

MONITOR

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The Physical Race for AI

How Control over Electricity, Water, and Critical Minerals Is Becoming a Determinant of AI Leadership

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- › AI- and cloud-driven data centre expansion is causing electricity demand to grow much faster than overall power consumption.
- › In Europe, slow grid expansion has emerged as a critical constraint on AI investments and digital competitiveness.
- › AI infrastructure is increasingly expected to follow available power sources ("data moves to power"), especially near renewable energy generation.
- › Large data centres require substantial cooling water, making water stress an important criterion for future AI locations.
- › Critical minerals are indispensable for AI hardware since copper, silicon, gallium, rare earths and lithium are essential for chips, power systems, cooling technologies and batteries.
- › Data centres increasingly compete with electrification, electric vehicles, hydrogen production, defence and the energy transition for power, grids and minerals.
- › Technological sovereignty in AI will increasingly depend on secure access to cheap electricity, fast infrastructure deployment, a steady supply of critical minerals and sufficient water resources.

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Introduction

Artificial Intelligence (AI) is often discussed in terms of algorithms and talented engineers. However, AI infrastructure and leadership are not only an issue of digital technology. Every model trained and prompt answered has a standing physical foundation as a prerequisite: reliable and cost-efficient electricity for computing power, sufficient water for cooling purposes, critical minerals for its technical components, and an infrastructure that connects them. As AI becomes increasingly embedded across whole economies, the question is no longer simply who can develop the most advanced systems, but who can secure the resources that are needed to power them. AI

policy is thereby becoming closely linked to energy policy, water management, infrastructure planning, and supply security of critical materials.

These prerequisites, in return, are shaped by geography and geopolitics. Access to affordable energy, climate-resilient water resources, sufficient grid capacity, and secure mineral supply chains are unevenly distributed across the world. Countries such as the US and China currently lead in the development of large language models and other frontier AI systems, but the next stage of global competition could strongly favour those who are able to leverage electricity, water, land, and minerals more effectively than their rivals. As energy prices rise, water becomes more scarce in many regions due to climate change, and critical raw materials are subject to an increasing competition from both states and industries, the race for AI leadership is evolving into a contest over physical resources as much as digital innovation. Whoever can either provide for the physical needs of AI fastest and cheapest or develop and deploy AI models with the lowest resource intensity will be best positioned in the future geography of AI power.

AI's Economic Promise

Artificial intelligence has become one of the most discussed topics in the economic policy debate. Its proponents argue that AI adoption will drive a new wave of productivity growth, reshape industrial structures, and become a decisive factor in increasing national competitiveness. This expectation has, in turn, fuelled a global push by governments, companies and investors to accelerate AI development and deployment.

Higher AI adoption, investment and innovation are associated with stronger productivity¹ and more modern industrial structures, as AI shifts resources and talent toward more technology-intensive activities while upgrading traditional industries through smarter production processes.² Additionally, AI is increasingly expected to become a technology for “general purpose” with economy-wide effects comparable with previous industrial revolutions. Estimates suggest that AI could contribute up to EUR 13.5 trillion to global GDP by 2030, making it one of the largest sources of economic value creation over the next decade.³ According to the IMF, nearly 40 percent of global employment will be impacted by AI, rising to around 60 percent in advanced economies, implying that a substantial share of future economic output will be generated, supported or transformed by AI-enabled processes.⁴ Although these projections remain highly uncertain as the pace of AI adoption and resulting productivity gains are difficult to predict, they have reinforced expectations among policymakers, economists and investors that AI will play a central role in economic growth.

Considering its promises, a critical mass of European firms, disproportionately larger ones, is already embedding AI into daily operations. According to Eurostat, the share of EU enterprises with ten or more employees using at least one AI technology rose from roughly 13.5 percent in 2024 to just under 20 percent in 2025 – the majority of which is still text-based applications.⁵ The growing integration of AI into business processes is widely expected to increase demand for the computational infrastructure required to develop and operate AI systems.

The Scale of AI and Data Centre Expansion

Computing power has become a critical factor in the AI ecosystem since the capability of modern AI systems depends not only on data and algorithms, but also largely on access to large-scale computational resources. As AI models grow in complexity, the amount of computing capacity required for both training and deployment increases substantially, turning compute infrastructure into a key determinant. Consequently, governments and firms around the world have begun to

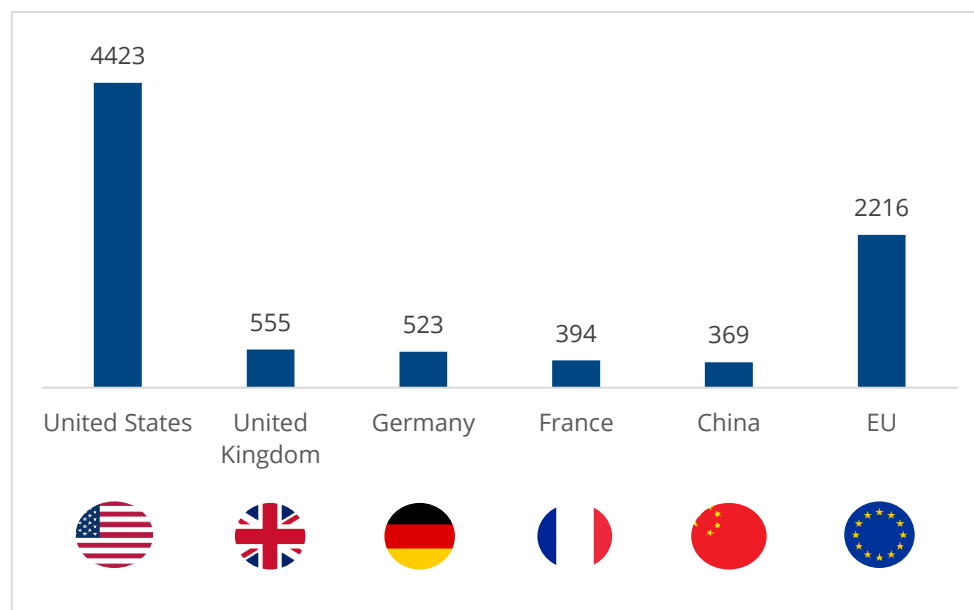
invest in data centres and high-performance computing facilities as strategic assets in the global AI race.

A Global Race for Computing Power

The commercial scale of the AI sector has expanded rapidly. Market estimates put the global AI market at roughly EUR 219 billion in 2025, with projections pointing to growth beyond EUR 1 trillion by 2030 and a sustained annual growth rate that would take the market past EUR 1.2 trillion by 2032.⁶ This growth is underpinned by a parallel expansion in the physical infrastructure needed to train and run AI models: data centres.

As of April 2026, the United States hosted by far the largest number of data centres of any country worldwide (over 4,400), reflecting its long-standing dominance in cloud infrastructure and AI model development. Germany ranked third globally, with the United Kingdom in second place and France and China rounding out the top five. This positions Germany as the European Union's most important data centre hub, a status that brings both economic opportunity as well as a strain on infrastructure.⁷

Figure 1: Top five countries by number of data centers worldwide as of April 2026



Source reference: Number of data centers worldwide by country. Statista (2026)

Germany's Data Centre Boom

Major tech companies have announced substantial new investment commitments in Germany. Google has committed EUR 5.5 billion to expand its cloud and AI infrastructure in the country, including a new AI-dedicated data centre near Frankfurt and expanding facilities in Munich and Berlin. Nvidia, in partnership with Deutsche Telekom, has outlined investment plans of approximately EUR 1 billion for an industrial AI cloud in Munich, while the French operator Data4 is constructing its first German site in Hanau.⁸ These announcements sit within a broader pattern of regional concentration.

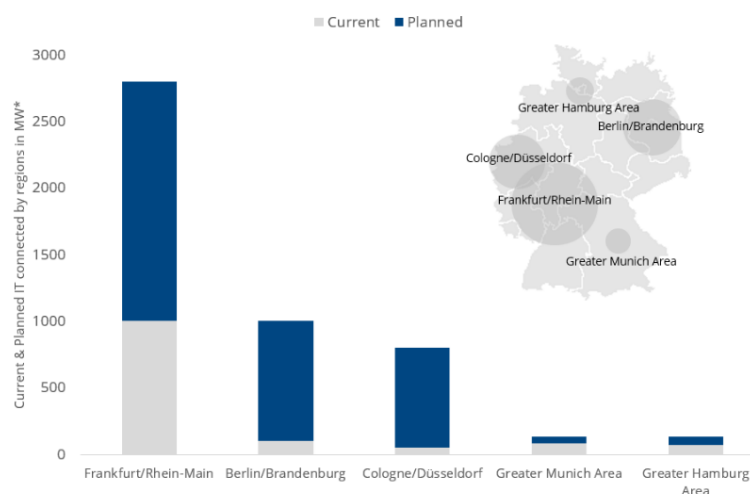
The Frankfurt/Rhein-Main region alone accounts for close to three times the current and planned capacity of the next largest hub, Berlin/ Brandenburg, reflecting its established position as a major

European internet exchange location and its existing grid and fibre infrastructure. While this clustering is efficient in some respects as it builds on existing strengths, it also concentrates risk. The region's grid and energy production capacity could become a possible point of failure for a large share of Germany's AI ambitions. Energy generation and grid infrastructure therefore constitute the first two physical foundations of the AI economy that set the limits for its further expansion.

The Physical Foundations of AI: Resources and Infrastructure

AI is often discussed as a digital phenomenon driven by code and models. In practice, however, it is also a deeply physical one: every model trained and every query answered draws on electricity, water, land, and a specific set of minerals and metals. Understanding the foundations of AI therefore requires looking to the material resources and structures that underpin it.

Figure 2: Current and planned data centre capacity by region in Germany (MW)



Source reference: The Data Center Landscape in Germany. Germany Trade & Invest (2025)

Energy Supply for Data Centres

The expansion of AI has substantial implications for energy systems. Global investment in data centre facilities has doubled since 2022, and the scale of individual facilities has grown accordingly. A large data centre can already consume as much electricity as 100,000 households, while the largest facilities currently under construction could draw as much as two million households' worth of power.⁹

Data centres accounted for approximately 1.5 percent of global electricity consumption in 2024, or around 415 terawatt-hours (TWh). The United States accounted for the largest share of this consumption (45 percent), followed by China (25 percent) and Europe (15 percent). Global data centre electricity consumption has grown at roughly 12 percent per year since 2017, more than four times the rate of growth in total electricity consumption in general. AI-focused facilities now draw electricity at a scale comparable to power-intensive heavy industries, such as aluminium smelting, but with far greater geographic concentration.¹⁰

The trajectory points sharply upward. Global data centre electricity consumption is projected to more than double to around 945 TWh by 2030, slightly more than Japan's current total electricity consumption. By 2035, the IEA estimates, consumption might further rise to 1,200 TWh. The United States is expected to account for the largest share of this growth; by the end of the decade, US data centres are projected to consume more electricity than the country's combined

production of aluminium, steel, cement, chemicals and other energy-intensive goods.¹¹ In Germany, electricity demand linked to AI is estimated to have risen from around 12 billion kWh in 2015 to approximately 21.3 billion kWh by 2025, equivalent to already roughly 4 percent of national electricity consumption.¹² The challenge for the future is therefore not only about producing more electricity, but also ensuring that sufficient power is available at the right location and the right time for increasingly concentrated points of demand.

Competing for the Same Electrons

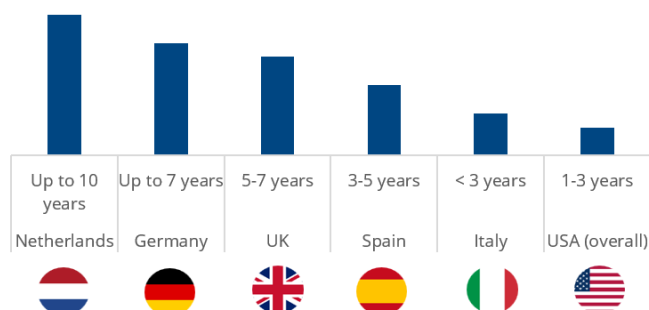
As AI turns into an increasingly large source of electricity demand, it enters an already crowded energy landscape. The challenge becomes not simply to just generate more electricity but to decide how increasingly scarce and fought-over infrastructure resources should be allocated in the future. Its infrastructure is entering direct competition with industrial electrification, electric vehicle deployment, hydrogen production and broader decarbonisation efforts. Every gigawatt committed to new data centre capacity is a gigawatt that cannot simultaneously support other strategic priorities.

This creates a new policy dilemma. For decades, energy policy focused primarily on the triangle of affordability, reliability and sustainability. AI introduces a fourth objective: strategic allocation. Governments will increasingly face choices between alternative uses of electricity, grid capacity and critical minerals. The ability to manage these trade-offs may become a decisive determinant of national AI competitiveness. In federal systems such as Germany, these trade-offs may also emerge across different levels of government, where national ambitions to expand AI capacity can conflict with state-level and local opposition to the infrastructure required to support it.

The Grid Bottleneck

Generation capacity alone will not resolve Europe's AI energy challenge. Delivering power to where AI infrastructure is being built requires transmission and distribution capacity, and this is where the sharpest constraint currently lies. Grid connection waiting times for new data centres in Germany can extend up to seven years, a delay that directly threatens the country's digital competitiveness, since capital committed to data centre project is of limited value without a timely grid connection.

Figure 3: Estimated Grid Connection Delay for Data Centres

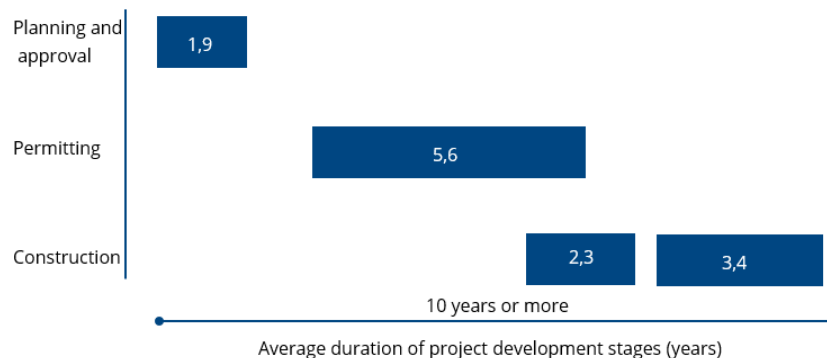


Source reference: Energy and AI. IEA (2025)

Across the European Union more broadly, new grid infrastructure projects typically take more than ten years from conception to completion. Planning and permitting, rather than construction itself, accounts for the largest share of this timeline, consuming more than half of the total project duration on average.¹³

This is a structural, largely self-imposed bottleneck. Since the primary obstacle is not a lack of technology, capital or engineering capability, but administrative and regulatory procedures, it could be alleviated through policy reforms. To address these growing bottlenecks, the German Federal Ministry for Economic Affairs and Energy (BMWE) has launched reforms to accelerate transmission-grid expansion and streamline grid connections for large electricity consumers such as the Federal Requirements Plan Act (*Bundesbedarfsplangesetz*) and the new Grid Connection Package (*Netzanschlusspaket*). Proposed changes, including greater transparency on available capacity and a shift towards a “first ready, first served” approach, could reduce delays for AI data centres and strengthen Germany’s attractiveness as a location for AI infrastructure. Together with the recent Data Centre Strategy (*Rechenzentrumsstrategie*), these reforms signal a broader effort to improve framework conditions for AI and data-centre investments in the country.¹⁴

Figure 4 : Average EU grid infrastructure project timeline



Source reference: European Parliamentary Research Service (2025)

Grid expansion, however, is not the only available instrument. A more digitally oriented approach is currently gaining traction under the label “data moves to power”. Rather than transporting large volumes of electricity over long distances to where AI computing demand is concentrated, the data itself can be moved to decentralised data centre clusters located close to where energy, particularly renewable energy, is generated. Not all AI-related workloads need to be in close range to urban demand centres. AI training, large-scale data analysis, simulation and backup can be processed flexibly wherever power is available. This can change the role of data centres from being an additional burden on the grid to potentially “grid-serving” assets that can absorb overproduction of renewable energy. This does not substitute for grid expansion, but it can reduce the pressure on transmission infrastructure while new capacity is being built.

While the current German government is doing their fair share to improve these conditions, further delays could push a substantial share of Europe’s AI infrastructure buildout into the 2030s, allowing competitors such as the United States, the Gulf states, and China to pull further ahead with faster permitting and grid-connection procedures.

Water Consumption

Water is a less visible but no less important input into the AI value chain. Even with efficient cooling systems, a single hyperscale data centre of roughly 130 megawatts (MW) can consume around 171 million litres of water annually.¹⁵ Data centres, however, are only the most visible part of the wider water footprint of AI that also includes semiconductor fabrication and the power generation that supplies the sector altogether, forming what can be described as the “AI economy’s” water demand.

Current estimates put total water consumption attributable to the AI economy at around 23 billion cubic metres per year, with projections suggesting this could more than double to over 54 billion cubic metres by 2050.¹⁶ This would be comparable to about 18 litres per day for the entire population of the world today. The concern, however, is not only the volume of water required but its location and timing. Around 40 percent of the world’s data centres are sited in areas already experiencing high or extremely high-water stress – in the desert Southwest US, the Middle East, Mediterranean Europe, and drought-prone regions of Latin America – and demand for cooling tends to peak in summer months, precisely when local communities and agricultural users also face the greatest shortages.¹⁷

Water shortages are, however, no longer confined to the dry deserts of the world. The severe heatwaves and drought conditions experienced across large parts of Europe during the summer of 2026 led to exceptionally low water levels in major rivers such as the Rhine and Danube, disrupting inland navigation and putting pressure on European energy systems which depend on river water for generation, cooling, and transport.

Electricity and water availability do not always coincide geographically. Regions with abundant renewable-energy potential may face growing water stress, while locations with reliable water resources may lack low-cost electricity. As a result, future AI infrastructure planning will increasingly require policymakers to optimise across multiple resource constraints simultaneously.

In general, Europe is rather heterogenous when it comes to water availability and climatic conditions across the continent – creating different operating environments for AI-related infrastructure. The Nordic countries, in particular, and the Netherlands sit at one extreme: reliable rainfall, ample freshwater reserves and cool climates allow “free cooling” techniques that barely touch local water tables, which is precisely why hyperscalers (large cloud/ AI providers like Google, Microsoft, Amazon, Meta) have clustered facilities there ahead of tightening EU environmental rules. France presents a more complicated picture. Cheap, low-carbon power from its nuclear power plants makes it an obvious candidate for energy-hungry AI clusters, yet that same nuclear fleet depends on river water for cooling, and public pushback over water withdrawals has grown sharper with each successive heatwave summer.¹⁸

The more acute pressure point lies further south. Spain, Italy, Greece and Mediterranean France already contend with severe seasonal drought and aquifer recharge rates that can fall under a fifth of normal levels, in a region where irrigation alone accounts for most water use. Adding large water-hungry facilities into this mix does not solve the problem. Even a mid-sized data centre can use hundreds of thousands of cubic metres of water a year, more than local rivers and groundwater are built to handle. For policymakers, this makes Southern Europe the region where AI infrastructure and existing water users are most likely to come into direct conflict.

This water-stress geography is accompanied by a separate spatial dynamic: European capacity is heavily concentrated in dense metropolitan hubs: Frankfurt, London, Amsterdam, Paris and Dublin. Known as FLAP-D, these urban centres captured 85 percent of new European capacity added in 2024 alone.¹⁹

Unlike the extra-urban desert siting pattern common in the US Southwest, European facilities cluster in these metropolitan regions because proximity to internet infrastructure, financial centres and enterprise demand matters more than land cost. As a result, water, power and land demand gets concentrated in places that are already dense with residential and municipal users, rather than distributing it across sparsely populated regions.

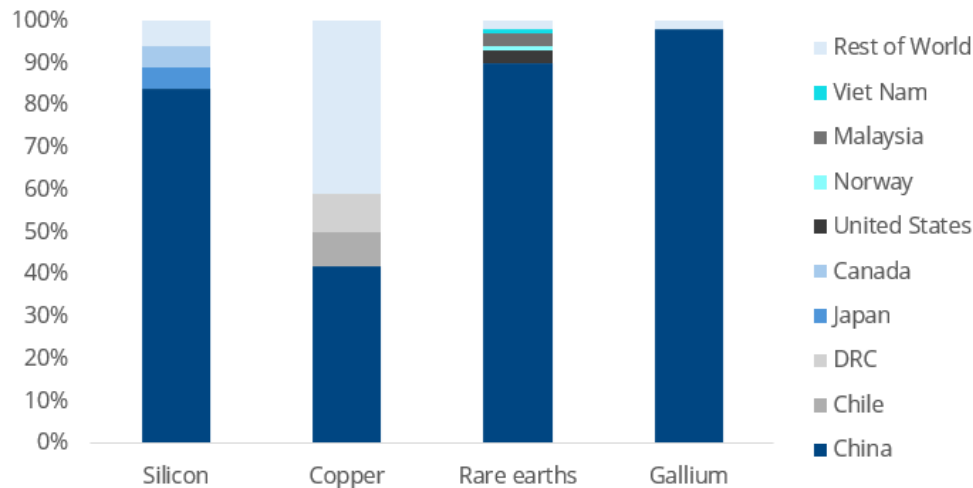
Semiconductor fabrication faces a related challenge. Nearly a third of global fabrication plants are in water-stressed areas, and each litre of the ultrapure water required for chip production can consume up to four litres of freshwater in processing. Chip-sector water demand is projected to increase by more than 600 percent by 2050 as chip complexity rises, even before accounting for the water intensity of extracting materials such as lithium and copper.²⁰

In absolute terms, AI's water footprint remains smaller than that of many heavy industries as well as agriculture. What distinguishes the sector from others, however, is the combination of factors at play: demand is emerging in specific locations where water is already scarce, competition for water resources is intensifying as extreme weather makes supply less predictable, and existing water systems in many regions are already under strain from decades of underinvestment. For German and European policymakers, this suggests that data centre siting decisions cannot be treated as a purely energy and connectivity question but rather water availability too needs to be built into permitting criteria from the outset.

Critical Minerals

Behind the code and before the computing power is put to work, the hardware for AI depends on an intricate and geographically concentrated supply chain. Apart from bulk construction materials such as steel and concrete, data centres require significant quantities of copper, aluminium, silicon, gallium, rare earth elements (REE) and battery minerals. Therein, AI infrastructure is increasingly competing with clean energy technologies, defence manufacturing, electric mobility and industrial electrification for the same finite supplies of minerals.

Figure 5: Geographic concentration of refined supply of selected minerals critical to data centre construction, 2024



Source reference: Global Critical Minerals Outlook. IEA (2024)

Each mineral serves a distinct function in the AI universe. Copper underpins power distribution, high-performance networking and cooling infrastructure. Ultrapure silicon remains the core semi-conducting material for processors and memory. Gallium, typically as gallium nitride or gallium arsenide, is increasingly used in high-efficiency power components. Aluminium is used extensively in structural components and cooling systems, while REE, particularly neodymium, praseodymium, dysprosium and terbium, are essential to the high-performance magnets used in cooling fans and precision components. Battery minerals such as Lithium, meanwhile, support the backup power systems that keep data centres running through outages.²¹

While data centres are not currently the largest source of demand for any of these minerals, projected capacity expansions through 2030 could account for a meaningful share of total demand growth, reaching an estimated 2 percent of total copper and silicon demand, over 3 percent of REE demand and as much as 11 percent of gallium demand. In absolute terms, this still implies demand for several hundred kilotons of copper and tens of kilotons of silicon by 2030, at a time when data centres will be competing for these same minerals against the defence, clean energy and construction sectors.²²

The geographic concentration of supply is the main concern in this regard. In 2024, close to 60 percent of refined copper supply, and more than 90 percent of refined aluminium, silicon, magnet REE and gallium, originated from just the top three producing countries with China dominant across nearly every category. This de-facto monopoly has already translated into geopolitical risks. In December 2024, China restricted exports of gallium, germanium and antimony to the United States which was widely seen as retaliation for expanding US export controls on advanced chips and chipmaking equipment. Beijing subsequently added graphite to the restricted list, and expanded controls again in February 2025 to cover tungsten, tellurium, bismuth, indium and molybdenum. Several of these materials are used directly in the microprocessors and diodes that power data centres, making the restrictions also directly relevant to AI infrastructure, not just to the chip and defence sectors originally targeted. For European policymakers, this showed that mineral supply security is now a live risk, not a hypothetical one, with consequences for the cost and speed of building AI infrastructure.

Energy, Water, Minerals and Infrastructure as the New Chokepoints

If electricity, water and minerals are the physical foundations of AI, the question of who controls and secures them is now a matter of geopolitics. Major powers are pursuing this contest through different models from state-directed in China, private-sector-led in the United States, mixed public-private-oriented in the European Union, and capital-driven in the Gulf states. In every case, the limits on electricity, water and minerals are not only engineering problems to be solved but are shaping how major powers position themselves in the global race for AI capacity.

These resource constraints are not trivial for the geopolitical competition but evolving into one of its central battlegrounds. Countries with abundant and diverse energy supplies, advanced grid infrastructure, and secure access to critical minerals and water are best positioned to also translate AI ambitions into AI capacities. Countries that are rich in capital or talent but resource-limited, on the other hand, will struggle to scale AI infrastructure at the pace their strategies aspire.

This reframes several policy debates. Export controls on critical minerals, mainly discussed in the context of defence and clean-energy supply chains, are also directly relevant to AI infrastructure planning. Grid expansion and reforms in bureaucracy, traditionally treated as a central issue for the energy transition, are similarly questions of future digital competitiveness and national security. Lastly, the decisions on data centre locations, previously seen mostly as a matter of local economic development, now carry implications for water security and regional resource competition.

The Emerging Geography of AI Power

The first phase of the AI revolution was shaped primarily by data and software capabilities. Leadership depended on access to talent, venture capital, research institutions and advanced semiconductor technology. Countries such as the United States, China and Taiwan developed commanding positions because they controlled key parts of the digital ecosystem, from model development and cloud infrastructure to semiconductor manufacturing.

The next phase of AI development may be defined by a different set of conditions. As AI systems become larger and more computationally intensive, access to its resource needs is emerging as a strategic advantage. The ability to build and operate AI infrastructure at scale increasingly depends on factors traditionally associated with energy policy and resource security rather than digital innovation alone. This raises an important question for policymakers and investors alike: will future AI leadership remain concentrated among today's "technology powers", or are we witnessing the emergence of a new geography of AI power based on resource richness and infrastructure capacity?

Current Leaders Still Hold Advantages

The United States remains the dominant force in the global AI ecosystem. It combines leadership in model development with unparalleled access to venture capital, the world's largest hyperscale cloud providers and a deep semiconductor ecosystem. It also continues to attract disproportionate shares of global AI investment and data centre construction.

China has pursued a different approach. Through large-scale state intervention, strategic industrial policies and close coordination between public authorities and private companies, Beijing has built significant domestic AI capabilities. China also holds an advantage that is becoming increasingly important: its dominant position in processing and refining many of the critical minerals required for digital infrastructure, clean-energy systems and advanced manufacturing.

Taiwan occupies a unique position within the global AI ecosystem. The island's semiconductor industry remains indispensable to the production of advanced chips. Yet Taiwan also highlights an emerging paradox of AI competitiveness: technological leadership does not automatically translate into infrastructure security. Energy constraints and geopolitical tensions continue to expose vulnerabilities in one of the world's most strategically important technology hubs.

What This Means for Germany and Europe

Germany and the European Union enter this global competition with real strengths: a large and sophisticated economy, an increasingly AI-literate business sector, world-class research institutions and a strong momentum in data centre investment. Germany in particular sits on a pivotal position. The Frankfurt/Rhine-Main region has emerged as one of Europe's largest data centre hubs, providing a significant share of the digital infrastructure needed by cloud services and AI applications.

At the same time, Europe's position is increasingly limited by fragmented infrastructure planning and lengthy permitting procedures. While Europe remains an important developer, consumer and adopter of AI technologies, its ability to host large-scale AI infrastructure is increasingly determined by its capacity to accelerate the deployment of physical infrastructure.

Unlike the United States or China, Germany and the EU cannot compete primarily on the scale of mobilised capital or the speed of state-directed industrial development. Their advantage will instead depend on whether they can translate existing economic and technological strengths into faster infrastructure delivery.

Energy is likely to be the most important test of this capability. Germany already faces very high electricity prices, grid bottlenecks and rising power demand from electrification and industrial transformation. For energy-intensive activities of large-scale data centres, electricity costs and reliability are a core location factor. Europe's digital ambitions and future competitiveness will therefore increasingly depend on the success of the energy transition that supplies affordable electricity at scale.

Experts are also suggesting establishing "AI Infrastructure Priority Zones" that combine grid access, renewable energy generation, fibre connectivity, sufficient water availability and suitable land. Such an approach would allow computing capacity to follow available power, reduce pressure on existing hubs and strengthen the resilience of Germany's digital infrastructure.

In conclusion, policymakers should begin viewing these policy challenges through an additional lens. Energy prices, electricity grids, permitting procedures, water availability and critical minerals are no longer only matters of energy, environmental or industrial policy. They are increasingly determinants of where future AI capacity will be built and who will benefit from the economic value it creates. The winners of the first phase of the race for AI were countries with the best algorithms. The winners of the second phase may be countries that can effectively combine access to cheap electricity, fast grid connections, the most secure mineral supply chains and the greatest capacity to build infrastructure quickly with the ability to develop and deploy increasingly resource-efficient AI systems.

Lastly, the debate is not only about competitiveness, but also sovereignty. Even a successful expansion of data centre capacity across Europe could leave it vulnerable if the underlying AI models, cloud services and key technologies remain overwhelmingly controlled from outside the continent. While ensuring that critical computing infrastructure is located within Europe may become

an increasingly important policy objective, genuine technological sovereignty requires more than hosting servers alone. Europe must also build and retain its own capabilities to develop, train and deploy advanced AI systems. Otherwise, it risks becoming a physical location of AI infrastructure without becoming a leading actor in the creation of AI value and strategic influence.

Translating the Physical Race for AI into Policy

This paper reinforced a number of well-established economic and industrial policy priorities – not only, but also pertaining to the question of future AI development – which include accelerating infrastructure planning, permitting, and grid connections; ensuring the availability of affordable and reliable energy; safeguarding water availability; and strengthening resilience in critical resource and raw-material supply chains. While none of these priorities are particularly new developments in themselves they are often missing from the AI debate and can no longer be treated as separate policy domains. Beyond these foundational priorities, this paper also points towards several broader strategic implications that deserve greater attention in Germany's policy debate.

Digital Sovereignty is a Question of Resource Security

Digital sovereignty is often discussed in terms of cloud infrastructure, semiconductors, cybersecurity, and technological capabilities. However, these capabilities ultimately depend on access to energy, water, land, and critical raw materials. Germany should therefore promote a broader understanding of digital sovereignty that explicitly incorporates energy security, water security, and resource security. This would move the debate beyond sustainability considerations and place it increasingly within the context of economic and national resilience. True digital sovereignty is not alone about owning or controlling digital technologies. The discussed “physical dimensions” should therefore be integral components of future discussions around technological sovereignty and industrial competitiveness.

AI Infrastructure is a Matter of Industrial Competitiveness and Local Prosperity

Political communication should emphasize that AI has the potential of becoming critical infrastructure for future economic security and value creation, in particular on the local level. The availability of resources and infrastructure will increasingly determine where companies invest, get taxed and potentially new jobs are created. Framing the issue through the prism of economic opportunity is likely to resonate more strongly with citizens than debates focused solely on regulations, innovations, and software development.

Build a European “AI Home Advantage” Based on Domestic Resources and Value Chains

Germany should pursue an AI infrastructure strategy that builds on its own strengths, namely renewable energy generation, while anchoring critical parts of the AI value chain in Europe. This includes expanding European capabilities in the processing, refining, and recycling of strategic raw materials. While Germany will never be fully self-sufficient in critical minerals, it should make greater use of available domestic resources such as lithium, copper, nickel, and cobalt across the country. The objective here should be strategic resilience by reducing critical dependencies and aiming for higher self-sufficiency.

Develop “Resource-Aware” AI Infrastructure Zones

While the national Data Centre Strategy already aims to improve site availability and energy access for new facilities, Germany should identify and actively promote locations where key enabling resources are already or easily available. Such an integrated resource-planning approach would help avoid future bottlenecks, improve planning certainty, and ensure that AI infrastructure develops in regions with favourable physical conditions.

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