

Artificial Intelligence and Sustainability: A Decolonial Comparative Law Perspective from Latin America

Ivon Dayann Gil Pedreros

Corporación Universitaria Asturias (Colombia),
ivon.gil@asturias.edu.co , dayann2119@hotmail.com

Pablo González Delgado

Universidad Nacional (Colombia),
pgonzalezd@unal.edu.co

Introduction

The rapid expansion of artificial intelligence (AI) in Latin America presents significant environmental challenges due to the considerable energy consumption and electronic waste generated by its use. From a decolonial perspective, this paper explores how constitutional advancements in Latin American countries such as Ecuador, Peru, and Colombia can provide an effective framework to regulate AI and mitigate its ecological impact. This analysis is complemented by a review of international initiatives, with the aim of proposing specific regulations that align with the realities of the Global South

International Context: Europe, the United States, and China

UNESCO has stated that AI has the potential to generate significant negative impacts on the environment. For this reason, Member States and companies should evaluate both the direct and indirect environmental impact, the carbon footprint, energy consumption, and the environmental toll of extracting the raw materials required for manufacturing these technologies. In its Recommendation on the Ethics of Artificial Intelligence, guidelines 17 and 18 establish that the development of AI systems must recognize, protect, and promote the well-being of the environment and ecosystems, as they are essential for human life and that of other living beings. Furthermore, all actors involved in AI must comply with existing environmental laws and reduce their ecological impact by promoting sustainable practices and avoiding the unsustainable exploitation of natural resources (UNESCO, 2023).

The above highlights the importance of incorporating environmental sustainability as a guiding principle at every stage in the development of artificial intelligence systems. It emphasizes that the environment and ecosystems are not only assets that deserve protection in their own right, but also constitute the indispensable foundation for human life and other species. Therefore, they are a necessary condition for benefiting from technological advances. Likewise, the document underscores the need for all actors involved in the AI value chain to comply with international and national regulations, including principles such as the precautionary principle, aimed at ecological protection and sustainable development. A clear call is made to reduce the carbon footprint of these technologies, prevent negative impacts such as climate change, and avoid the unsustainable exploitation of natural resources, aligning technological progress with global conservation objectives.

Similarly, the United Nations has pointed out that large-scale implementations of artificial intelligence, mainly operated in data centers managed by cloud service providers, generate significant environmental impacts. The manufacturing of the electronic equipment used—such as a computer weighing just 2 kg—can require up to 800 kg of raw materials, and the microchips used in AI contain rare earth elements whose extraction is often highly polluting, according to the Navigating New Horizons report. Additionally, these centers generate electrical and electronic waste that contains toxic

substances such as mercury and lead, which are hazardous to both human health and the environment (PNUMA, s.f.).

Additionally, water consumption by data centers is substantial, as it is used both during construction and later in their cooling systems, which are essential for keeping their electronic components operational. It is estimated that, on a global scale, infrastructure related to artificial intelligence could consume up to six times more water than the entire country of Denmark, a nation with a population of approximately six million. This represents a concerning challenge, especially considering that one-quarter of the world's population still lacks adequate access to safe drinking water and basic sanitation systems (PNUD, s.f.).

The operation of AI data centers requires high energy demand, mostly sourced from fossil fuels, which worsens climate change. A single ChatGPT query consumes ten times more electricity than a traditional Google search. The International Energy Agency (IEA) estimates that in Ireland, these centers could consume up to 35% of the country's total energy by 2026. This growth raises serious environmental concerns (PNUMA, s.f.).

As a result of the rapid development of AI, the number of data centers has increased substantially, rising from approximately 500,000 in 2012 to around 8 million today. Experts predict that technological demand on the planet's resources will continue to grow in the near future. (PNUD, s.f.).

Europe is leading significant efforts to regulate the environmental impact of emerging technologies such as artificial intelligence (AI). Recently, the European Parliament and the Council of the European Union enacted Regulation (EU) 2024/1689, which establishes a uniform legal framework for the development and use of AI systems within the EU (European Parliament and Council, 2024). This regulation states that AI systems should be developed and used in a sustainable and environmentally respectful manner, for the benefit of all human beings, while also being monitored and evaluated for their long-term effects on individuals, society, and democracy. The application of these principles should be reflected, whenever possible, in the design and use of AI models.

In this regard, to ensure that AI leads to positive outcomes, the following recommendations are made (European Parliament and Council of the European Union, 2024): i) Member States are encouraged to support AI projects with social and environmental benefits, prioritizing those that promote accessibility, reduce inequalities, and meet environmental goals, through public and EU funding; ii) Projects should be developed through effective collaboration among AI experts and specialists in equality, accessibility, consumer rights, environmental protection, digital rights, and academia; and iii) The environmental impact of AI must be assessed and reduced by applying techniques that ensure energy efficiency in its design, training, and deployment.

Likewise, the EU has implemented policies aimed at transitioning toward a green economy, including legislative measures for reducing carbon emissions and implementing carbon pricing. These policies seek to accelerate the development of the digital single market and empower citizens and consumers, with the transformative goal of achieving Europe's "Digital Decade" (Banco de España, 2024). For example, Spain, as a member state of the EU, has implemented the National Program for Green Algorithms, which aims to promote the sustainable use of high-capacity computing resources and artificial intelligence. This program aligns with the EU's objectives of fostering environmentally sustainable and resource-efficient AI. (Ministerio de Asuntos Económicos y Transformación Digital, 2022).

In the United States, although technology regulation has traditionally not focused on the specific environmental impact of AI, recent initiatives have begun to recognize its importance. At the federal level, the *Declaración de Derechos sobre IA* issued in 2022 by the Biden administration (2021–2025) indirectly mentions the need to consider environmental impact in the development of emerging technologies (The White House, 2022).

Federal states such as California have moved more clearly in this direction. The law *Privacidad del Consumidor de California* (CCPA), although primarily aimed at protecting personal data, indirectly encourages more environmentally responsible practices by limiting large-scale data storage and processing—activities that are highly energy-consuming (State of California Department of Justice, 2018). U.S. case law, such as *Carpenter v. United States* (2018), has increased awareness of technological surveillance, though it still does not explicitly address the direct environmental impacts of AI.

Subsequently, in 2024, the Artificial Intelligence Environmental Impacts Act de 2024 was enacted with the aim of evaluating, mitigating, and disclosing the environmental effects stemming from the use and development of AI technologies in the United States. This legislation states that the Environmental Protection Agency (EPA) must conduct a comprehensive study, in collaboration with other federal agencies, to assess energy consumption, water usage, pollution, and electronic waste associated with the lifecycle of AI models and systems. This study must be presented four years after the enactment of the law by the National Institute of Standards and Technology (NIST), the EPA, and the Department of Energy.

This regulation is important because it acknowledges that the intensive use of AI is driving a rapid increase in energy consumption and the use of natural resources. It also recognizes both the environmental benefits of AI (such as energy optimization or climate monitoring) and its risks (such as increased electronic waste and carbon footprint), and it is considered essential to promote the responsible development of AI with a focus on sustainability and environmental justice (U.S. Congress, 2024).

Finally, in China, the environmental impact of AI is strategically addressed within the country's national technology development framework. The 2017 National Artificial Intelligence Strategy explicitly considers sustainability as one of its essential pillars, promoting technologies that are resource-efficient and low in emissions (State Council of China, 2017); it establishes that “the development of Artificial Intelligence technologies shall be promoted by ensuring notable energy efficiency and encouraging the manufacturing of devices and equipment with greater environmental awareness” (BCN, 2017).

Recent laws, such as the Data Security Law (DSL) and the Personal Information Protection Law (PIPL), although primarily focused on security and state control, also exert an indirect influence by strictly regulating digital infrastructure, thereby contributing to the optimization of technological resources and the reduction of the environmental impact of large data centers (National People's Congress, 2021).

Decolonial Law – A Perspective from South America

The methodology of comparative law has reinforced a hierarchical view among legal systems, classifying some as “mother legal systems” and others as “children,” the latter considered mere reproductions lacking their own innovation (Zweigert & Kötz, 1996). This classification has favored a Eurocentric perspective that legitimizes only the legal systems of former colonizing countries (with the exception of the U.S.). In response, critical and decolonial schools of thought have challenged this hierarchy from postcolonial perspectives, influenced by authors such as Edward Said, Homi Bhabha, Gayatri Spivak, Roger Merino, and Daniel Bonilla (Bhabha, 1994, 2006; Morris & Spivak, 2010; Said, 2019; Bonilla Maldonado, 2022).

From this critical perspective, decolonial comparative law seeks to dismantle colonial vestiges and propose methodologies that avoid forms of unequal legal integration (Tapia, 2016). Through constitutional studies from the Global South, a methodology applicable to private law is proposed, based on Latin American approaches focused on environmental justice. This vision is reflected in the new constitutionalism of Ecuador, Peru, and Colombia—countries that have strengthened the protection of nature and community rights.

Before addressing these developments, it is important to highlight the limited regulatory treatment of the environmental impact of artificial intelligence (AI) in Latin America. A recent effort is the Declaración de Montevideo sobre Inteligencia Artificial y su Impacto en América Latina (Fundación Sadosky, 2023), which emphasizes that AI should be designed to do no harm and to minimize its environmental footprint. In Chile, the Política Nacional de Inteligencia Artificial establishes objectives such as using AI to address climate change (Ministerio de Ciencia, Tecnología, Conocimiento e Innovación, 2021). It has been warned that the energy consumption of AI systems could account for up to 50% of global electricity usage by 2030 (National Institute for Research in Digital Science and Technology, 2020).

In Colombia, AI is used to optimize natural gas transportation, reducing the carbon footprint (Agencia de Noticias UNAL, 2023). In Peru, both the private and public sectors apply AI in services, logistics, facial recognition, and energy management (Secretaría de Gobierno y Transformación Digital, s.f.). In Ecuador, AI is applied in logistics, agriculture, and citizen services, guided by the Agenda de Transformación Digital 2022-2025 (Ministerio de Telecomunicaciones y Sociedad de la Información, 2022).

The low level of environmental regulation of AI stands in contrast to the significant progress in environmental law in the region. Ecuador was a pioneer by enshrining the rights of nature in its 2008 Constitution (Asamblea Nacional Constituyente, 2008), supported by decisions such as ruling 218-15-SEP-CC and the Río Vilcabamba case (Corte Constitucional del Ecuador, 2015; Gudynas, 2011). Peru has protected Indigenous rights through the Ley de Consulta Previa (Ley N.º 29785) and rulings such as STC Exp. N.º 00022-2009-PI/TC (Congreso de la República del Perú, 2011; Tribunal Constitucional del Perú, 2009). Colombia has judicially recognized the rights of nature: the Atrato River was declared a subject of rights in ruling T-622 of 2016, and the Amazon was protected in STC4360-2018 (Corte Constitucional de Colombia, 2016; Corte Suprema de Justicia de Colombia, 2018).

In summary, Ecuador, Peru, and Colombia have made significant progress in building robust environmental legal frameworks, with constitutional and judicial recognitions that promote sustainability and could serve as a foundation for the future environmental regulation of AI.

Sustainable Artificial Intelligence (AI): A Proposal from the Global South

Artificial intelligence (AI), more than a technological abstraction, is a deeply material phenomenon—based on natural resources, energy, human labor, and physical infrastructure (Crawford, 2022). This perspective reveals that AI systems are not neutral but respond to dominant interests due to the high levels of capital investment they require. This reality poses two fundamental challenges for Latin America: on one hand, the lack of domestic investment perpetuates dependency relationships with countries of the Global North; on the other, weak regulation makes the Latin American region an attractive, though vulnerable, location for establishing infrastructures that threaten environmental resources.

In this context, Latin America has become a preferred destination for installing data centers, drawn by low energy costs and lax environmental regulations (PUCP, s.f.). According to the International Energy Agency, a single ChatGPT query may consume up to ten times more energy than a conventional search, raising serious environmental concerns. In response to this reality, the region urgently needs a robust regulatory framework to limit the ecological impacts of these technologies.

Environmental regulation of AI must be built upon the normative advances of Latin American environmental constitutionalism, especially in Ecuador, Peru, and Colombia—countries that have made important strides in recognizing the rights of nature and of communities. In Ecuador, the 2008 Constitution recognizes nature as a subject of rights, establishing that any activity, including technological ones, must respect, restore, and maintain ecological balance (Asamblea Nacional

Constituyente, 2008). The ruling on the Vilcabamba River reaffirms this vision by protecting an ecosystem from the impact of infrastructure development (Gudynas, 2011).

Peru, in turn, contributes with the *Ley de Consulta Previa* (Law No. 29785), which protects the rights of Indigenous communities against interventions that could affect them (Congreso de la República del Perú, 2011). This law could be adapted to require mandatory consultation with communities before developing AI systems with significant environmental impact. The jurisprudence of the Peruvian Constitutional Court also reinforces this approach by recognizing the right to a healthy environment as a fundamental right (Tribunal Constitucional del Perú, 2009).

Colombia has been a pioneer in the legal protection of ecosystems. The Constitutional Court, in ruling T-622 of 2016, recognized the Atrato River as a subject of rights, and in 2018 the Supreme Court extended this protection to the Amazon (Corte Constitucional de Colombia, 2016; Corte Suprema de Justicia de Colombia, 2018). These decisions inspire the possibility of granting special status to ecosystems threatened by technological developments, requiring their promoters to undertake clear conservation obligations.

In addition, Chile's experience with its *Política Nacional de Inteligencia Artificial* offers valuable lessons. Objective 2.7 of this policy promotes the use of AI to address climate change through systems that are responsible and energy-efficient (Ministerio de Ciencia, Tecnología, Conocimiento e Innovación, 2021). In this vein, the regional regulatory framework could include legal and economic incentives to promote green technologies and impose penalties on developments that fail to meet minimum sustainability standards.

To ensure the effectiveness of the proposed framework, it is suggested to establish a regional observatory specialized in AI and the environment. This institution could continuously monitor technological advances, assess impacts, provide technical recommendations, and facilitate knowledge exchange among countries in the region.

The *Declaración de Montevideo sobre IA e Impacto en América Latina* also provides key principles, such as the need to design systems from the outset to minimize harm (Fundación Sadosky, 2023). This premise supports the inclusion of precautionary principles in national legislation, prohibiting the implementation of technologies without prior assessment ensuring their environmental sustainability.

It is also relevant to adopt transparency and accountability mechanisms inspired by regulatory frameworks such as Regulation (EU) 2024/1689. This regulation requires developers to produce detailed reports on energy consumption, management of technological waste, and use of water resources—guidelines that could be applied to AI projects in Latin America when promoted by multinational companies.

In conclusion, environmental regulation of artificial intelligence in Latin America must be based on three fundamental pillars. First, the recognition of the intrinsic value of nature and its rights, already enshrined constitutionally and judicially in countries such as Ecuador, Peru, and Colombia. Second, the guarantee of community participation through prior consultation mechanisms, adapted to address the environmental impacts of AI. And third, the implementation of strict technical standards for the evaluation, monitoring, and mitigation of ecological damage, including tools such as impact assessments, periodic reports, and proportional sanctions.

This comprehensive approach would allow Latin America to position itself as a global leader in the ethical and ecological regulation of emerging technologies, demonstrating that technological development can—and must—be compatible with environmental sustainability and social justice.

Conclusions

The implementation of a regulatory framework for artificial intelligence based on the principles of Latin American environmental constitutionalism would not only effectively address ecological challenges but

also strengthen the region's technological sovereignty in relation to the countries of the Global North. It is crucial that such a regulatory framework incorporate inclusive and participatory mechanisms involving local and Indigenous communities, ensuring the respect of their rights and promoting sustainable practices from a holistic perspective. It is important to note that, although this was a more descriptive proposal, it opens the door for a deeper study on the development of AI and its environmental impact—one that reflects the realities experienced in Latin America and may contribute meaningfully to regulation on this issue.

Finally, considering international experience, Latin America has the opportunity to position itself as a global leader in the ethical and sustainable development of AI. To achieve this, the implementation of transparent and rigorous policies is required—ones that continuously assess the environmental impact of these technologies. The creation of specific incentives and the establishment of a specialized regional observatory could ensure technological development that aligns with the values of sustainability and respect for nature, moving toward a more just and equitable future for the region.

References

- Agencia de Noticias UNAL. (2023). *Inteligencia artificial para reducir la huella de carbono en energía de gas en Colombia*. Universidad Nacional de Colombia. <https://lc.cx/SdKddc>
- Asamblea Nacional Constituyente. (2008). *Constitución de la República del Ecuador*.
- Banco de España. (2024). *La estrategia de la UE para la transición verde y digital: características y efectos macroeconómicos*. <https://lc.cx/6ux8Mj>
- Bhabha, H. K. (2006). *The location of culture* (Edición digital). Routledge.
- Bonilla Maldonado, D. (2022). El giro hacia el Sur en el derecho constitucional comparado: Ensayo sobre el libro *Comparative Constitutional Law and the Global South*. *Revista de Derecho*, (57), 186–211. Barranquilla.
- Congreso de la República del Perú. (2011). *Ley de Consulta Previa*, Ley N.º 29785.
- Corte Constitucional de Colombia. (2016). *Sentencia T-622 de 2016*.
- Corte Constitucional del Ecuador. (2015). *Sentencia No. 218-15-SEP-CC*.
- Crawford, K. (2022). *Atlas de inteligencia artificial: Poder, política y costes planetarios*. Fondo de Cultura Económica.
- Forbes Ecuador. (2024, diciembre 15). Ecuador y la IA: ¿Cómo nos posicionamos frente a la transformación digital? *Forbes Ecuador*. <https://n9.cl/lmwwl>
- Fundación Sadosky. (2023). *Declaración de Montevideo sobre Inteligencia Artificial y su impacto en América Latina*. Recuperado el 24 de marzo de 2025. <https://fundacionsadosky.org.ar/declaracion-de-montevideo-fun>
- Gudynas, E. (2011). *Derechos de la naturaleza: Ética biocéntrica y políticas ambientales*. Ediciones Abya-Yala.
- Ministerio de Asuntos Económicos y Transformación Digital. (2022). *Programa Nacional de Algoritmos Verdes*. <https://n9.cl/sqtb2x>
- Ministerio de Ciencia, Tecnología, Conocimiento e Innovación. (2021). *Decreto 20: Aprueba la Política Nacional de Inteligencia Artificial*. Biblioteca del Congreso Nacional de Chile. <https://n9.cl/jijqr>
- Ministerio de Telecomunicaciones y Sociedad de la Información. (2022). *Agenda de Transformación Digital del Ecuador 2022-2025*. Ministerio de Telecomunicaciones y Sociedad de la Información. Quito, Ecuador.

- Ministerio del Ambiente, Agua y Transición Ecológica. (2022). *Factores de emisión de CO₂ en el Sistema Nacional Interconectado del Ecuador (SNI)*. Ecuador Carbono Cero. <https://n9.cl/kt9jty>
- Morris, R. C., & Spivak, G. C. (Eds.). (2010). *Can the subaltern speak? Reflections on the history of an idea*. Columbia University Press. <http://swb.eblib.com/patron/FullRecord.aspx?p=895096>
- Parlamento Europeo y Consejo de la Unión Europea. (2024). *Reglamento (UE) 2024/1689 del Parlamento Europeo y del Consejo, por el que se establecen normas armonizadas en materia de inteligencia artificial*. *Diario Oficial de la Unión Europea*, 1–144. www.boe.es/doue/2024/1689/L00001-00144.pdf