278. WATER AS A GEOPOLITICAL LEVER: HOW DATA CENTER WATER CONSUMPTION COULD BECOME A SOURCE OF CONFLICT IN WATER-STRESSED REGIONS

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This paper examines water as a strategic resource in the digital economy, focusing on the growing water consumption of data centres that support cloud computing and artificial intelligence.

Water has increasingly been recognised as a critical resource for digital infrastructure, especially for data centres supporting cloud services, artificial intelligence, and the global internet. Growing computing capacity has increased demand for facilities operating continuously and relying on cooling systems that often use local freshwater supplies. In the United States, projections suggest that rising demand may require hundreds of millions of gallons of additional daily water capacity and major investments in water infrastructure [1]. This development positions water not only as an environmental resource but also as a strategic economic and political factor.

The relationship between data centres and water availability is particularly visible in water-stressed regions. Analyses in China estimate that data centres consumed about 15.7 billion cubic meters of water in 2022, with roughly 72 percent of computing capacity located in areas facing severe scarcity [2]. Similar global patterns show that many new facilities are built in regions already experiencing water stress, increasing competition for limited resources.

These trends extend into broader political considerations as water scarcity intersects with economic policy and technological expansion. Governments and industry actors must balance digital growth with sustainable resource management, while decisions about infrastructure and cooling technologies increasingly influence regional planning and governance [3]. In this context, water begins to function as a geopolitical lever shaping technological and economic development. The rapid expansion of digital infrastructure has made data centres essential to the global economy. Cloud computing, artificial intelligence, and online services rely on facilities that operate continuously and generate significant heat, requiring constant cooling and substantial water use. Because of this dependency, water increasingly emerges as a strategic resource within the digital economy. Many data centres use evaporative cooling systems in which water absorbs heat and evaporates, meaning much of the withdrawn water is permanently lost. Estimates suggest that about 80 percent of water used in such cooling evaporates, compared with roughly 10 percent in residential consumption, highlighting the intensity of industrial cooling demands [4].

The rapid growth of artificial intelligence has significantly increased the water demand of digital infrastructure. A typical 100-megawatt data center may consume around two million liters of water per day, and in some cases large facilities can require up to five million gallons daily – an amount comparable to the water use of a town with tens of thousands of residents [5]. These figures highlight that data centres are not only digital infrastructure but also major industrial consumers of natural resources. The global expansion of artificial intelligence has intensified this trend. Analysts estimate that data centres worldwide already consume hundreds of billions of liters of water annually, and projections suggest that this number could more than double within the next decade as more powerful computing systems are deployed. Rapid technological progress is driving the construction of increasingly large facilities designed to process massive datasets and train complex machine-learning models. These developments contribute to a steady rise in both direct and indirect water consumption associated with digital infrastructure.

Indirect water use plays an important role in the overall environmental footprint of data centres. In addition to water used directly for cooling, substantial volumes are also required for electricity generation that powers these facilities. Some estimates indicate that indirect water consumption associated with energy production may account for nearly 60 percent of the total water footprint of data centres. As a result, the environmental impact of digital infrastructure extends beyond the boundaries of individual facilities and affects regional energy systems as well.

Geographical location further complicates the issue. Many data centres are built in regions attractive for technological investment due to land availability, regulation, and energy resources, yet these areas often lack sufficient freshwater supplies. Analyses indicate that about two-thirds of new data centres planned or constructed since 2022 are located in water-stressed regions, including more than 160 artificial-intelligence-related facilities in the United States alone [6]. Similar trends appear in parts of Asia and the Middle East, where technological growth frequently coincides with arid climates.

This concentration increases competition for limited water resources among industry, agriculture, and local communities, especially during droughts or extreme heat. Rising water demand also affects urban planning, as projections suggest U.S. data centres may require up to 1,450 million gallons of additional daily water capacity by 2030, necessitating significant infrastructure investment and negotiations between technology companies, governments, and local stakeholders [7].

The development of artificial intelligence intensifies these pressures because advanced computational models require enormous processing power. Training large language models, for example, can involve substantial water consumption associated with both computing and energy production. Environmental assessments show that training even relatively efficient language models may consume millions of liters of water [8]. As AI applications become integrated into everyday digital services, the cumulative environmental footprint of these technologies continues to grow.

Another dimension of the issue is the uneven distribution of water resources across regions. Climate change, population growth, and economic development have already placed significant pressure on global freshwater supplies. When high-tech infrastructure enters areas with limited water availability, local environmental vulnerabilities may become more pronounced. For example, in drought-prone regions of the United States, the expansion of data centres has raised concerns that industrial water consumption could exacerbate existing shortages and increase competition between economic sectors.

Technological companies have begun to acknowledge these challenges and have introduced sustainability commitments aimed at reducing their environmental impact. Several major firms have pledged to become “water positive,” meaning that they intend to replenish more water than they consume by the end of the decade. However, achieving this goal remains complex. Regions that offer the most abundant renewable energy resources, such as solar energy, are often located in dry climates where water scarcity is already severe. Balancing the need for low-carbon energy with responsible water management therefore presents a difficult strategic challenge for technology companies and policymakers.

The relationship between digital infrastructure and water resources also has potential geopolitical implications. Water scarcity has long been recognized as a factor influencing regional stability and international relations. When technological infrastructure depends heavily on water availability, control over freshwater resources may become intertwined with economic competition and technological development. Countries seeking to establish leadership in artificial intelligence and digital services may face increasing pressure to secure stable supplies of both energy and water.

Decisions about where to locate data centres, how to regulate water consumption, and how to allocate limited resources may influence not only environmental sustainability but also economic competitiveness and technological innovation. As artificial intelligence continues to expand across industries and societies, the demand for computing infrastructure will likely intensify further.

Consequently, the intersection of technological progress and environmental constraints is becoming increasingly visible. Digital infrastructure, often perceived as intangible and immaterial, depends heavily on physical resources such as energy, land, and water. The rapid growth of artificial intelligence illustrates how emerging technologies can reshape resource consumption patterns on a global scale. When water-intensive infrastructure expands into regions already experiencing scarcity, tensions may emerge between technological development and environmental sustainability.

In the broader perspective, the water consumption of data centres represents more than a technical challenge related to cooling systems. It reflects a deeper transformation in the relationship between digital technologies and natural resources. As societies continue to rely on data-driven services, ensuring responsible management of water resources becomes an essential component of sustainable technological development. This perspective makes it possible to understand why water is increasingly viewed as a geopolitical lever within the evolving architecture of the global digital economy.

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