment framework includes requirements for evaluating risks to health, safety, and fundamental rights. However, it does not mandate Sustainability Impact Assessments (SIA) that would systematically evaluate environmental risks across the AI lifecycle.

This omission is significant given the Act's express commitment to environmental protection in Article 1 and the recitals. Mandatory SIA would provide a mechanism for integrating environmental considerations into the Act's risk framework, without fundamentally altering its structure. It would require providers to identify, assess, and mitigate environmental risks, consistent with the Act's general approach to risk governance.

4.5 Indirect Emissions and Value Chain Responsibility

The AI Act fails to address indirect greenhouse gas emissions from AI applications—the Scope 3 emissions that arise from the AI value chain, including hardware manufacturing, supply chain logistics, and upstream resource extraction. These emissions often exceed direct operational emissions but are not captured by reporting requirements or risk assessments.

Addressing Scope 3 emissions would require extending regulatory reach beyond direct AI providers to include hardware manufacturers, cloud service providers, and other value chain actors. This raises jurisdictional and enforcement challenges but is essential for a comprehensive approach to AI's environmental footprint.

5. Complementary Regulatory Frameworks: Data Centers and Beyond

5.1 Energy Efficiency Directive and Data Center Reporting

The recast Energy Efficiency Directive (EED) (EU/2023/1791) and the Delegated Regulation (EU/2024/1364) establish reporting requirements for data centers with power demand exceeding 500 kW. Operators must collect and report data on energy consumption, power utilization, temperature set points, water usage, and renewable energy use. The Commission aggregates this data to calculate sustainability indicators including Power Usage Effectiveness (PUE), Water Usage Effectiveness (WUE), Energy Reuse Factor (ERF), and Renewable Energy Factor (REF).

While these requirements represent progress, they have significant limitations. The reporting threshold of 500 kW excludes smaller data centers, which collectively account for substantial energy use. Reporting is primarily informational rather than performance-based; data centers are not required to meet specific efficiency or renewable energy targets. And enforcement mechanisms are weak, with limited consequences for non-compliance or substandard performance.

Some member states have implemented more ambitious requirements. Germany's Energy Efficiency Act expands the reporting obligation to data centers above 300 kW and sets binding targets for PUE and renewable energy use. These national variations highlight the potential for regulatory innovation at the member state level but also raise concerns about fragmentation and competitive disadvantage.

5.2 Ecodesign Requirements for Servers and Data Storage

The EU has established ecodesign requirements for servers and data storage products since 2019, which are currently under review. These requirements address energy efficiency in hardware, establishing standards that can constrain the environmental impact of AI infrastructure. However, ecodesign requirements apply at the product level and do not address systemic issues like software efficiency, model architecture choices, or the decision to deploy AI in specific use cases.

The European Commission has also commissioned studies to explore the current and expected environmental impact of AI and to develop a potential "Green AI" label. Such labeling schemes could empower consumers and procurers to make environmentally informed choices, creating market incentives for sustainable AI development.

5.3 The Need for Regulatory Coherence

The fragmented nature of AI environmental regulation—spanning the AI Act, EED, ecodesign requirements, and member state initiatives—creates legal uncertainty and regulatory loopholes. No single instrument addresses AI's environmental impacts comprehensively; each covers a portion of the lifecycle or value chain, and the interaction among instruments is often unclear.

This fragmentation is particularly problematic for cross-border value chains and transboundary environmental impacts. Hardware may be manufactured in one jurisdiction, data centers sited in another, and AI systems used globally. Environmental impacts are distributed across this value chain, but regulatory responsibilities are fragmented, creating opportunities for regulatory arbitrage and undermining accountability.

6. Policy Pathways: Integrating Sustainability into AI Regulation

6.1 A Lifecycle Governance Model for AI

Building on the analysis above, we propose a Lifecycle Governance Model for AI that integrates environmental sustainability across all stages of the AI lifecycle: hardware production, model development, training, deployment, and disposal. The model has six key elements:

Sustainability-by-Design: Mandatory requirements for energy and resource efficiency in AI systems, analogous to ecodesign requirements for other products. This would include standards for model architecture, programming practices, and infrastructure design that minimize environmental impact without compromising performance.

Lifecycle Assessment: Mandatory environmental lifecycle assessment for high-risk AI systems, covering energy consumption, water usage, greenhouse gas emissions, and resource depletion across the entire lifecycle. Assessment results would inform regulatory classification and risk management requirements.

Transparency and Disclosure: Binding reporting obligations covering all stages of the AI lifecycle, including training, inference, hardware manufacturing, and disposal. Reporting should be standardized to enable comparison across systems and over time.

Performance Standards: Graduated performance standards for energy efficiency, water usage, and emissions, with binding targets that become more ambitious over time. Standards should be technology-neutral and performance-based to encourage innovation.

Extended Producer Responsibility: Requirements for AI providers to manage the environmental impacts of their systems across the lifecycle, including end-of-life disposal and e-waste management. This would create accountability for the full environmental cost of AI deployment.

Post-Market Monitoring: Ongoing monitoring of AI systems' environmental performance after deployment, with requirements for corrective action when systems exceed environmental thresholds. This recognizes that performance may degrade over time and that real-world impacts may exceed pre-deployment estimates.

6.2 Integrating Environmental Law Principles into AI Governance

The Lifecycle Governance Model should be informed by environmental law principles that have proven effective in other contexts:

Precaution: When there is uncertainty about potential environmental harm from AI systems, regulatory action should be taken before harm occurs. This implies mandatory environmental impact assessment for new AI applications with significant potential environmental impacts, and a cautious approach to scaling systems whose long-term environmental consequences are unknown.

Prevention: Environmental harm should be prevented at source, rather than remediated after it occurs. For AI, this means promoting sustainability-by-design approaches and ensuring that environmental considerations are integrated into development processes from the outset.

Public Participation: Communities affected by AI infrastructure—including those near data centers, resource extraction sites, and disposal facilities—should have voice in decisions about AI deployment. This requires transparent consultation processes, access to information, and mechanisms for addressing community concerns.

Accountability and Access to Justice: Those who cause environmental harm through AI development or deployment should be held accountable, and affected parties should have access to effective remedies. This may require establishing liability regimes for environmental damage caused by AI systems or their infrastructure.

6.3 Harmonized Standards and International Cooperation

Given the global nature of AI development and deployment, harmonized international standards are essential for effective environmental governance. International standard-setting organizations, including the International Telecommunication Union (ITU), International Organization for Standardization (ISO), and International Electrotechnical Commission (IEC), are well-positioned to develop common metrics, methodologies, and performance standards.

ITU-T Study Group 5 has developed recommendations on environmental sustainability for digital technologies, including AI. These recommendations provide frameworks for measuring and managing environmental impacts across the AI lifecycle. However, standards alone are insufficient without enforceable regulatory mechanisms. International cooperation should extend beyond standard-setting to include mutual recognition of compliance assessments, information sharing on enforcement approaches, and coordination on addressing transboundary impacts.

6.4 Lessons for Developing Economies

The challenges of AI environmental governance are particularly acute in developing economies, which often serve as sites for resource extraction, hardware manufacturing, and electronic waste disposal. These communities bear disproportionate environmental burdens while receiving limited benefits from AI development.

Indonesia's consideration of an AI Umbrella Act based on the EU framework illustrates both the opportunities and risks of regulatory borrowing. Indonesia has environmental commitments and digital investment aspirations that could be aligned with an AI governance framework, provided it incorporates meaningful environmental safeguards and stakeholder participation.

Developing economies should consider their specific environmental contexts and vulnerabilities when developing AI regulation. This includes addressing resource extraction practices, managing electronic waste, and ensuring that AI governance contributes to sustainable development rather than perpetuating environmental injustice. UNESCO's emphasis on bioregional collaboration—aligning governance with ecological realities that transcend national borders—is particularly relevant for developing economies facing shared environmental challenges.

7. CONCLUSION

The intersection of artificial intelligence and environmental sustainability presents one of the most significant regulatory challenges of our era. AI offers unprecedented opportunities for environmental monitoring, climate mitigation, and sustainability optimization. Yet the technology's own environmental footprint—its energy consumption, water usage, and resource demands—threatens to undermine the very sustainability goals it promises to advance.

This paper has examined how AI regulation engages with environmental sustainability, with particular focus on the European Union's AI Act. Our analysis reveals an "instrumentation gap" between the Act's environmental aspirations and its operational provisions. Environmental sustainability is recognized as an objective but not implemented through binding requirements. Environmental impacts are addressed indirectly through transparency provisions and voluntary codes rather than substantive performance standards. The anthropocentric framing of environmental harm fails to capture ecocentric concerns about resource depletion, ecosystem degradation, and cumulative lifecycle impacts.

Based on this analysis, we have proposed a Lifecycle Governance Model that integrates environmental sustainability across the AI value chain. The model incorporates sustainability-by-design requirements, mandatory lifecycle assessment, binding transparency and disclosure obligations, graduated performance standards, and post-market monitoring mechanisms. It draws on established environmental law principles—precaution, prevention, public participation, and accountability—to ground AI governance in proven regulatory approaches.

The fragmentation of current regulatory frameworks across jurisdictions and instruments underscores the need for harmonized standards and international cooperation. As AI development accelerates and its environmental footprint grows, inaction is not an option. The policy pathways outlined in this paper provide a starting point for designing regulatory frameworks that align AI innovation with environmental sustainability.

Future research should examine specific sectors and applications where AI's environmental impacts are most pronounced, develop more sophisticated metrics and methodologies for measuring lifecycle impacts, and evaluate the effectiveness of regulatory interventions across jurisdictions. The urgency of the climate crisis and the rapid pace of AI development demand that regulatory responses evolve at the speed of the technology itself. The twin transitions—digital and green—must be governed together, not in isolation.

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About the Author

Uttam Vir Singh is an Assistant Professor at Saraswati Vidhya Mandir Law College, Shikarpur, Bulandshahr, Uttar Pradesh, India. He is engaged in teaching and research in the field of law, with interests in legal education, constitutional law, and contemporary socio-legal issues. He is committed to academic excellence and promoting quality legal education through research and professional development.