Modern education and development
ISSN: 3060-4567

POLICY AND JUSTICE DIMENSIONS OF ARTIFICIAL INTELLIGENCE WATER CONSUMPTION: TRANSPARENCY, REGULATION, AND ENVIRONMENTAL EQUITY

Shaxobova Shaxzoda Avazovna
Teacher at Department of International Investments and Management, The University of World Economy and Diplomacy, Tashkent, Uzbekistan
s.shaxobova@uwed.uz
Aziza Asrarova
First-year student of international relations The University of World Economy and Diplomacy Tashkent, Uzbekistan,
aziza.asrarova@gmail.com

ABSTRACT*: The rapid expansion of artificial intelligence (AI) has resulted in significant but mostly unnoticed costs to the environment. In this paper, the policy and justice aspects of the water footprint of AI are analyzed. Corporate disclosures of Google, Microsoft and Amazon show major differences in transparency: Google discloses information on the facility level, Microsoft withholds location-specific breakdowns, and Amazon presents only efficiency measures, which obscures the total footprint, estimated as exceeding global bottled water consumption. An overview of regulatory initiatives such as the U.S. Artificial Intelligence Environmental Impacts Act of 2024, the EU AI Act, and proposed Planning and Infrastructure Act amendments in the UK reveals a fragmented and underdeveloped policy landscape. The recent U.S. Supreme Court case Loper Bright Enterprises v. Raimondo complicates the authority of federal agencies, meaning Congress will need more specific legislation. This paper argues that mandatory disclosure, standardized reporting distinguishing Scope-1 and Scope-2 consumption, and binding water*

efficiency targets are necessary to ensure accountability and prevent disproportionate burdens on vulnerable communities.

Keywords: *Artificial Intelligence; Water Footprint; Environmental Justice; Corporate Transparency; AI Regulation; Loper Bright Decision; EU AI Act; Scope-1 Water Usage; Scope-2 Water Usage*

1. INTRODUCTION

The artificial intelligence revolution carries a significant environmental footprint in the computational infrastructure incon which it relies. The data centers where AI models are trained and executed require vast amounts of energy and, critically, water for cooling as AI models become more complex (Li et al., 2023; Mytton, 2021). AI technologies offer new tools that help with personalized learning, automated testing, and interactive communication, which contribute to improving students' academic performance and writing skills (Usmanova, 2025). Although the technical analyses have already measured the increasing water consumption associated with AI, less attention has been directed to the policy mechanisms required to ensure accountability and the justice implications associated with the allocation of these costs (Garcia, 2025). Large technological corporations with thousands of data centers around the world release environmental reports of different degrees of detail. The transparency of the corporations that operate most of the cloud infrastructure presents a spectrum ranging from partial disclosure to significant opacity. Such corporate opacity has a direct effect on communities. Data centers are frequently located in regions that are already stressed by water, which makes the requirements of digital infrastructure conflict with the water demands of inhabitants and farmers in the United States and Europe (Responsible AI Foundation, 2025). Neglecting to report fundamental operational information prevents communities from evaluating potential impacts, limits policymakers' ability to establish evidence-based rules, and provides little useful information to investors and the public. This study addresses three questions: What is the current level of corporate transparency regarding AI water consumption? How does the environmental justice of AI data

center siting work? What governance structures are possible to provide accountability and fair share of environmental consequences?

2. METHODS

The qualitative policy analysis approach is used in this study. Corporate sustainability reports were used as primary data (Google, 2021-2025; Microsoft, 2021-2025; Amazon, 2021-2025). The analysis is based on the framework presented by Li et al. (2023), where the Scope-1 water consumption (direct onsite consumption) is associated with cooling, and Scope-2 water consumption refers to water used in offsite electricity generation (offsite electricity generation). Research on regulatory documents has been conducted on major jurisdictions: the proposed U.S. Artificial Intelligence Environmental Impacts Act of 2024, the EU AI Act (Regulation (EU) 2024/1689), the recast Energy Efficiency Directive (EED) and suggested changes to the UK Planning and Infrastructure act 2025. Legal commentary on the case of Loper Bright Enterprises v. the U.S. Supreme Court. Raimondo (2024). The information in the case studies of Goodyear and Chandler, Arizona, and Coweta County, Georgia, was obtained from the municipal records and the investigative journalism. Differences in U.S., EU and UK governance approaches were analyzed within a framework of comparison.

3. RESULTS

3.1 Corporate Transparency: A System of Varying Opacity

Corporate sustainability reporting analysis proves that there is a serious lack of transparency. The most transparent company is Google, which reports the amount of total water used (about 24 31 million m 3 per year) and provides some facility-level details. Nonetheless, researchers comment on its reported numbers, which tend to omit Scope-2 water use that is related to electricity production (Li et al., 2023). Microsoft discloses aggregate consumption (around 7.8 million m 3 / year) but does not break them down by facility due to competitive concerns (which critics contend makes it impossible to assess local effects) (Garcia, 2025). Amazon is the least transparent, releasing only Water Usage Effectiveness (WUE) rates but no total consumption and facility data, therefore, it is not possible to make a comprehensive

Company	Annual Electricity Consumption	Annual Water Consumption	Scope-1/Scope-2 Distinction	Transparency Assessment
Google	~25-30 TWh	~24-31 million m^3	Scope-1 only; Scope-2 excluded	Highest (facility data for some sites)
Microsoft	~23-30 TWh	~7.8 million m^3	Scope-1 only	Partial (no facility-level breakdowns)
Meta	~15 TWh	~3 million m^3	Unclear	Limited
Apple	~3.5 TWh	~6.1 million m^3	Scope-1 only	High (corporate, but less AI-focused)
Nvidia	~0.6 TWh	~134,000 m^3	Unclear	Limited

evaluation of its high footprint. These disclosures were provided in a Hugging Face analysis, which indicated how unsatisfactory the existing practices were (IEEE/OECD, 2025). Table 1 synthesizes data from industry reports to illustrate the scale of consumption and transparency variations.

Table 1. Environmental Footprint of Major AI Companies (Annual Data)

Source: Compiled from IMD analysis (2025) and corporate sustainability reports (2021–2025).

Recent research found that in 2025 the estimated global water footprint of AI could reach 767 billion liters, compared to the estimated annual bottled water usage in the world, but stated that this was even harder to calculate than the carbon footprint because of corporate secrecy (de Vries-Gao, 2025).

3.2 Environmental Justice: The Local Burden of a Global Industry

Regulatory patterns of environmental injustice can be identified by mapping the water footprint of AI.

Arizona, USA: Goodyear vs Chandler is an example of the way that resources in the community determine the result. Goodyear, a less wealthy community, gave a green light to a Microsoft data center during a historic drought, relying on the already strained water resources at the time when local citizens are subjected to water conservation effort. Chandler, a richer neighbor, leveraged its political and economic power to implement ordinances that limited the new data centers by concluding that cost of resources exceeded economic gain (Garcia, 2025).

Georgia, USA: A planned data center project (Project Sail) with yearly outlays of 17 billion was an area of intense local anger in Coweta County. The area inhabitants rallied to save the rural nature of the land and environmental concerns were raised. At the same time, in the neighboring Newton County, there are some Meta data center-related reports on the increase of water prices, broken wells, and estimated water shortages, which reflect tangible local expenses that are rare to notice (Responsible AI Foundation, 2025).

Europe: The trend is going global. In the Netherlands and Ireland, new data centers have been moratoriumed because of public outcry. On the other hand, in southern Europe where there is a drought, the governments are actively seeking data center investment, which concerns that water stressed areas are being targeted with new infrastructure because the climates are favourable to the performance of servers, in practice offloading environmental burdens to less politically powerful regions (Jegham et al., 2025).

3.3 Regulatory Landscape: A Fragmented and Nascent Response

United States: The federal intervention is still provisional. The Artificial Intelligence Environmental Impacts Act of 2024 is a framework of voluntary reporting, which, through its implementation, would introduce an initial measure of transparency that is not disruptive of the critical role of control, according to critics (Garcia, 2025). The new Supreme Court case Loper Bright Enterprises v. Raimondo brings about a lot of complexity. The decision will deprive federal agencies of

deference in the interpretation of vague statutes by repealing the Chevron doctrine that had reigned since the 1980s. Congress now has to legislate to the degree of exceptional specificity and delegate authority and give useful regulatory direction to issue binding regulations. The situation is not the same at the state level where bills requiring water reporting were introduced in many states in 2025, although the vast majority of them failed. The state of Minnesota and Kansas alone had implemented legislation whereby data center tax incentives were tied to water conservation.

European Union: EU is the best developed jurisdiction. The AI Act mandates the general-purpose AI model providers to record energy usage. More importantly, the repackaged Energy Efficiency Directive (EED), obliges all data centers with power consumption exceeding 500 kW to publicly disclose energy and water performance in a database opened up at the Union (European Parliament, 2024). This is a compulsory disclosure model that requires the distinction between Scope-1 and Scope-2 consumption which offers a strong template to other countries.

United Kingdom: Another innovative model is proposed in the amendment of 185P to the Planning and Infrastructure Act of 2025. This would involve the government releasing a National AI Water Efficiency Strategy and statutory planning consideration in the use of water, so that developers would consider the impact on local water resources (UK Parliament, 2025).

4. DISCUSSION

The evidence reveals a significant challenge. Corporate reporting is fragmented and often opaque, concealing a large and growing environmental burden on the environment. The amount of water used in AI, which is comparable to the size of the bottled water sector, shows how big the problem is estimated to be (de Vries-Gao, 2025). More importantly, due to the lack of standardized Scope-2 reporting, even reported values, in all probability, underestimate real consumption by a factor of three to four (Li et al., 2023).

This burden is not distributed equally. The process of developing data centers tends to exacerbate existing environmental inequities as seen in both Arizona and Georgia case studies, where the less-resource-rich community has realized that

water-intensive develops on them. This is a global phenomenon, and the pushback in Europe- moratoriums in the Netherlands; concerns in southern Europe prove this point.

The existing regulatory action is divided and unable to match. The American strategy which is crippled by the Loper Bright case and its dependence on voluntary actions is just not working. By comparison, the EU-compulsory reporting of the EED provides a viable and enforceable way forward which specifically covers both Scope-1 and Scope-2 consumption. Another potentially successful model is the one suggested by the UK, according to which water efficiency should be incorporated in planning law.

4.1 Implications for Policy and Industry

1. **Mandatory disclosure is essential.** The existing voluntary reporting system of patchwork continues to create lack of transparency. The regulators need to follow the example of the EU that mandates the reporting of both Scope-1 and Scope-2 water consumption on a public, facility, level with the help of standardized methodologies.

2. **Environmental justice must be integrated into planning.** The community impact assessment, aimed at balancing and reducing the disproportionate burden of vulnerable populations, should be carried out before grants of permits (Garcia, 2025).

3. **The *Loper Bright* decision demands legislative specificity.** The congress of the U.S has to come up with clear statutory language that will assign authority to agencies, such as EPA to control the use of data centers water, but not through agency interpretation.

4. **Binding efficiency targets can drive innovation.** The water efficiency of nations or regions, in relation to incentives to switch to dry cooling, direct-to-chip liquid cooling, and water recycling, can be decoupled with the growth of AI (Jegham et al., 2025).

5. **Standardized metrics are a prerequisite for accountability.** The extensive use of Scope-1/Scope-2 differences, and the compulsory reporting of the

WUE, would allow the significant comparison and trace the progress over time (IEEE/OECD, 2025).

5. CONCLUSION

The artificial intelligence's environmental costs are not abstractions. They are quantified in terms of liters of fresh water pulled out of drought-stricken societies, in higher water bills for low-income households, and in political capital poorer towns must spend to resist unwanted development. As has been shown in this paper, the price of any query done by ChatGPT is not only paid in terms of resources used, but also in the unfair distribution of the burden to the least capable communities to carry it. The present lack of transparency in the technology sector, as well as the disintegration in the international regulatory action, continues this injustice. To reverse this trend, a radical change in voluntary to compulsory, standardized disclosure between Scope-1 and Scope-2 consumption, and between a corporate efficiency narrow perspective to a broader forthcoming environmental equity obligation is needed. Without comprehensive transparency and strong regulation The future development of artificial intelligence risks reinforcing environmental inequities. Recognizing and acting upon this reality is the essential first step toward ensuring that AI's transformative potential does not come at the expense of the planet's most vulnerable communities.

REFERENCES

1. de Vries-Gao, A. (2025). AI's hidden carbon and water footprint. *Patterns*, published in conjunction with Vrije Universiteit Amsterdam. https://vu.nl/en/news/2025/ai-s-hidden-carbon-and-water-footprint

2. Dhar, P. (2020). The carbon impact of artificial intelligence. *Nature Machine Intelligence*, 2(8), 423-425. https://www.nature.com/articles/s42256-020-0219-9

3. European Parliament. (2024). Regulation (EU) 2024/1689 (EU AI Act) and recast Energy Efficiency Directive (EED). Official Journal of the European Union.

4. Garcia, M. (2025). AI Uses How Much Water? Navigating Regulation of AI Data Centers' Water Footprint Post-Watershed Loper Bright Decision. *Texas Tech*

Law Review, 57, 517-554. https://ttu-ir.tdl.org/items/3bb26787-9659-4867-9d5b-b853333f7693

5. IEEE/OECD. (2025). The hidden costs of AI: Unpacking its energy and water footprint. *OECD AI Policy Observatory / IEEE P7100 Working Group*. https://oecd.ai/en/hidden-costs-ai

6. IMD Analysis. (2025). Corporate sustainability reporting and AI environmental footprint. International Institute for Management Development.

7. Jegham, N., et al. (2025). How hungry is AI? Benchmarking energy, water, and carbon footprint of LLM inference. https://arxiv.org/abs/2505.09598v5

8. Li, P., Yang, J., Islam, M. A., & Ren, S. (2023). Making AI Less "Thirsty": Uncovering and Addressing the Secret Water Footprint of AI Models. https://arxiv.org/html/2304.03271v5

9. Mytton, D. (2021). Data centre water consumption. *npj Clean Water*, 4(11). https://www.nature.com/articles/s41545-021-00101-w

10. Responsible AI Foundation. (2025). AI companies are draining water from regions that are already running dry. https://www.responsibleaifoundation.com/post/ai-companies-are-draining-water-from-regions-that-are-already-running-dry

11. U.S. Congress. (2024). Artificial Intelligence Environmental Impacts Act of 2024 (Proposed).https://www.congress.gov/bill/118th-congress/senate-bill/3732/text#:~:text=To%20require%20the%20Administrator%20of,the%20Director%20to%20develop%20a

12. U.S. Supreme Court. (2024). *Loper Bright Enterprises v. Raimondo*, 603 U.S. (2024).https://www.theepochtimes.com/article/the-biggest-supreme-court-decisions-of-2024-post-5782143?utm_medium=GoogleAds&utm_source=PerfmaxM&utm_campaign=PM_max-G-5Ancient_AU22_2-mik-20250926&gad_source=1&gad_campaignid=23063143669&gbraid=0AAAACsffekxZk-5Tvjglv03ER9W05ECT&gclid=Cj0KCQjwgr_NBhDFARIsAHiUWr5FQ-

d-
bRTr0YDr89lOJeSCORjFR4Jn78XfJ9O65x6V8zefmG5cH2waAu39EALw_wcB

13. USMANOVA, S. (2025). GOOGLE CLASSROOM ORQALI YOZMA KO‘NIKMALARNI RIVOJLANTIRISHDA ASOSIY MUAMMOLAR VA ULARNING YECHIMLARI. *«ACTA NUUz»*, *1*(1.10), 186-188.