

TECHNOLOGY AND CLIMATE CHANGE LAW: REGULATING ARTIFICIAL INTELLIGENCE FOR SUSTAINABILITY

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Abstract *The intersection of technology and climate change law is rapidly redefining global environmental governance. Artificial intelligence (AI), data analytics, and digital innovation now play crucial roles in energy efficiency, climate modeling, and policy implementation. Yet, the integration of AI into climate governance also presents complex ethical, legal, and regulatory challenges. This article explores the evolving relationship between technology and climate change law, focusing on the role of AI in advancing sustainability. It examines international legal frameworks, national strategies, and emerging governance models aimed at ensuring that technological innovation contributes to climate goals rather than undermining them. Drawing lessons from U.S. and global experiences, the study argues that regulating AI for sustainability requires a balance between innovation, accountability, and environmental protection — an approach that can strengthen the rule of law in the age of digital climate governance.*

Keywords *Artificial Intelligence, Climate Change Law, Environmental Governance, Technology Regulation, Renewable Energy, Digital Sustainability, Climate Innovation, Global Governance, Data Ethics, Climate Policy*

Technological innovation has always shaped environmental policy, from early industrial regulation to modern renewable energy transitions. Today, artificial intelligence (AI) represents the next frontier in addressing global environmental challenges. AI's potential to optimize resource use, predict climate impacts, and monitor emissions positions it as an indispensable tool in advancing sustainability. However, its deployment raises critical legal and ethical questions — including

accountability, transparency, and environmental impacts from data-driven systems themselves.

As governments adopt AI tools to monitor deforestation, model greenhouse gas emissions, and manage renewable energy grids, law must evolve to ensure responsible innovation. Climate change law and technology regulation are converging into a new field of **digital environmental governance**, where traditional legal principles must adapt to the pace and complexity of technological change.

This article examines how international and domestic legal systems can regulate AI in ways that promote climate goals. It discusses the opportunities and risks associated with AI applications in climate action, explores current international frameworks, and identifies pathways for aligning AI regulation with sustainability objectives.

Artificial intelligence contributes to climate action in several ways — from improving data collection to enabling predictive modeling and supporting cleaner technologies. AI systems are used to track deforestation, optimize energy grids, and predict weather extremes with increasing precision.

For example, the **World Meteorological Organization (WMO)** and research institutions employ machine learning models to enhance climate prediction accuracy and disaster preparedness.¹

In the private sector, companies are using AI to improve energy efficiency and reduce emissions in supply chains. These developments illustrate how AI can accelerate progress toward the **United Nations Sustainable Development Goals (SDGs)** related to climate action, clean energy, and innovation.²

Yet, AI also has a carbon footprint. Large-scale data centers consume vast amounts of electricity, raising concerns about the environmental cost of digital

¹ World Meteorological Organization, *Artificial Intelligence in Climate Services Report* (2023), <https://public.wmo.int/en/resources>

² United Nations, *Sustainable Development Goals*, <https://sdgs.un.org/goals>

innovation. Effective governance is therefore essential to ensure that technology remains part of the solution rather than becoming a new source of emissions.

International environmental law is beginning to recognize the role of emerging technologies in achieving sustainability. The **Paris Agreement (2015)** encourages parties to promote technology development and transfer as key components of climate mitigation and adaptation.³

Similarly, the **UN Framework Convention on Climate Change (UNFCCC)** supports cooperation on data, innovation, and capacity-building through mechanisms such as the **Technology Mechanism** and the **Climate Technology Centre and Network (CTCN)**. These initiatives reflect a global consensus that digital innovation is central to fulfilling environmental obligations.

However, existing international law lacks a comprehensive framework for regulating AI in climate applications. Legal scholars argue that future agreements must address issues such as algorithmic transparency, intellectual property rights, and the environmental impacts of digital infrastructure.⁴

The challenge for international law is to ensure that technology governance aligns with the principles of equity, sustainability, and accountability that underpin global environmental law.

Different countries are experimenting with legal frameworks that integrate technology and climate governance. The European Union's **AI Act** sets out comprehensive rules for trustworthy AI, emphasizing risk assessment, transparency, and sustainability. The United States, while more fragmented, has adopted sector-specific approaches through the **National AI Initiative Act (2020)** and environmental legislation promoting data-driven innovation.

California, in particular, has emerged as a hub for sustainable technology policy. Through its **Clean Energy Programs** and **Cap-and-Trade System**, the state

³ UNFCCC, *The Paris Agreement*, <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

⁴ Safoev, S., *International Climate Change Law: Evolving Legal Frameworks and Future Directions*, *J. Multidisciplinary Bulletin*, 8(9), 25–29 (2025)

promotes AI-enabled solutions for monitoring emissions, managing renewable energy, and optimizing transportation systems.⁵

Legal innovation is crucial here — not only to regulate AI but also to ensure that environmental objectives remain central to technological progress. This interplay between regulation and innovation mirrors broader trends in global climate law, where policy experimentation drives global standards.⁶

While AI enhances efficiency and accuracy, it also introduces complex legal and ethical challenges. Algorithmic decision-making can reproduce social biases, exclude vulnerable populations, or prioritize economic efficiency over justice. Moreover, the environmental footprint of data-intensive technologies raises concerns about the sustainability of AI systems themselves.

The concept of “**digital environmental justice**” is emerging as a way to address these issues. It calls for inclusive governance of digital technologies, ensuring that benefits are equitably distributed and risks are mitigated. Transparency, explainability, and accountability must be built into AI systems used for environmental purposes.

Environmental law can guide this process by applying principles such as the **precautionary principle**, **polluter pays**, and **public participation** to digital governance. These principles ensure that technology serves sustainability rather than undermines it.⁷

AI plays a transformative role in the transition toward renewable energy. It optimizes grid stability, forecasts solar and wind generation, and reduces system losses. These capabilities make it a vital enabler of the clean energy shift.

The integration of AI into renewable energy systems demonstrates how technology law and climate law can reinforce each other. Legal frameworks must

⁵ California Air Resources Board (CARB), *Cap-and-Trade Program Overview*, <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program>

⁶ Safoev, S., *The Legal Dimensions of Renewable Energy Transition: Global Pathways and Challenges*, Shokh Library, 2025

⁷ OECD, *AI Principles for Responsible Innovation* (2019), <https://oecd.ai/en/ai-principles>

adapt to support innovation while ensuring data protection and environmental safeguards.⁸

Countries that successfully integrate technology and sustainability tend to adopt flexible, forward-looking regulations. This includes promoting open data sharing, funding research partnerships, and aligning digital policies with emission-reduction goals.

The global nature of AI development necessitates cooperation across borders. International law must facilitate the exchange of climate-related data and technology while protecting privacy, security, and sovereignty.

The **OECD**, **G7**, and **UNESCO** have initiated frameworks for ethical AI, emphasizing sustainability, inclusivity, and human rights. However, enforcement remains limited, and developing countries often lack the resources to implement such standards effectively.⁹

Promoting equitable access to AI technologies is therefore essential. Global environmental law should include obligations for technology transfer, capacity building, and open-access data to ensure that AI benefits all nations — not just the technologically advanced.

To achieve sustainability, climate change law must explicitly incorporate AI governance. Future treaties and national strategies should:

1. Establish **AI sustainability standards** for energy efficiency and emissions transparency.
2. Require **environmental impact assessments (EIAs)** for large-scale data centers and digital infrastructure.
3. Promote **ethical AI certifications** for climate applications.
4. Strengthen **international cooperation** on data governance and technology transfer.

⁸ Safoev, S., *Laws on Green Energy and Climate Change*, *Am. J. Educ. & Learning*, 2(5), 470–474 (2024)

⁹ UNESCO, *Recommendation on the Ethics of Artificial Intelligence* (2021), <https://unesdoc.unesco.org/>

Such measures align with the **Environmental Rule of Law**, which emphasizes accountability, access to information, and participatory decision-making.¹⁰

The integration of digital governance into climate law can create a more adaptive and transparent global legal system capable of addressing emerging technological risks.

The convergence of AI and climate governance offers valuable lessons for the evolution of global environmental law:

- **Interdisciplinary Regulation:** Law must bridge environmental protection, technology, and ethics.
- **Equity and Inclusion:** Digital tools must serve marginalized communities and developing countries.
- **Innovation Governance:** Flexibility and adaptive regulation enable sustainable progress.
- **Transparency and Data Justice:** Open and accountable AI systems are essential for legitimacy.

These lessons reflect a broader transformation in international law — from reactive policymaking to proactive governance that anticipates technological change.

Artificial intelligence holds immense promise for accelerating climate action, but its integration into global governance requires thoughtful regulation. The U.S., European Union, and international organizations are beginning to shape frameworks that balance innovation with accountability.

Global climate law must now embrace technology governance as a core component of sustainability. By embedding ethical, environmental, and social safeguards into AI development, the world can harness digital innovation to meet the goals of the Paris Agreement and the SDGs. The future of climate justice and environmental law

¹⁰ UNEP, *Environmental Rule of Law: First Global Report* (2019),
<https://www.unep.org/resources/report/environmental-rule-law-first-global-report>

depends not only on reducing emissions but also on ensuring that the technologies we create serve humanity and the planet alike.

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