Artificial Intelligence as National Infrastructure

Aspects and Approaches for Securing AI Infrastructure in Israel

Niv Shapira, Efrat Behar-Netanel and Gal Levant

MOSAIC
מכון למדיניות בינה מלאכותית

November 2025

Executive Summary

AI technologies are changing the world we know at a pace, scale, and breadth without precedent. They rest on unique infrastructures that demand enormous economic investment and solutions to spatial and energy problems needed to support those infrastructures. **The race to build these infrastructures is the "arms race of the 21st century."** Israel, despite high global rankings on AI indices, is ranked low in the AI infrastructure layers — physical infrastructure, data, and governance. To keep up and to continue holding its standing as a leader in AI, **it must devise a plan and allocate resources to secure these infrastructure needs and the energy needs that enable them.**

This paper presents an approach according to which **Israel must first acknowledge its infrastructural limitations. Consequently, it must invest substantial resources in securing sovereign data centers for acute needs** (sensitive and classified information, ensuring operational continuity, and advanced research that requires physical access to the infrastructure); **and alongside this, build strong ties and partnerships with countries that possess strong infrastructural capabilities,** especially the United States, the Abraham Accords countries, and leading European countries. In this way it will secure direct, continuous, and subsidized Israeli access to AI infrastructures — including for uses that do not necessarily require high sovereignty.

To energetically support the local infrastructures — while accounting for policy, site conditions, and loads — **the state must encourage the establishment of storage facilities adjacent to data centers in the north and south, and the establishment of conventional generation facilities adjacent to data centers in the center.** This, together with **removal of the 125% regulatory generation cap** tied to the peak consumer consumption, so that these facilities can also supply electricity to the areas surrounding the data centers. Such a policy will enable "regional matching" of production and consumption, in a way that reduces effects on the transmission system and enables meaningful auxiliary benefits for the energy economy and the Israeli economy overall.

Alongside the investment in physical infrastructures, the state must preserve and develop human-capital resources and the operating environment in the technology fields, through grants, incentives, investment in academia, and setting the regulation.

2024 was the year in which governments more than tripled their AI investment, both economically and regulatory-wise. Yet Israel's AI investments remained low on a global scale. To preserve and improve its standing as a leader in the field, **Israel too must "enter the game" — establish the required infrastructures and secure access to AI infrastructures as national infrastructures.**

Key Recommendations

1. Formulating a national strategy. Israel's future in the AI era does not lie in its becoming an infrastructure super-power, but in positioning itself as a small, knowledge-intensive state that connects its human and technological advantages with local, regional, and international infrastructures. This combination, together with smart energy regulation and technology-trade agreements within a regional and global framework, will secure a leading standing in the era at hand.

2. Defining sovereign On-Premise infrastructure needs. Demand forecasts must be produced for the data centers designated to store the sensitive and classified information that must be kept within Israel's borders only. These forecasts will enable us to derive (I) the required data storage infrastructure scales, (II) the compute scales required to train AI models on that data, and (III) the required scales of supporting infrastructures (energy, construction land, connectivity, etc.). In line with expected demand, land preservation, accelerated planning procedures, and the required electricity infrastructure must be secured. It is important to stress that demand forecasts are expected to change frequently, and flexible update mechanisms must be created — both for the forecasts themselves and for the planning aspects.

3. Securing access to On-demand cloud infrastructure. Most uses do not require sovereign infrastructure in Israel, but they do require guaranteed access to substantial compute and storage resources. To meet these demands, the state can secure — through G2G (government-to-government) and G2B (government-to-business) commercial agreements — a certain quantity of compute resources in foreign countries: resources reserved for Israeli companies and bodies, guaranteeing Israel preferential allocation in availability and cost-effectiveness. The "Abraham Accords" can be leaned on as a basis for strategic partnerships with the UAE, Saudi Arabia, and other countries of the region. Such a combination can position Israel as a regional key player providing expertise and human capital and receiving preferential access to data centers.

4. Accelerating development of the energy sector. To secure appropriate electricity supply for local data centers, it must be ensured that data centers do not become a burden on the energy economy but rather a lever for national energy policy, through integrated infrastructure planning. Thus, storage facilities will rise adjacent to data centers in the north and south, and conventional generation facilities will rise adjacent to data centers in the center; and — with regulatory adaptations — they will also be able to supply electricity to areas adjacent to the data centers. In general, the development of the Israeli energy sector must be accelerated to ensure meeting future demand targets deriving from AI and from the technologies to come in its wake.

5. Data infrastructures. The unification and accessibility of the public information databases must continue to be advanced, and in particular those unique to Israel. Also, large parts of the governmental information systems must be unified and connectivity between them enabled, in order to begin the integration of AI systems within them. Alongside this, work must continue on arranging the regulatory field concerning the use of data in AI systems and the use of data created by AI systems. This, while considering regulatory compatibility with Israel's key partners, and in particular Europe and the United States, and considerations of innovation versus preservation of information security.

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1 Introduction

Artificial intelligence is a disruptive technology that produces breakthroughs in almost every field — in medicine, in industry, in science, in education, in agriculture, and in defense systems. It enables automation, prediction, decision-making, streamlining of processes, and acceleration of scientific and technological innovation. Its economic impact is expected to be enormous — from growth in labor productivity to the shaping of new markets. At the same time, AI also has unique infrastructural requirements. First and foremost, huge compute volumes, high bandwidth for real-time connectivity, accessible and structured data reservoirs, and above all — an unprecedented scale of demand for energy. An economy based on artificial intelligence rests on robust physical and digital infrastructures. Therefore, in order to realize AI's potential, governments are required to identify and invest in critical infrastructures — from securing access to high-performance compute power to the supply of energy and rapid communications.

AI has created a new digital divide: states that possess the compute power needed to build advanced AI systems, and states that lack these capabilities. This divide shapes the global balance of power and the global economy. To secure broad, stable, and sovereign access to the required infrastructures, various approaches are being taken. Among the central alternatives: direct government investment in national infrastructures; public–private partnerships for joint building and operation of infrastructures; use of international commercial cloud services with remote access; participation in regional or international infrastructure initiatives; and hybrid models that combine local infrastructures with access to external platforms alongside adapted regulation.

Israel entered the AI era as a hi-tech power and is ranked high in its readiness for it, especially thanks to substantial investments in the private sector.[1] But developments in the field are especially rapid, and to preserve its standing — and even to number among the leading countries in it — it must invest resources in supplying the required infrastructures in aspects of energy, storage and data-processing components, and data-transfer infrastructures. Thus, in order to secure Israel's economic and technological standing in the new era, in the face of geopolitical and budgetary challenges, a sensible infrastructure policy is required — one that prioritizes investments according to national goals and that ensures access to the resources required for the coming years and decades.

Recently, Israel received a wake-up call in the form of announcements about the blocking of Unit 8200's access to Microsoft cloud services.[2] This event highlights the acute need of the state to rely on sovereign infrastructures for certain needs, and in parallel to ensure convenient access to efficient, low-cost, and innovative AI infrastructures for other needs. Above all, it emphasizes that AI infrastructures must be treated as first-order national infrastructures — safe and continuous access to these infrastructures is not a luxury, but a vital national need.

In this document we review the physical infrastructures required for developing, establishing, and deploying ("going live") AI systems, and the global trends. We examine Israel's strengths and weaknesses in the field in light of its unique characteristics, and where it must invest resources to enable the continued successful development of AI within its borders. The main scale that will stand for examination in this review is local–external (or in other phrasings: build–buy / sovereign–international), that is: what

1. Oxford Insights, Government AI Readiness Index 2024; Tortoise, The Global Artificial Intelligence Index 2024.
2. News Agencies, "Microsoft Blocked Unit 8200's Access to Some of the Cloud Services Storing Palestinians' Conversations," 2024.

are the requirements and scopes for local-sovereign infrastructure, mainly in the infrastructure and data layers. We will examine this across four central uses: industry and entrepreneurship; research and development; national-civilian; and national-security.

The Mosaic Institute for AI Policy (a non-profit) works to shape and promote a vision and a roadmap for securing a future in which AI serves as a positive force that serves all citizens of Israel. We believe that this document presents the infrastructural logic required for Israel to thrive in the AI era, and that adoption of its recommendations will advance the ability to use AI systems for civilian, national, and security purposes in the state.

2 Theoretical Background: AI Infrastructure

AI systems have been circulating in the technological world for many years, but in recent years we have witnessed their surge and their integration into many aspects of our lives. These systems are already driving deep changes in society and the economy — a trend expected to intensify as they continue to develop. Because they are learning systems, they embody demanding infrastructure requirements, including: especially powerful accelerators, vast storage capacity, and fast, secure connectivity. All this, in order to continue to learn and develop. The infrastructures in question consume large amounts of electricity, have a high physical footprint, and require enormous capital investment.

The AI Stack

Like any technological system, AI systems are built from hardware and software, but they have several intermediate layers:

1. Infrastructure layer: The infrastructure of AI systems is built from three central components — *accelerators* (which, as their name suggests, accelerate computations); data storage units; and communication networks for data transfer. Because of the enormous data volumes required by AI systems, and the complex computations performed on them, the accelerators must be especially powerful, the data storage units must be especially large, and the data-transfer networks must have low latency and high bandwidth.
2. Data layer: The data that AI systems handle can be especially large and lacking orderly structure — for example: raw text, images, video and audio, and even information such as data from medical sensors, from car or refrigerator sensors, and in fact from any sensor whatsoever. Because of this, appropriate storage capabilities and pre-processing of the data are needed (for example: removing duplicates and standardization). Likewise, in some systems there is a need to label the data (that is, to add information or descriptions that classify it). Finally, the data must meet privacy and information-security standards through encryption, compartmentalization, and de-identification (anonymization).
3. Model development and training layer: In this layer the system learns how to perform certain actions based on the data from the data layer. In other words, this is the layer in which the model is trained. Within it, the system also feeds additional information that it processes into the data layer, creating a loop between these two layers. These operations are carried out using machine learning algorithms and tuning of the model's parameters, in order to achieve the best possible results.
4. Model deployment layer: In this layer the model is wrapped in a format that enables access to the trained model, such as an API — Application Programming Interface (an interface that enables different software programs to communicate with one another), an application with a convenient and intuitive user interface, or some other service. In this layer the trained model can already be used — that is, fed new information and asked to produce an output through a process called inference.
5. Governance layer: This is the layer that oversees the operation of the AI system. It examines whether the system operates in a responsible and ethical manner, in accordance with the rules of the state and

the organization (for example: privacy laws in the use of data), and whether it is fair, has certain biases, and so on.[3]

Infrastructure and Data Layers

1. AI infrastructure and the data it requires

AI systems rely on vast amounts of data that grow and change constantly, and they constitute learning systems that develop continuously and demand high compute capabilities. This, in contrast to IT (Information Technology) systems, which operate on smaller and more stable databases, develop at a much slower pace, and require far lower compute capabilities. Accordingly, AI systems have unique infrastructure needs in several respects:

- Compute capabilities: dedicated, powerful accelerators capable of handling multiple computations simultaneously. Many organizations use cloud services that provide access to these accelerators according to the organization's needs.
- Storage solutions: because of the common reliance on unstructured data, such as images, video and audio, which consume especially large storage volumes that traditional storage solutions cannot handle, dedicated solutions are required. These include special forms of storage and retrieval as well as storing the information across multiple devices, in order to ease access to the data and increase access speed.
- Communication and data transfer: because of the enormous amounts of information passing through AI systems, networks with high bandwidth and low latency are needed, in order to preserve the efficiency of learning and reduce delays between the various components on which the system runs. To this end, advanced communication management solutions and physical data-transport infrastructures capable of supplying these needs are required. In addition, to transfer data between different regions and between compute infrastructures and consumers, fast and broad local and international communication infrastructures are needed.[4]
- Ancillary infrastructures: the infrastructures in question emit high heat and therefore require powerful cooling facilities. To this must be added supporting systems — generators, UPS units and the like — as well as infrastructure and personnel for security and maintenance.
- Energy: all the above components consume energy, and a great deal of it. According to a report by the International Energy Agency, in 2024 data centers consumed about 415 TWh (terawatt-hours), which is about 1.5% of world electricity consumption. By 2030 they are expected to double their annual consumption to 945 TWh — a scope slightly higher than Japan's total annual consumption today, and about 3% of world electricity consumption. There are even estimates that consumption will reach 1,500 TWh in that year — about 4.5% of global consumption.[5] As of today, compute capabilities (including certain data storage) consume on average 60% of the electricity in data centers, storage solutions consume about 5%, communication equipment about 5%, cooling

3. Cole Stryker, "What Is an AI Stack?"
4. AI21labs, "What Is AI Infrastructure?"
5. IEA, Energy and AI, 14.

systems 7%–30%, and there is additional equipment that requires electricity such as lighting and UPS units.[6]

Today, these data centers are the common infrastructural structure for AI needs. They have existed for years as centers that store data, but in the AI era they are gradually becoming ones that also perform complex computations, for training models and running inference from them. Such updated centers, which focus on computation rather than storage, function more like supercomputers, or by another name: high-performance computing (HPC). Therefore, it may be more accurate to call them "compute centers," or by the name coined by Nvidia's founder and CEO Jensen Huang, "AI factories."

Admittedly, the infrastructures required for data centers and for compute centers are similar (racks of compute components, cooling systems, connectivity and more), but there are several significant differences: first, the compute components themselves differ — mainly storage servers in data centers, versus a large scale of processors and powerful accelerators in compute centers. Second, data centers and compute centers that provide AI inference services require maximum uptime, in order to supply services at every given moment and especially in critical times. Uptime gaps of tenths of a percent can increase the capital investment in them by thousands of dollars. In contrast, compute centers that train AI models do not require such uptime, since they do not provide services to users in real time, and mostly perform a backup every half hour.

Thus, in data centers there will be large capital investment in UPS systems and in electricity-supply backups, in order to prevent situations of malfunction, alongside relatively small investment in compute components. Conversely, compute centers for training models require very large investment in compute components, but almost do not require infrastructures that ensure high uptime. Likewise, in compute centers for AI training, information passes more frequently within the compute centers themselves. This, in contrast to classic data centers and to compute centers for AI model inference, in which there is more information traffic between the centers and the users. This phenomenon too requires different capabilities of connectivity infrastructures.[7]

Despite the differences between the centers, for the sake of convenience, in this document we will refer to all types of centers as "data centers."

2. AI Infrastructure Deployment Models

The common term used to describe a convenient deployment form for the use of compute infrastructures is **"cloud."** It describes a deployment model of infrastructures and systems that enables convenient access, available at any time and on demand, to a shared pool of compute resources, which are allocated to the user with minimal effort on the part of the service provider.[8] In light of the high infrastructure demands that AI systems place on their developers, owners and users, not every individual or organization can build a dedicated AI infrastructure — that is, a dedicated private cloud — and it is customary to use a

6. IEA, Energy and AI, 52–53.
7. Giorgio Sbriglia, "Data Center Design Requirements for AI Workloads: A Comprehensive Guide."
8. Mell and Grance, SP 800-145. The NIST Definition of Cloud Computing.

number of models for accessing these infrastructures. Broadly speaking, there are five main models for deploying AI infrastructures:

- Private cloud: a dedicated environment in which the resources and services of the cloud are allocated to a single organization.
  - Dedicated private cloud: a model in which the organization controls all the infrastructures on which the system operates — the site, the external structure, the compute components, the personnel, etc. We will refer to the case in which these infrastructures are located in a physical location adjacent to the organization's seat (on-premises).
  - Rented private cloud (Colocation): a model in which the organization rents racks in another organization's data center, and installs its own compute components in them — the processors, the accelerators, the communication components, and so on.[9]
  - Private cloud on public infrastructure: a model in which the organization pays for all, or at least a large part, of the services provided by a public cloud (see below), including hardware and software, but receives a private environment dedicated to its unique needs. This can provide varying degrees of sovereignty — from an environment isolated by encryption, through the choice of the physical location of the infrastructures (from given options), all the way to the use of an environment completely separated from other environments, which provides a degree of sovereignty similar to a rented private cloud.[10]
- Public cloud: an environment in which the cloud's resources and services are divided among a large number of users. In a public cloud, an external organization manages and controls the cloud's resources. Usually, the mode of use in this model is on demand (on-demand, or Pay as you go) — that is, payment is made when a need arises (for example, payment by the hour or by data volume). It should be noted that in this case too the users receive a private environment, but the settings of this environment are limited and supplied as an off-the-shelf product, compared with the dynamic and dedicated settings in the case of a private cloud on public infrastructure.
- Hybrid model: a model that combines several models — for example: using a dedicated private cloud for the most sensitive information, and a private cloud on public infrastructure for less-sensitive information. Or: using a private cloud for storing the information, and a public cloud for processing it.[11]

Each model has its own advantages and disadvantages, as generally detailed below:[12]

9. Paul Kirvan and Brien Posey, "Colocation (Colo)."
10. Google Cloud, "Sovereign Cloud."
11. Google Cloud, "What Is a Private Cloud?"
12. Syed et al., "Artificial Intelligence as a Service (AIaaS) for Cloud, Fog and the Edge," tbl. 4; Google Cloud, State of AI Infrastructure, 36–44.

Model	Advantages	Disadvantages
Dedicated Private Cloud	• Full control over infrastructure, information security, and deployment. • Full privacy and customized solutions.	• Difficult to execute at large scale. Expensive to maintain and requires high upfront investment. • Requires extensive professional knowledge, ongoing maintenance, and large amounts of data. • Local infrastructure requires much physical space and high energy demands.
Rented Private Cloud	• Relatively strong control over infrastructure, information security, and deployment. • Full privacy and customized solutions. • Does not necessarily require physical space and energy infrastructures like a dedicated private cloud.	• Difficult to execute at large scale. Expensive to maintain and requires high upfront investment. • Requires extensive professional knowledge, ongoing maintenance, and large amounts of data.
Private Cloud on Public Infrastructure	• Strong control over information security and deployment. • High privacy and customized solutions. • Does not necessarily require physical space and energy infrastructures like a dedicated private cloud. • Enables use of advanced services and technologies.	• May contain information-security risks. • High ongoing operating costs.
Public Cloud	• Low to negligible initial cost. • Enables access to compute components as needed. • Enables use of systems that have already been trained. • Minimal maintenance. • Requires relatively little professional knowledge.	• Little flexibility and customization. There may be privacy and information-security issues. • In the long term, operating costs may accumulate and swell.
Hybrid Model	• Relatively low cost. • Improved flexibility and customization.	• May be complex in designing the architecture of the system and in its implementation, as well as in maintaining the connection between inside and outside.

Model	Advantages	Disadvantages
		• May be complex in managing workloads.

3. AI Sovereignty

Following the ever-growing demand for AI systems, and hence for the infrastructures that support them and particularly for the accelerators, control over these infrastructures grants states strategic geopolitical influence as well as independence, privacy and security in the use of AI systems, or in other words — AI sovereignty. Many countries are investing enormous efforts in achieving this sovereignty, in what is called "the arms race of the 21st century."[13]

The combination of the two concepts — sovereignty in the cloud — can be defined as the degree of control that an organization has over the services and resources of the cloud.[14] This can be expressed in different layers of the AI stack, in a manner that embodies different levels of sovereignty. We will now examine them:

1. Data sovereignty: control over the data stored in the cloud. This is usually achieved through encryption of the data, in such a way that the consumer is the only one who can decrypt it. Data sovereignty enables both preservation of information security and privacy, and compliance with the regulatory rules set by the state. However, if one settles for this sovereignty layer, which relies mainly on encryption, there is a risk that the encryption wall protecting the data will be breached relatively easily.
2. Compute sovereignty: in the "arms race of the 21st century," the reference is mainly to the race to achieve compute sovereignty. This requires the largest resource allocation and the highest costs, in an attempt to control, as much as possible, the hardware components on which the cloud operates. In an article by Hawkins, Ledonvirta and Vu of the University of Oxford,[15] the concept of compute sovereignty is divided into three levels: (I) the extent of AI processing capabilities located within the state's borders, so that its regulatory span of control applies to them; (II) the degree to which the companies that own the AI data centers are registered under the state. Such registration enables both a certain regulatory span of control and the prevention of sovereignty-endangering actions such as "by-the-book" espionage; (III) the degree to which the companies producing the AI accelerators are registered under the state. Here too, this influence can be used to activate regulation (for example: the American legislation that prevented Nvidia from selling chips to China), or even to "adapt" the chips in order to achieve certain intelligence outcomes.
3. Software sovereignty: control over the software running in the cloud, from the point of view of the AI stack. This can be expressed in the model training and model deployment layers, as well as in the cloud control system.[16]

13. Mairéad Pratschke, "The Global Pursuit of Sovereign AI Is Becoming the 21st Century's Arms Race."
14. Pieter-Jan Nefkens, "Digital Sovereignty / Sovereign Cloud Explained."
15. Hawkins et al., "AI Compute Sovereignty."
16. World Economic Forum, "What Is Digital Sovereignty and How Are Countries Approaching It?"

| AI sovereignty in a global system

In practice, the data-center market (cloud services) is controlled by six giant companies: the American AWS (Amazon), GCP (Google) and Microsoft Azure (Microsoft), and the Chinese Tencent Cloud, Huawei Cloud and Alibaba Cloud (alongside additional companies such as IBM and Oracle, which are growing stronger in the field). This leads other countries to choose between cooperation with American companies or Chinese companies, or both — decisions carrying heavy political and strategic implications.

In the accelerator market, the American NVIDIA controls about 80%–95% of the market, with Intel and AMD as marginal competitors. However, the production of semiconductors — the materials from which the accelerators are built — takes place 90% in Taiwan by Taiwan Semiconductor Company (TSMC), and these in turn rely on lithography equipment (technology for producing chips) supplied by the Dutch company ASML.

This long, international supply chain makes it difficult to have full control over the production of accelerators, even in the countries with the highest compute sovereignty (namely, the U.S. and China). In addition, in cases where such control does exist (as in the case of not selling NVIDIA's accelerators to China) and regulatory power is applied, this may spur countries to begin an independent chip-production process (as the Chinese government is doing through the companies Huawei and SMIC).[17]

4. Units of measure and the relations between them

When referring to data centers, they are usually measured by their electrical power in **watts (W)**, or on the scale of data centers — usually in **megawatts (MW)**. However, this metric does not express the compute and storage capabilities of the data center. These vary according to the capabilities of the equipment located in the data center. There are, for example, data centers that mainly store information and have low processing capabilities, and in contrast, centers with very high processing capabilities but little information storage. Likewise, together with technological developments, the electricity consumption of each of the components within the data center changes. Thus, a 30 MW data center enables a constant capacity of 30 MW, but the configuration of the components within it can change according to developments and different needs, as long as it does not exceed 30 MW.

To measure advanced processing capabilities, one usually uses the unit **FLOPS – Floating-point operations per second**, that is: the number of computations (of very large or very small numbers) that can be performed in one second. On the scale we are dealing with, the reference is usually to **TFLOPS** or **PFLOPS (tera/petaFLOPS)**. Thus, for example, the A100, one of NVIDIA's advanced GPUs, is capable of running 312 TFLOPS.[18]

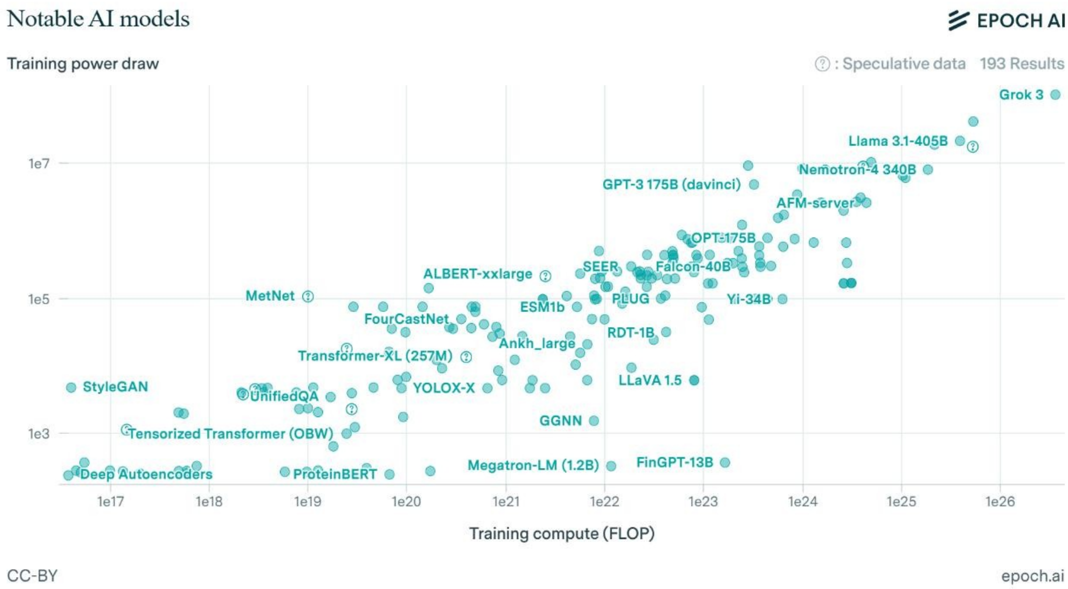
To measure data storage capacity, one uses the unit **byte**, and on the scale of data centers **terabytes or petabytes (TB/PB)**. Thus, for example, the music-streaming service Spotify stores about 460 PB.[19]

Although the conversion between the different units of measure is not direct, there is a clear correlation between them. As a rule of thumb, the greater the number of computations, or the larger the

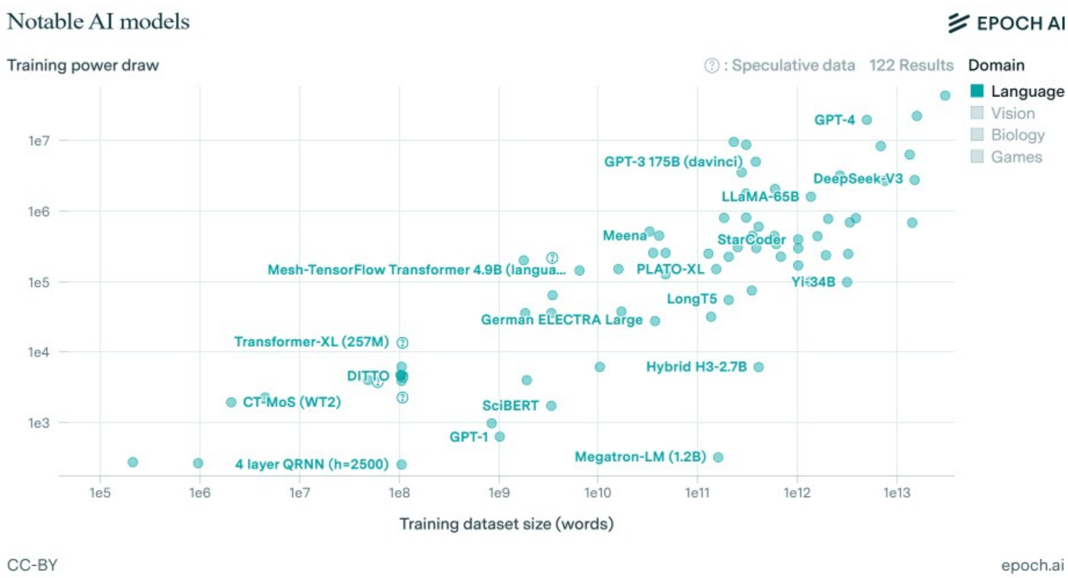
17. Hawkins et al., "AI Compute Sovereignty," 3–5.
18. SAUR News Desk, "Why Data Center Capacity Is Measured in Megawatts: SaurEnergy Explains."

scope of data on which the models are trained, the greater the electricity consumption will be, and the relationship is linear:

Electricity consumption as a function of the number of computations for training notable models[20]



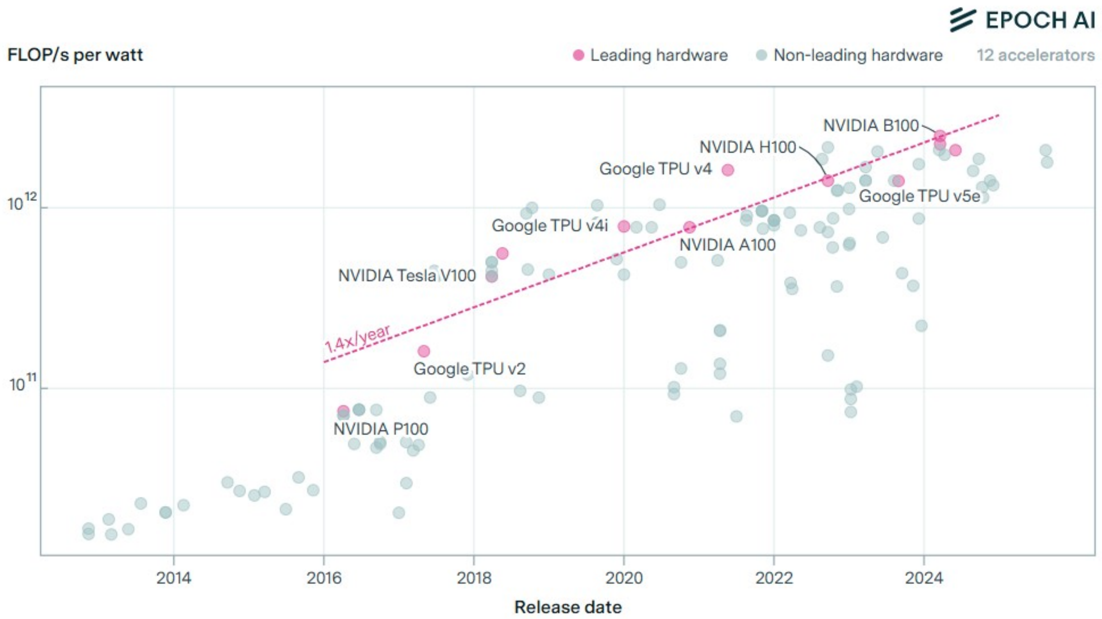
Electricity consumption as a function of the scope of data for training notable models[21]



That said, in recent years technological developments have led to significant efficiency improvements, with the chips leading in machine learning becoming more efficient (in the FLOPS-per-Watt ratio) by 40% every year.[22]

19. Vishnu Jayan, "How Many Terabytes Are In A Data Center? Exploring Storage Capacities in Modern Enterprises."
20. Epoch AI, "Data on AI Models."
21. Epoch AI, "Data on AI Models."
22. Epoch AI, Leading ML Hardware Becomes 40% More Energy-Efficient Each Year.

Accelerator efficiency (FLOPs/Watt) — number of computations per second per one Watt of power, as a function of the accelerator's release date[23]



23. Epoch AI, Leading ML Hardware Becomes 40% More Energy-Efficient Each Year.

3 Economic and Regulatory Aspects: Costs and Regulations in Israel

In the following chapters we survey the various strategies adopted around the world, the characteristics of the various sectors in Israel, and the deployment models suited to each sector. Before that, however, we must weigh the economic and regulatory constraints facing the various models. We focus on costs and regulations bearing on the question of whether to choose local infrastructure (within Israel's territory) or external infrastructure (outside Israel).

Costs: local and external data centers

The costs of the various models are difficult to estimate. They change constantly in response to technological developments, regulatory changes, precise needs, and supply and demand. Furthermore, each of the models we have proposed is only a "meta-model" containing many configuration possibilities, each of which is priced differently and whose pricing changes constantly. Therefore, as noted, we focus on the costs of local versus external infrastructure.

1. Total Cost of Ownership — TCO

Total Cost of Ownership (TCO) is the calculation of the direct and indirect costs of any asset over the course of holding and operating it. It can be divided into capital expenditures (CapEx) — used for purchasing, upgrading, or preserving assets in order to generate future profits; and current or operating expenses (OpEx) — required for daily use of the asset. Below we list some of the components of the TCO of AI infrastructure (both private and public):

- CapEx
  - Acquiring the right to use a land unit: purchasing a parcel of land on which the establishment of a data center can be advanced.
  - Planning and construction of the structure and facilities required for the data center: architectural planning, building permits, construction, operation, and all attendant payments.
  - Acquisition of facilities and mechanical and electrical equipment: generators, UPS units, ventilation and cooling systems, and so on.
  - Computing equipment: processors, accelerators, and drives for storing data. This equipment typically has a lifespan of 3–5 years,[24] which requires a large expenditure to renew it every so often.[25]

24. Tim Day and Nam D. Pham, Data Centers — Jobs and Opportunities in Communities Nationwide, 7.
25. INTUVA, "An Overview of Data Center Costs (All You Need to Know)."

- OpEx
    - Electricity: mainly for the computing equipment and cooling systems.
    - Personnel: security, computing staff, operational staff, and so on.
    - Taxes.[26]
    - Maintenance: component replacement, fault handling, and so on.
    - Subscription to cloud services and to systems: for public-cloud services, as well as for ready-made AI systems or software supporting operations.
    - Data transfer: the price of internet networks, including **data egress fees** — a fee on data egress from the cloud, which can grow very large in non-local clouds.[27]

In general, deployment models that entail high sovereignty — such as a dedicated private cloud or a leased private cloud — require high CapEx and low OpEx, which over the long term add up to a lower TCO, at the cost of high risk in cases of damage to the infrastructure, or high upgrade prices due to the need to keep pace with innovation. On the other side, deployment models that entail low risk — protection from damage, ease of use, and the ability to adapt quickly to innovation — such as public cloud, require low CapEx and high OpEx, which may result in a higher TCO over the long term, as well as a lower degree of sovereignty.[28]

2. Construction costs of a data center

The establishment of a data center includes, roughly, the following costs:

- CapEx: the capital expenditures for a general data center include the costs of purchasing land, constructing the building, building the electrical and cooling infrastructure, purchasing the computing equipment, and security infrastructure. These expenditures are estimated at about $10M/MW (ten million dollars per megawatt), although this estimate may be higher for AI-oriented facilities, which may require above $20M/MW.[29]
- OpEx: the operating expenses include maintenance costs (about 40% of OpEx), electricity consumption (15%–25%),[30] personnel, data-transfer costs, and software (there are estimates with different variables presenting a different ratio).[31] In a rough, top-level estimate of orders of magnitude, given an electricity price in Israel of $0.097 per megawatt,[32] we obtain an annual cost of $849,720/MW. Assuming that electricity consumption accounts for about 20% of OpEx, we obtain a total annual cost of $4.2M/MW.

When such a data center is established, it can be used as a dedicated data center for a given organization; racks in it can be leased under the leasing model; parts of it can be provided as ready-made infrastructure for a private cloud on top of public infrastructure; and it can even be used as a fully public-cloud infrastructure.

26. Tim Day and Nam D. Pham, Data Centers — Jobs and Opportunities in Communities Nationwide, 7.
27. Lauren Morley, "When to Choose Private Cloud Over Public Cloud for Big Data."
28. Netris, "Cloud Strategies for the Best Cost and Results: Public vs Private vs Hybrid Cloud."
29. Thunder Said Energy, Data-Centers: The Economics?
30. Thunder Said Energy, Data-Centers: The Economics?
31. Thunder Said Energy, Data-Centers: The Economics?
32. GlobalPetrolPrices.Co, "Israel Electricity Prices."

3. The time frame in which pay-per-demand becomes more expensive than construction

In terms of the net economic cost of purchasing computing equipment or building a data center, versus using them on-demand — the first alternative becomes cheaper within a relatively short period of time. For example, the purchase of an Nvidia H100, one of the most powerful accelerators in the industry at the time of writing, becomes cheaper than on-demand use within 10–15 months.[33] In a Lenovo survey of a server with eight H100 accelerators operating 24/7, including expenditures on infrastructure accompanying the accelerators, over five years one can save $2.52–3.43 million dollars through investment in local infrastructure. It should be noted, however, that computing components become irrelevant within 3–5 years.[34]

4. Costs of using a local versus external public cloud

Beyond the needs of sovereignty and innovation, which will be detailed later in the chapter, there are several economic factors that an organization must take into account when it chooses whether to use local or external data-center infrastructure. This infrastructure, like any infrastructure, is subject to the influences of the local and global economy. Therefore, the costs of using it vary according to the geographic region in which it is located, even if it belongs to the same company. We present below a comparison of the service costs of Amazon's AWS cloud, on the assumption that the trends reflect those seen among other cloud providers:

- Data-egress costs: while bringing external data into a local cloud is usually a free operation, egress of data in large volumes can be very expensive, especially in Israel. The reason for this is that data-egress costs incorporate the costs of establishing and using the communication lines between the various regions in a manner that is immediate and continuous at all times, and these costs vary between different regions.[35] An analysis of data-egress costs from AWS in Israel to the internet shows these to stand at $0.055/GB – $0.11/GB, and to be 22% higher than in Europe and the US. Likewise, transferring data from AWS's Israeli cloud region to most other AWS cloud regions costs $0.08/GB, four times that in Europe or the US.[36]
- Storage and compute costs: these are higher in Israel than in the US and parts of Europe, and lower than in other parts of Europe. Thus for example, in the AWS cloud, standard storage costs in Israel are about 9% more expensive than in the US and Ireland, but about 7% cheaper than in Zurich; advanced storage (EBS) costs are about 32% more expensive than in the US and about 20% more expensive than in Ireland, but about 8% cheaper than in Zurich; and standard compute costs are about 19% more expensive than in the US and about 5% more expensive than in Ireland, and about 6% cheaper than in Zurich (see the full table in Appendix 1).[37]

33. TRG Datacenters, "NVIDIA H100 Price — Is It Worth the Investment?"
34. Lenovo, On-Premise vs Cloud: Generative AI Total Cost of Ownership.
35. Kevin Bogusch, "Cloud Data Egress Costs: What They Are & How to Reduce Them."
36. Amazon EC2 On-Demand Pricing, "Data Transfer."
37. Avi Keinan, AWS Region in Tel Aviv, Israel — Price Comparison versus Other Regions.

In sum, insofar as public-cloud use is concerned, there are places in the world where storing data and performing computations on it is considerably cheaper than the cost in Israel — in particular, in Ireland and the US.

5. Energy consumption of computing components and support systems

The pace of chip development and their energy efficiency makes it difficult to set a consistent estimate of electricity consumption volumes. This creates a challenge in formulating forecasts of global energy demand. In order to gauge current electricity consumption for an advanced computing component, we take the Nvidia H100 accelerator as a case study for the energy needs of accelerators (the central component of AI infrastructure). One such component consumes about 700W.[38]

Power Usage Effectiveness (PUE) is the metric that examines the excess electricity consumption of a data center for each unit of computation. A PUE of 1.0 represents perfect efficiency — when the data center's electricity consumption stems solely from the electricity consumption of the computing components within it. At a PUE of 1.5, for every watt the computing units consume, the data center consumes 1.5 watts — 50% more than the consumption of the computing components within it. As of July 2024, the average PUE at data centers stands at 1.56.[39] Google reported a PUE of 1.09 at its data centers in 2024–2025.[40]

Combining the figures, then, per H100 accelerator the average power required in a data center is 1,092W — which entails a monthly consumption of about 800kWh (kilowatt-hours), slightly less than that of an average household in Israel (903kWh).[41] In the best case, if we take Google's figure as the minimum power, we obtain 763W and monthly consumption of about 560kWh, slightly more than the bi-monthly consumption of an average household in Israel.

That is, the support systems for computing components currently consume about 50% of the electricity consumption of the computing components themselves, which, as we saw, is itself quite high. There is also a need for backups in case of power outages, with the scope of the backups depending on the type of data center and its intended purpose.

Regulations on transferring data outside Israel and on establishing foreign-owned data centers in Israel

Before we can examine the suitability of the various deployment models for Israel, we must take stock of the main constraints currently facing anyone who wishes to work with large and sensitive databases needed for operating AI systems in certain sectors and for certain purposes. In particular, we consider the restrictions on transferring data outside Israel, whether for storage or for use.

Today, the Privacy Protection Regulations (Transfer of Data to Databases Outside the Country's Borders), 5761–2001, provide that: "a person shall not transfer information and shall not allow the transfer of information from a database in Israel to outside its borders, unless the law of the country to

38. TRG Datacenters, "NVIDIA H100 Power Consumption and Its Impact on High-Performance Computing."
39. Data Center Average Annual Power Usage Effectiveness (PUE) Worldwide from 2007 to 2024.
40. Google Data Centers, "Growing the Internet While Reducing Energy Consumption."
41. Electricity Data, "Publications on Electricity Consumption in Israel."

which the information is transferred ensures a level of protection of information that is not less, with the necessary changes, than the level of protection of information established under Israeli law," this, apart from a number of exceptions, among them — the consent of the data subject, information that has been published publicly and with authorization, information that is necessary to transfer in order to safeguard public security, and so on. Likewise, information may be transferred if the recipient of the information undertakes to observe the Israeli privacy-protection rules, including if the information is transferred to an organization controlled by the owner of the database.[42]

The list of countries approved for the transfer of information includes all countries that are signatories to the European Convention for the Protection of Individuals with regard to Automatic Processing of Personal Data (Convention 108), and accordingly — all EU member states. It should be noted that the US is not on this list.

Alongside all of these, there are also sectoral regulations. Thus, for example, the Bank of Israel does not permit banks to store data in a cloud located outside the country's borders, unless the cloud-service provider meets binding regulations.[43]

It should be noted that, according to a guidance on the application of the Privacy Protection Law to AI systems, "the provisions of the Privacy Protection Law apply not only to personal information that is fed into an artificial intelligence system — but also to personal information that the system infers from the data fed into it." Likewise, "the existence of a legal basis must be verified as a condition for processing personal information in each of the stages of an AI system's life cycle, including the development and training of models and the use of the systems for actual data processing."[44]

An important point is that, from the standpoint of Israeli regulation, there are no regulatory differences between Israeli data-center providers and foreign ones. This is aside from the requirement to undergo a review of national-security aspects for foreign investments.[45] Despite this, each case is examined on its merits, and additional restrictions may appear in the terms of the agreement. For example, in the framework of the Nimbus project tender for setting up data and AI infrastructure for the Israeli government, which was won by Google and AWS, it was stated that the companies cannot withhold services from the government, whatever the services may be.[46]

42. Ministry of Justice, Privacy Protection Regulations (Transfer of Information to Databases Outside the State's Borders), 5761–2001.
43. Amit Dat and Omri Rachum-Twaig, Israel — Data Transfers.
44. Privacy Protection Authority, Guidance — Application of the Privacy Protection Law to AI Systems.
45. Advisory Committee for Examining Foreign-Investment National Security Aspects.
46. Dan Swinhoe, Israel Government Says AWS and Google Can't Boycott Nimbus Project.

4 Deployment Models and National Strategies: International Overview

Now, having examined the various deployment models and the benefits of each, we turn to the deployment models and policies of selected countries. We do so in light of the distinctive characteristics of those states — their geopolitical requirements, geographic and demographic data, points of strength and weakness — and in light of their declared goals for their future in the world of AI.

Global trends

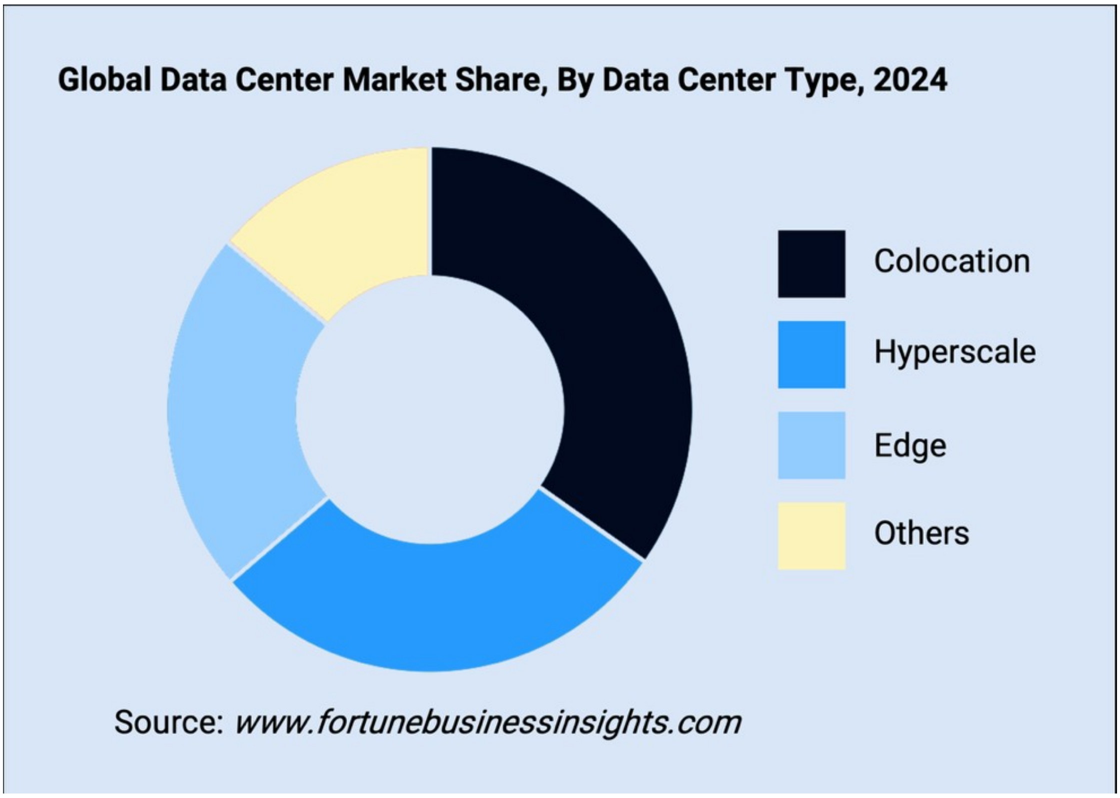
The global AI field is dominated, unambiguously, by two principal players — the United States and China. As of May 2025, the US holds about 75% of global supercomputing power, with China in second place at 15%.[47] Likewise, according to the Stanford AI Report for 2025, the US leads with 40 noteworthy AI models, compared to 15 for China (and three for the European Union). However, while in 2023 the performance gap between American and Chinese models stood at tens of percent, by 2024 it had almost vanished.[48] As for AI sovereignty, as we detailed earlier, there are six data-center giants — all American or Chinese — and only one giant that controls roughly 85%–90% of the global accelerator market, the American Nvidia.

In terms of the energy required, as noted, in 2024 data centers consumed about 415 TWh, roughly 1.5% of global electricity consumption, with forecasts of growth to 3% and even 4.5% of global consumption by 2030.[49] The global data-center market value stood at $269.79B in 2025, and is expected to more than double in the coming years, reaching $584.86B in 2032.

Broken down by deployment models, about 35% of data centers are dedicated to rack leasing (the colocation cloud model). About 30% belong to the Hyperscaler giants such as Google, Amazon and Microsoft, which offer public-cloud and private-cloud-on-public-infrastructure deployment models (alongside more dedicated solutions in certain cases). These data centers are expected to grow at the most significant rate. Another 20% or so are dedicated to edge compute, and the remaining share is dedicated to other models.

47. Epoch AI, The US Hosts the Majority of AI Supercomputers, Followed by China.
48. Yolanda Gil and Raymond Perrault, Artificial Intelligence Index Report 2025.
49. IEA, Energy and AI, 14; semianalysis, AI Datacenter Energy Dilemma — Race for AI Datacenter Space.

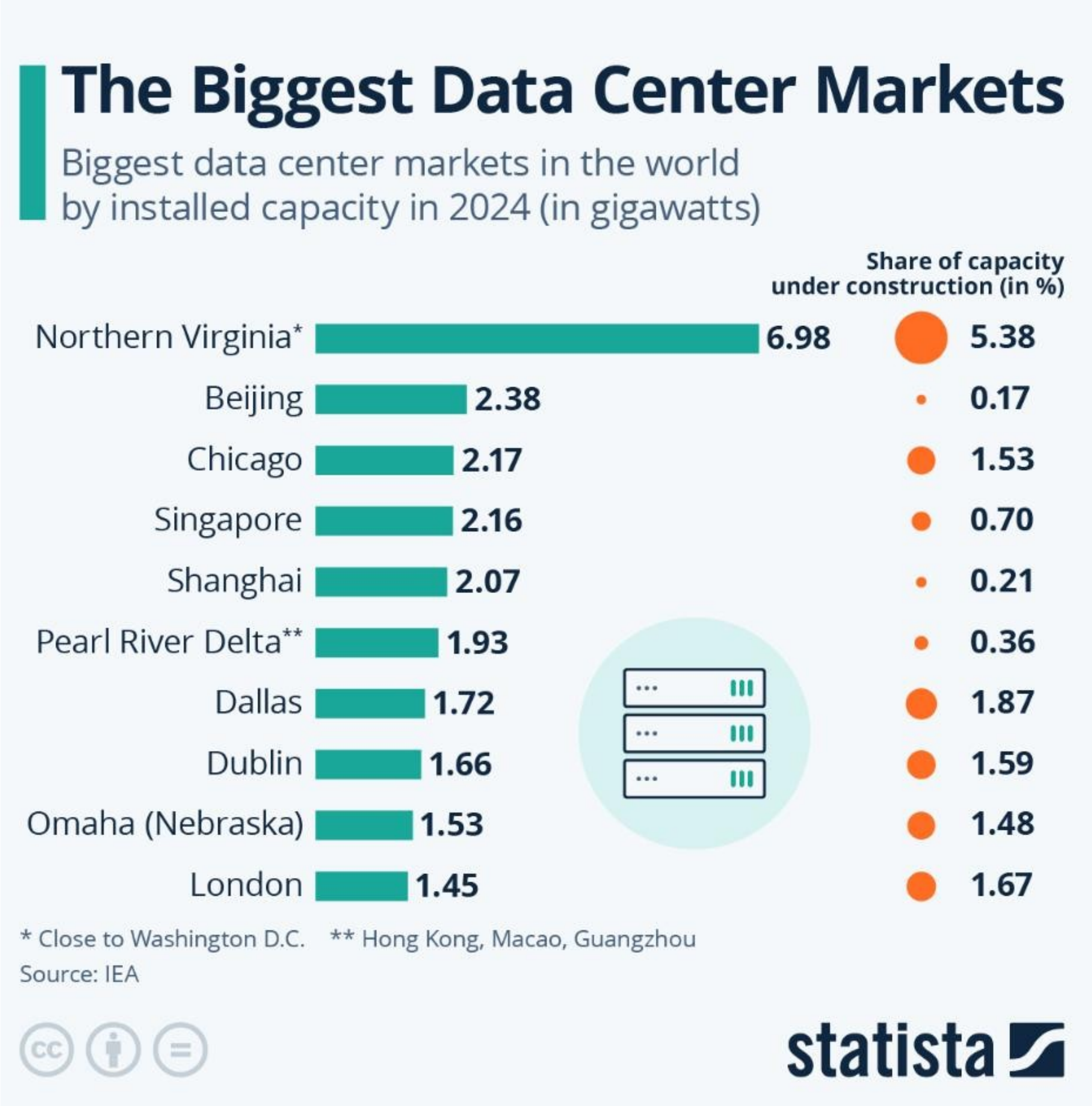
Global Data Center Market Share, By Data Center Type, 2024[50]



In the geographic distribution of data centers, North America leads: Northern Virginia is considered the highest-capacity data-center region in the world, at 6.98GW, followed by Beijing at 2.38GW, and then Chicago, Singapore, and others. Dublin ranks first in Europe and eighth in the world at 1.72GW. Aggregating the major US data-center regions — Northern Virginia, Chicago, Dallas, and Omaha — reached 12.4GW in 2024, roughly 21% of the total data-center capacity worldwide (59.58GW).[51] Aggregating the leading regions in East Asia — Beijing, Singapore, Shanghai, Hong Kong, Macau, and Guangzhou — summed to 8.5GW, about 14% of global capacity. Data centers in Dublin and London — the largest concentrations in Europe — together reached 3.11GW, about 5% of global capacity.

50. Fortune Business Insights, Data Center Market Size, Share & Industry Analysis, By Component, By Data Center Type, By Tier Level, By Data Center Size, By Industry, and Regional Forecast, 2025–2032.
51. Mordor Intelligence, Data Center Market SIZE & SHARE ANALYSIS — GROWTH TRENDS & FORECASTS UP TO 2030.

The Biggest Data Center Markets[52]

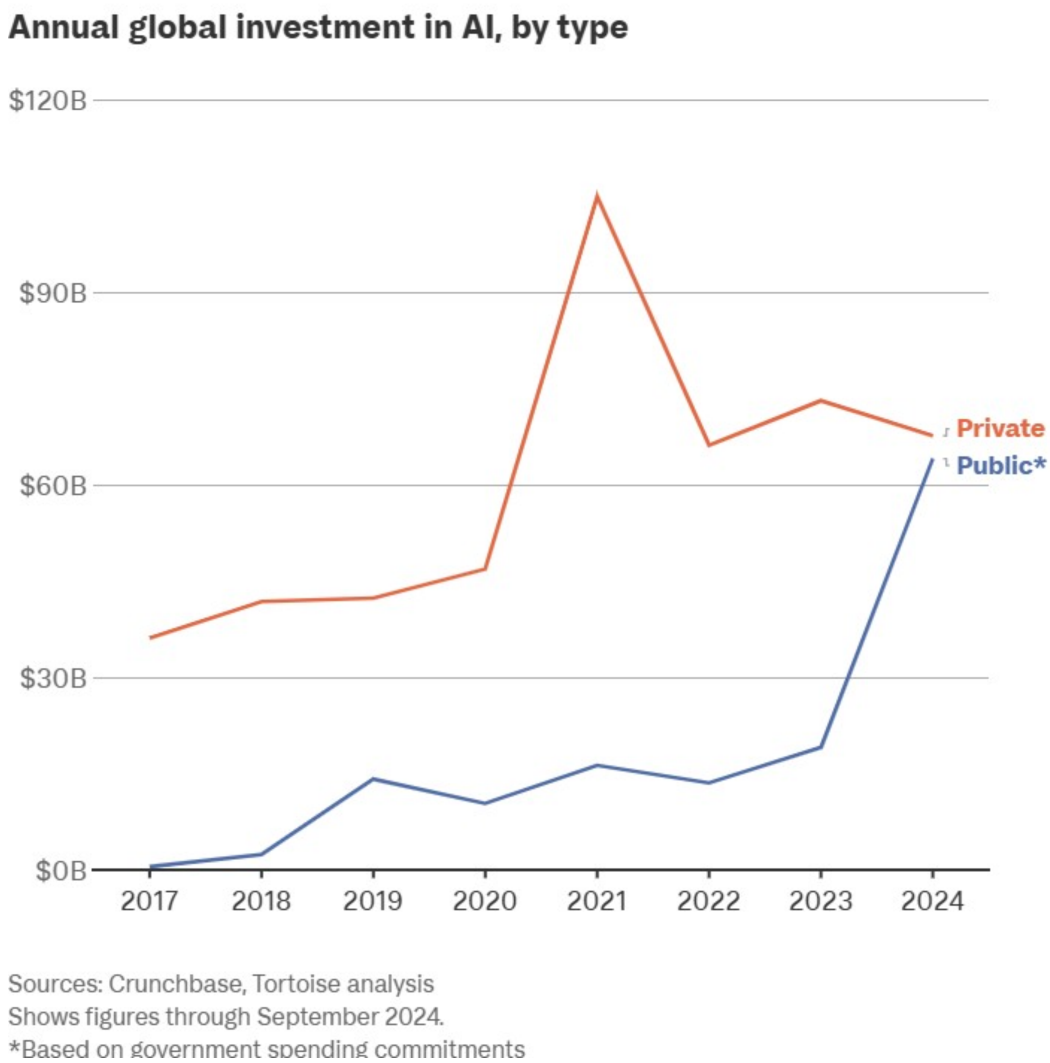


On the regulatory front, two extremes can be identified: the European Union, which enacted a broad and restrictive AI Act placing privacy protection and ethics in AI development as an explicit value; and the US, which favors an approach of setting principles and regulations for specific sectors while emphasizing the promotion of innovation in AI. Between them stands China, with rapid and flexible legislation that adapts to developments and with heavy government intervention in AI systems, in a manner that enables censorship and selective enforcement.[53]

Overall, 2024 is regarded as the year in which governments recognized the value and potential of AI, with a leap in government investment to $64B compared to only $19B in 2023 — while dramatically narrowing the gap between government and private investment to only $4B.

52. Anna Fleck, Which Regions Have the Biggest Data Centers?
53. Emmanuel Pernot-Leplay, Ph.D, The AI Dilemma: AI Regulation in China, EU & the U.S.

Annual global investment in AI, by type[54]



In light of these figures, the rest of the world's countries — those that are neither the US nor China — face a dilemma: how to position themselves as leaders in AI when competition on compute against the two giants is nearly impossible. Below we survey how four selected countries have chosen to cope with this reality.

Selected countries

United Kingdom

The United Kingdom is ranked fourth in Tortoise's AI Index for 2024, with high scores in the areas of talent pool, operational environment, research, government strategy and commercial environment, but relatively low in infrastructure and development.[55] Indeed, the UK has a large number of AI startups,

54. Tortoise, The Global Artificial Intelligence Index 2024.
55. Tortoise, The Global Artificial Intelligence Index 2024.

world-class researchers and universities, as well as data centers (most of them concentrated in the London area)[56] with a capacity of about 1.6GW and a value of $10.69B, expected to grow to $22.65B by 2030.[57] However, to a large extent, the UK owes its leadership to DeepMind, which was acquired in 2014 by the American Google and became the basis for its advanced AI models. For instance, 7.2% of citations in the top 100 papers in the AI field are of British researchers, but when citations of DeepMind research are excluded, the citation share drops to 1.9%.[58]

In 2021 the British government published its 10-year national AI strategy, in which it declared that the state aims to be "the best place to live and work with AI, with clear rules, applied ethical principles and an innovation-supporting regulatory environment."[59] Among other things, it was decided to create the AI Research Resource (AIRR) — a supercomputer cluster under state control, in partnership with the universities of Cambridge and Bristol and the companies Intel, Dell, HPE and Nvidia, intended to serve British research and development.[60] In January 2025 the government published a new plan that included a decision to expand the resources within this framework by a factor of 20, under the assumption that UK data-center capacity will reach 6GW by 2030. Within this framework, a call was issued to local authorities and to data-center and energy companies to propose regions in the UK that meet a number of criteria (including the ability to supply over 500MW of electricity by 2030, sufficient physical space, access to water and communications, feasibility, and more), in order to designate them as AI Growth Zones (AIGZs) — regions that would receive state support and benefits for establishing and operating data centers with a capacity of over 500MW.[61] Additionally, in July 2025 the government presented a further plan for the UK's compute capabilities that detailed 10 steps for advancing AI in the country. Among them: the call to establish AIGZs mentioned above; a decision to invest over $1.34B (£1B) in AIRR, to increase its compute capabilities by a factor of 20, and $1B (£750M) in the establishment of a new supercomputer in Edinburgh; ensuring sovereign access to AI for security bodies and for high-impact research and innovation institutions; investment in the search for innovative energy infrastructure, and more.[62]

In general, on the sovereignty measure, the UK tends to allow substantial entry of foreign companies, mainly American ones. In May 2025 it signed a trade agreement with the US that secures larger volumes of trade and investment in the digital domain between the countries. In addition, several American companies have announced the establishment of data centers in the UK at a combined cost of tens of billions of dollars.[63] Yet, as of 2023, of the data-center regions (a region with one or more data centers of the same company) owned by American and Chinese companies in the UK, about 25% were owned by Chinese companies.[64]

Regarding data reservoirs themselves, it was decided to establish a national data library including five significant databases. In addition, the NHS AI Lab was launched — a body for producing outputs by means of artificial intelligence from the data reservoirs of the National Health Service (NHS).[65]

Compared to the European Union, British regulation is far softer and places innovation first, sometimes at the expense of privacy protection and data security. Moreover, due to the heavy involvement of American technology companies both in the British private market and in the government's compute

56. Estimate of Data Centre Capacity: Great Britain 2024.
57. Research and Markets, United Kingdom Data Center Market — Investment Analysis & Growth Opportunities 2025–2030.
58. Matt Davies, "A Lost Decade? The UK's Industrial Approach to AI."
59. National AI Strategy, 2021.
60. Department for Science, Innovation and Technology and UK Research and Innovation, "AI Research Resource."
61. Department for Science, Innovation and Technology, "AI Growth Zones: Open for Applications."
62. Department for Science, Innovation and Technology, UK Compute Roadmap.
63. Megan Kirkwood, "The UK's AI Strategy Risks Entrenching the Power of Big Tech."
64. Katharina Bucholz, "Where Chinese or American Tech Is Used in Cloud Data Storage."
65. techUK, "The UK's AI Moment: An Ambitious New Plan for Innovation and Growth."

infrastructure, there is concern that these companies may exert heavy pressure on regulators to limit oversight of competition and privacy.[66]

In summary, the UK, like Israel, is trying to preserve its position as a leader in AI (and as a technological leader in general). It does this by investing in the establishment and development of national compute infrastructure for use across all sectors, by making data reservoirs accessible, and by securing access to infrastructure for high-impact institutions.

Singapore

As a small, advanced island state, Singapore is an interesting case study. It is ranked third in Tortoise's AI Index, after the US and China, with especially high scores on the infrastructure and research indices (third in both areas, after China and the US) as well as on the other indices, except for operational environment — mainly due to significant "brain drain."[67]

In 2019 Singapore introduced its National AI Strategy, which laid down the conceptual infrastructure on the subject at a relatively early stage. It focused on nine sectors: transportation and logistics, manufacturing, finance, security and safety, cyber defense, smart cities, health, education and government, as well as on "AI enablers": collaboration between research, industry and government; education for AI expertise; data architecture; a trusted and advanced environment; and international collaboration. The strategy led to the establishment of about 150 research groups and about 900 startups in the AI space. In fact, as early as 2017, AI Singapore was established — an umbrella body to coordinate and promote research, industry and governance in the AI field. In 2019 Singapore published the world's first Framework for governance in AI models, and in 2022 launched a system for measuring this governance and made it available as open source.

In 2023 the national strategy was updated in a new plan that marked three axes of change: (I) AI is no longer just an opportunity but a necessity. (II) A shift from a local focus in Singapore to positioning it as a global leader. (III) A shift from leading projects to designing systems that support AI. The plan also set 15 actions to be carried out over a 3–5-year timeframe, including: strengthening research and industry, including expanding the AI expert pool to 15,000; freeing up physical space for AI needs; increasing sovereign high-performance compute capabilities (with an investment of $500M); opening government information for public use; developing privacy-preserving technologies, and more.[68]

In addition to all this, in June 2023 Singapore's Digital Connectivity Blueprint was published, setting a target of creating local connectivity of 10Gbps (gigabits per second — a unit for measuring the amount of information that passes over a network in one second; by comparison, in the first quarter of 2025 the average download speed in Israel was 169.1Mbps, 60 times smaller than Singapore's target, while most communications companies in Israel offer a maximum private access of 1Gbps)[69] within five years, and securing green energy.[70] In 2024, a follow-up to the plan was published dealing with green data centers, setting them on three parameters: energy efficiency of the center and its hardware, green energy production, and efficient water use.[71]

66. Andrew Charlesworth et al., "What Are the Main Shortcomings of the 'pro-Innovation Approach to AI Regulation' White Paper Published by the UK Government in March 2023?"
67. Tortoise, The Global Artificial Intelligence Index 2024.
68. National AI Strategy.
69. SPEEDTEST, "Israel Median Country Speeds."
70. Digital Connectivity Blueprint.

In terms of geopolitical strategy, in AI too, Singapore adheres to a "friend to all, enemy to none" approach, striving to occupy a comfortable middle position between the two major players. For example, as of 2023, there is complete parity between the data-center regions of Chinese providers and those of American providers in Singapore.[72] Looking at the current infrastructure status, in 2024 Singapore's data centers totaled a capacity of 717MW and a market value of $3.3B,[73] including massive investment of billions of dollars from all the American and Chinese technology giants alike. Another striking figure is that 15% of Nvidia's global revenue comes from Singapore and — considering the size of Singapore's population — amounts to $600 per capita for Nvidia chips — 10 times the ratio in the US and 200 times that of China.[74] Added to this is Singapore's historic status as a trading hub of Southeast Asia and its position as a connection point for dozens of undersea cables linking East Asia to its center and west, and even to Europe, North America, and Australia.[75]

Singapore's AI-startup environment includes 650 startups, among them, as of July 2025, 32 "unicorns" (valued at over one billion dollars). Two of the country's universities are ranked in the top ten in AI (Nanyang Technological University in third place and National University of Singapore in ninth).

Singapore's Achilles' heel, as noted, is its AI talent pool, with 74% of employers struggling to find suitable candidates in the field. However, the state is investing significant resources in training and academic programs to improve this figure.[76]

In summary, Singapore is an exemplar of establishing broad physical, operational and academic infrastructure to lead in the AI field, with substantial financial investment — though modest relative to the giants of the field — and despite its small area and scarce physical resources.

United Arab Emirates

The United Arab Emirates has embarked on a mission "to become the best country in the world within the coming jubilee, by 2071,"[77] as part of a plan based on a future-focused government, excellent education, a competitive and diversified economy (with reduced reliance on oil), and a happy, cohesive society. In stated alignment with this plan is the National Strategy for Artificial Intelligence 2031, as an engine for improving education, the economy, governance and happiness. It presents eight strategic goals for establishing the country's position as a global player in the AI field, as well as four paths of leadership in AI: (I) leadership in current industrial resources and in emerging sectors such as health and cyber (with an assessment that investment in these sectors will increase total exports by AED 335B (about $91.5B)). (II) Leadership in smart government, including smart transportation, chatbots for customer service, and more. (III) Data sharing and governance. (IV) A new generation of regional talent.[78]

The UAE is ranked, admittedly, only 20th in Tortoise's AI Index,[79] but the future appears to lie ahead of it. The data-center market, whose capacity as of 2024 is over 350MW,[80] is expected to grow by 2030 by

71. Mark Wong, "Singapore's Green Data Centre Roadmap — Representing a Necessary Intersection between Digital Infrastructure and Sustainability."
72. Katharina Bucholz, "Where Chinese or American Tech Is Used in Cloud Data Storage."
73. Structure Research, Singapore 2024: Data Centre Colocation, Hyperscale Cloud & Interconnection.
74. Blake Crosley, "Singapore's $27B AI Revolution Powers Southeast Asia 2025."
75. TeleGeography, "Submarine Cable Map | Singapore."
76. Blake Crosley, "Singapore's $27B AI Revolution Powers Southeast Asia 2025."
77. UAE Centennial 2071.
78. UAE National Strategy for Artificial Intelligence 2031.
79. Tortoise, The Global Artificial Intelligence Index 2024.
80. Research and Markets, UAE Existing & Upcoming Data Center Portfolio Report 2025: Existing Data Center Capacity in UAE Is Over 350 MW, While the Upcoming Capacity in the Region Is Expected to Be Around 500 MW.

about 750MW, with the data-center capacity added in the country in 2024 accounting for about 30% of the data-center capacity added in the entire Middle East. As for market value, by 2030 it is expected to grow at a compound annual growth rate of 17.64%. The market is largely controlled by regional players, chief among them Khazna — the hardware-leasing arm of the government-backed Emirati company G42, which holds 59% of the market.[81] To these is added the ambitious Stargate UAE project — a collaboration between G42 and the Emirati government and major American companies to establish a supercomputer with a huge capacity of 1GW. By comparison, the largest data center in the world today, China Telecom Data Center, has a capacity of "only" 150MW. Stargate UAE will be part of the joint UAE-US AI campus that will be established in Abu Dhabi with a capacity of 5GW. Outside the Emirates, G42 already operates data centers with a total capacity of hundreds of megawatts in the US, and has signed agreements to transfer surplus GPUs with American technology giants such as Microsoft.[82] These steps consolidate Emirati compute sovereignty while significantly strengthening cooperation with the US — and represent a clear side-picking in the inter-superpower struggle.[83]

The UAE also uses the regulatory side to preserve privacy and to consolidate sovereignty. For example, financial data, medical data, Internet of Things (IoT) and telecom data must remain within the borders of the Union.[84] Privacy laws require obtaining a person's consent before collecting personal data about them, except in certain cases of competing public interest, and a person must be allowed to modify the data collected about them or to halt its processing.[85] The UAE also operates free-trade zones, and in particular AI-dedicated ones, in which there are different regulatory rules that align with global standards such as GDPR (the EU's regulations on privacy and personal data use).[86] These zones also include exemption from corporate tax and foreign-ownership limits, along with additional benefits, and thus constitute an attractive target for foreign investment.[87] Alongside them, there are substantial environments that incentivize and support startups and R&D, such as Hub71 — Abu Dhabi's global ecosystem.[88]

In research and development, Mohamed bin Zayed University of Artificial Intelligence (MBZUAI), founded in 2019, is the world's first AI research university, and its aim is to attract and produce world-class experts in the field.[89] The Technology Innovation Institute is a technological research body that, among other things, developed the Falcon series of large language models. Among them: Falcon-H1, which delivers high performance with the goal of enabling use on edge devices and in environments with limited compute resources; and Falcon Arabic, the world's leading model in the Arabic language.[90]

Overall, according to estimates, the local AI market is expected to grow from a value of $3.47B in 2023 to $46–50B in 2030 — a stunning compound annual growth rate of 43.9%.[91] The UAE is investing enormous resources in becoming a global leader in AI, out of an aspiration to lean its economy on AI and out of the view that AI is a significant foundation on the path to becoming the best country in the world.

81. Arizton Advisory and Intelligence, United Arab Emirates Data Center Market — Investment Analysis & Growth Opportunities 2025–2030.
82. Dylan Patel et al., "AI Arrives In The Middle East: US Strikes A Deal with UAE and KSA."
83. G42, "Global Tech Alliance Launches Stargate UAE."
84. Daljeet Singh, Data Residency in the UAE: The Definitive Guide.
85. U.A.E, "Data Protection Laws."
86. Daljeet Singh, Data Residency in the UAE: The Definitive Guide.
87. "AI Investment and Business Opportunities in the UAE: Growth, Regulations, Key Sectors."
88. Hub71, "Who We Are | Hub71."
89. Mohamed Bin Zayed University of Artificial Intelligence, "Mohamed Bin Zayed University of Artificial Intelligence | About."
90. "Falcon."
91. Ahmed El Safty, "UAE AI Ambitions: Building the Foundations of the next Economic Growth Era."

Saudi Arabia

Saudi Arabia is ranked 14th in the Tortoise Index for 2024, with relatively low scores on most criteria, but it stands out on one criterion — government spending on AI. On this measure it is ranked first, far ahead of the US, China and the rest of the countries,[92] with total planned spending of over $40B in the coming decade.[93] Indeed, the Saudi government is Saudi Arabia's principal engine of innovation. In 2016 Saudi Vision 2030 was launched — Saudi Arabia's overarching plan for the coming years. Its goals: diversifying the economy beyond reliance on oil and gas, empowering the citizens, creating a vibrant environment for local and international investors, and establishing Saudi Arabia as a global leader.[94] The world of artificial intelligence stands at the heart of the plan, with 66 of its 96 goals related to data and AI,[95] with an expected contribution of $235.2B (12.4%) to GDP.[96] To achieve these ambitious goals, the Saudi Data and Artificial Intelligence Authority (SDAIA) was established, which in 2020 published the National Strategy for Data and AI. It set three time-bound milestones: (I) 2021 — addressing Saudi Arabia's urgent needs. (II) 2025 — building the infrastructure for a competitive advantage in specific niches — education, government, health, energy and transportation. (III) 2030 — competing in the global arena as a leading economy in the use and export of data and AI. The plan also set quantitative targets, such as ranking among the top 15 countries in AI, and additional goals marking the scale of investment, the number of talent, and the country's placement in the global AI indices.[97]

Today, it appears that many parts of the strategy are indeed progressing. Saudi Arabia's data-center market comprises 440MW of capacity as of 2025 and is expected to grow to 1,190MW by 2030, with a CAGR of 21.87% (the highest among the countries surveyed).[98] The data-center market value is expected to grow from $1.6B in 2025 to $5.3B in 2032, with a CAGR of 16.3%.[99] One of the significant factors drawing companies to build data centers in Saudi Arabia is the relatively low electricity price — $0.05 per kWh, compared to about $0.18 in the US.[100] Alongside this, Saudi Arabia is investing in green energy, and even plans to operate the Oxagon data center in NEOM — the business metropolis that is the flagship of Saudi progress — on the basis of green energy alone. In terms of communications infrastructure, in recent years there has been a significant improvement in the country's internet infrastructure, with about 99% connectivity. The same holds for the cellular network infrastructure, with 70% of populated areas covered by 5G networks.[101] This is alongside connection to dozens of undersea cables that pass through Saudi Arabia and link Europe, Africa and Asia.[102]

The executive arm of the Saudi government for channeling these enormous sums is the Saudi Public Investment Fund (PIF). Among its holdings is the company HUMAIN, whose goal is to provide a solution for all layers of the AI stack, and which is emerging as the counterpart to the Emirati G42. HUMAIN has already signed several major deals with American technology companies to establish data centers and to deploy AI platforms.[103] It should be noted that this movement toward agreements with American compan-

92. Tortoise, The Global Artificial Intelligence Index 2024.
93. Niusha Shafiabady, "Saudi Arabia Has Big AI Ambitions. They Could Come at the Cost of Human Rights."
94. Vision 2030.
95. SDAIA, "Saudi Data & AI Authority and Vision 2030."
96. Zuhair Khayyat, "AI Is Powering Saudi Arabia's Vision 2030 Transformation."
97. SDAIA, "National Strategy for Data & AI."
98. Mordor Intelligence, Saudi Arabia Data Center Market SIZE & SHARE ANALYSIS — GROWTH TRENDS & FORECASTS UP TO 2030.
99. Saudi Arabia Data Center Market Size Forecast.
100. World Population Review, "Cost of Electricity by Country 2025."
101. Saudi Arabia Data Center Market Size Forecast.
102. TeleGeography, "Submarine Cable Map | Saudi Arabia."

ies marks a shift from the historical Saudi model in which, even as recently as 2023, China was the dominant superpower in Saudi Arabia's data centers.[104]

On the regulatory side, Saudi Arabia presents strict laws with heavy penalties in the context of privacy and the preservation of local data. Thus, all information about Saudi residents must be kept within its borders; approval must be requested for the collection of any piece of information and for its use, and data subjects must be allowed access to the data collected about them and be able to request its modification, to halt its use, or to have it deleted; and only the minimum information required for each purpose may be collected.[105] On the other hand, Saudi Arabia makes its open data reservoirs freely accessible, equally available to all, and machine-readable.[106] However, there are concerns that Saudi Arabia, as a state with a questionable reputation regarding human rights, will use its strict data-collection framework to surveil residents. For example, The Line, the smart city being built as part of NEOM, is expected to collect nearly every possible piece of personal data about its residents, and some have dubbed it a "surveillance city."[107]

In summary, Saudi Arabia, like the UAE, is trying to move toward an economy that leans on growth engines other than oil and gas, and views AI as the ultimate answer to this goal. The Saudi government leads this drive, with aggressive and massive investment across all layers of the AI stack and by means of many and varied collaborations, drawing on the current advantages of the Saudi economy — strategic location, cheap energy, and government economic wealth.

103. Dylan Patel et al., "AI Arrives In The Middle East: US Strikes A Deal with UAE and KSA"; Jamie Lane, "HUMAIN to Launch Arabic-Centric ALLaM 34B Foundation Model by End of August"; Nvidia Newsroom, "HUMAIN and NVIDIA Announce Strategic Partnership to Build AI Factories of the Future in Saudi Arabia."
104. Katharina Bucholz, "Where Chinese or American Tech Is Used in Cloud Data Storage."
105. InCountry Staff, "Saudi Arabia Data Sovereignty Policies and Requirements."
106. Gov.Sa, "Open Government Data."
107. Niusha Shafiabady, "Saudi Arabia Has Big AI Ambitions. They Could Come at the Cost of Human Rights."

5 The Value of the Deployment Models for the Four Sectors in Israel

As we have seen, the models for deploying AI infrastructure can be divided, broadly, into five. Each model has its own advantages and disadvantages, and therefore no single model fits all purposes. Likewise, different models may be suited to different layers of the AI stack. For example, sensitive data can be stored and AI models trained in a private cloud of various types (data and training layers), while use of the trained model (the deployment layer and the inference process) can be carried out on a public cloud, or in a distributed manner on edge devices. In general, one can say that weighing the trade-offs in choosing among the models rests on three legs:

- Sovereignty: the degree of control over data and infrastructure, as detailed in the first chapter.
- Innovation: the degree to which rapid adaptations can be made in light of technological innovations and developments.
- Costs: of setup and operation, including physical-space and energy needs, and on the other side — the return on investment.

In this chapter we examine the benefits and costs of each of the deployment models against the sovereignty and innovation needs of each of the four sectors in Israel — industry and entrepreneurship; research and development; national-civilian; and national-security. As noted, the main question that occupies us in this document is whether to invest in local infrastructure or in remote infrastructure. Of the three legs — sovereignty, innovation, and costs — sovereignty and costs are decisive: as the need for sovereignty grows, local infrastructure is preferred. At the same time, the direct and indirect costs (constraints on the electricity system, land limitations, regulation, and the like) of local infrastructure can be very high in Israel. As for the innovation leg, Israel is already home to data centers of all the major technology companies, which provide access to the overwhelming majority of the innovation needs required. Therefore, as long as this access is assured, the innovation consideration is secondary in choosing between local and remote infrastructure.

Industry and Entrepreneurship

The private sector, and the high-tech industry in particular, is the main engine of Israel's economic growth. The Israeli technology sector accounts for 20% of GDP and 53% of exports.[108] The Israeli ecosystem is ranked first in the world in the number of AI start-ups per capita and in the number of patents per capita.[109] Among the pillars of the sector are out-of-the-box thinking, a high readiness to experiment and entrepreneurial thinking, collaboration and interdisciplinarity, a high density of start-ups, research and development centers of international companies, and international investment.[110] All of these require being at the frontier of technology at all times, high access to innovation, high scalability, and continuous

108. Israel Innovation Authority, "Israeli Innovation. Global Impact."
109. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
110. Israel Innovation Authority, "The Israeli Tech Ecosystem."

international collaborations. In this context, many companies have large volumes of data that regularly flow out of data centers to the internet and to other countries.

On the other hand, there are two central considerations in favor of more sovereign solutions in the business sector — regulation and information security. As we saw in the previous chapter, Israeli regulation restricts the transfer of certain data outside the country's borders. Therefore, Israeli companies dealing with data collected in Israel may have good reason to keep their infrastructure within the country. In addition, some companies hold sensitive trade secrets — the "crown jewels" — such as algorithms, source code, tactics, processes, and more, which it is important to safeguard under the highest layer of confidentiality. In such cases, there is great value in keeping the assets on sovereign infrastructure to the extent possible.[111]

In summary, on the sovereignty-innovation axis, the business sector stands for the most part on the innovation side, and primarily requires access to international compute infrastructure at the cutting edge of the industry. Therefore, the vast majority of industry can rely on a **public cloud** and derive great value from it, and for part of it there is no need at all for this cloud to be stored within the borders of the State of Israel. For companies that must handle more sensitive data, such as defense companies, FinTech and HealthTech, the **hybrid model** can be used — with a **private cloud on public infrastructure** or a **rented private cloud** (as needed) for storage and processing of sensitive data, and a **public cloud** for the other aspects such as development, data analysis, and so on.

Academia, Research and Development

In recent years, Israel has stood at the scientific frontier of artificial intelligence. Its papers rank first in average citations, and its researchers had, as of 2023, participated in the development of about 4% of the significant machine learning systems (more than 30 times Israel's share of the world's population).[112] To maintain this respectable position, research and development, similar to the business sector, moves between an essential need for innovation and access to open data repositories, and dealing with local data and access — sometimes necessarily physical — to highly complex and advanced infrastructure, such as quantum computers and high-performance computing (HPC).[113]

With regard to the need for innovation and open access to the international academic community, one can point to the need for access to open data repositories, access to the most advanced AI models, collaboration with universities abroad, and grants from international organizations — all of which require access to shared data repositories and shared compute capabilities.

The need for sovereignty arises, as with the private sector, in the form of sensitive data on which research is sometimes conducted, including external data researched in collaboration with universities abroad;[114] and also in the infrastructure enabling R&D on advanced hardware, such as quantum computers.

In summary, as in the business case, in the academic case too it is essential to be at the scientific frontier, and therefore access to innovation is of the utmost importance. That said, because of the extensive research also concerning the compute components themselves, sovereign infrastructure must

111. The Investopedia Team, "Trade Secret: Definition, Examples, Laws, Vs. Patent"; Adam Hayes, "Crown Jewels: What It Means, How It Works."
112. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence, 4.
113. Eliahu Weidel and Jaime Speers, "Establishing the Quantum Center at Tel Aviv University Could Turn Israel into a Quantum Power."
114. Adv. Chaim Ravia, GDPR Guide for Hebrew University Researchers.

be provided on which such research can be conducted. Accordingly, here too it is necessary to use a **public cloud**, and the **hybrid model** for more sensitive needs, as well as **dedicated sovereign infrastructure** for research that involves engagement with the frontier of hardware technology.

National-Civilian

The public sector represents, perhaps, the greatest challenge of all in terms of the adoption of artificial intelligence. On the one hand, this is the sector where the gains from adopting artificial intelligence and digitization can be the greatest — improved efficiency, increased accessibility, reduction of gaps, and, in general, improvement of the services the state provides to its citizens.[115] On the other hand, this is the sector that has the most difficulty with adoption and with a readiness for innovation. According to an OECD report, public innovation in Israel is characterized by a "lack of systemic ambition".[116] Likewise, this sector is characterized by dealing with highly sensitive data about citizens — biometric, medical, economic, and more — with an acute need to create secure connections between these data and to ensure continuous operation at all times.

In light of all this, it is clear that the issue of sovereignty is the most important for this sector, both in terms of information security — which requires the highest level of protection across all layers of the AI stack — and in terms of operational continuity (the "pull-the-plug" test). At the same time, it is important not to fall into "innovation stagnation" — becoming fixed on certain technologies without ongoing attention to the rapid developments in the technological field. Possible examples are systems in the domains of decision-making, autonomous transport, or health, which could bring wondrous improvements to citizens' welfare but are not adopted in the public system because of that same stagnation.

In summary, because of the essential need for a high level of sovereignty, the national-civilian sector should have access to a **private cloud** for many needs. The degree of sovereignty of this private cloud can range between a **dedicated private cloud** for particularly sensitive needs and a **private cloud on public infrastructure** for less sensitive needs, which also require direct and rapid access to technological innovation.

National-Security

The national-security sector holds, perhaps, the most closely guarded information — intelligence and operational secrets — and must also be able to function at all times, including in extreme cases. Therefore, it is clear that this sector places the highest importance on information security — both in terms of the infrastructure on which the information is stored and the personnel operating it, and in terms of the encryption of the information. Likewise, there is critical importance in creating infrastructure that functions at all times, with many backup layers.

At the same time, it is essential that the defense establishment be able to produce innovative solutions and cope with new threats. It must therefore be constantly up to date with new technologies. It also appears that there are times and places in which one can compromise, to a certain extent, on the level of security, and benefit from technological capabilities that the market has to offer but that have not yet reached the defense establishment. For example, Amazon's cloud (AWS) has been used to store

115. Ministry of Social Equality, The National Digital Program of the Government of Israel.
116. Adv. Rota Golstein-Galperin, "Innovation Is Essential If the Public Sector Is to Remain Relevant."

intelligence information regarding the Gazan population during the "Iron Swords" war. It was also reported that the cloud companies have Speech to Text (STT) capabilities that the military does not possess at a sufficient level, and therefore their use was considered.[117] A further example is the use of Microsoft's cloud (Azure) as well to store conversations gathered by Unit 8200 during the "Iron Swords" war, but in September 2025 Microsoft declared that it had blocked access to it,[118,119] and thus this is also an example of the dangers involved in such a relinquishment of sovereign infrastructure.

Accordingly, there are cases in which there is no doubt that there is a need for a **dedicated private cloud**, encompassing the highest possible degree of sovereignty (at the level of location, hardware, personnel, etc.) and capable of providing both information security and operational continuity. Alongside this, reality shows that there are cases in which a **private cloud on public infrastructure** may suffice. There is also great value in constant exposure to and even adoption of new technologies, which can be enabled through a **private cloud on public infrastructure** or through the creation of secured "sandboxes" in **public clouds**.

The Four Sectors — Summary of the Analysis

From the analysis of the four sectors it emerges, as expected, that the main need for local infrastructure, and in particular for infrastructure with high sovereignty, lies to a large extent with the national sectors — civilian and security — and to a smaller extent with the edge needs of the academic and business sectors.

Even so, in the national sectors use is made of the services of American technology giants such as AWS (Amazon) and GCP (Google), within the framework of the "Nimbus" project to create a governmental cloud, as well as in cooperation with AWS, Microsoft, and possibly additional companies, for the storage of intelligence information.

The option of foreign infrastructure is available primarily to the academic and business sectors, in which, for most uses, there is no need for local infrastructure, and for some of which there is even an essential need for access to foreign infrastructure. Nevertheless, the volumes required for local infrastructure in these sectors are significantly lower than in the national sectors, yet they too are essential in order to enable local research and development at the cutting edge of AI.

In light of all this, the State of Israel must invest in developing local infrastructure — both infrastructure belonging to technology giants, which provides innovation alongside sovereignty, and sovereign infrastructure at the highest level. This, alongside ensuring access to remote AI and data infrastructure.

117. Yuval Abraham, "'Order from Amazon': How Tech Giants Are Storing Mass Data for Israel's War."
118. Yuval Abraham, "'Order from Amazon': How Tech Giants Are Storing Mass Data for Israel's War."
119. News Agencies, "Microsoft Blocked Unit 8200's Access to Some of the Cloud Services Storing Palestinians' Conversations."

6 Israel's AI Stack

Israel is entering the AI age as one of the leaders in global technology, and in AI in particular. In the Tortoise Global AI Index, out of 83 countries, it is ranked ninth on the weighted index and second relative to population — just behind Singapore. In the development and deployment layers, Israel excels especially. The academic sector stands out in AI models, and so does the business sector, which is also strong in developing AI interfaces. On the other hand, there has been a decline in the number of academic papers in the field, and relatively slow growth in the number of AI experts. This is in addition to low rankings in the infrastructure, governance, and data layers.[120]

These phenomena are not new to the AI era. Israel has always stood out for fast and creative solutions, and less so for long-term planning and the laying of strong infrastructures — a fact reflected in the "Start-Up Nation" moniker. Among the reasons for this one may count an immigrant mentality, which research has identified as more creative and more willing to take risks; a small domestic market, which forces companies from the moment of their founding to aim at the international market and thereby build on top of foreign countries' infrastructures while largely neglecting local ones; and a non-hierarchical culture, which allows flexibility and creativity on the one hand, but yields low discipline and order on the other.[121]

Infrastructure Layer

The infrastructure layer is one of the weakest links in the Israeli stack. On this dimension, Israel was ranked in 2024 in 26th place out of 83 countries in the Tortoise Global AI Index.[122] The ranking weighs metrics such as the share of residents connected to electricity and the internet, network speeds, local compute capacity, the volume of chip imports and exports, and mentions of the use of advanced accelerators in academic papers.[123] That said, efforts are being invested to correct this historical weakness, even if they are not complete. The scope of electricity consumption by data centers is expected to grow by 2030 at a compound annual growth rate (CAGR) of 5.62%[124] (the global CAGR is 14.7%),[125] while colocation revenues are expected to grow at a CAGR of 10.08%[126] (versus a global CAGR of 16% — a somewhat narrower gap). These developments are driven for the most part by the private sector, through the technology giants Google, Amazon, and Microsoft, which have entered the Israeli market as infrastructure providers, in addition to local companies such as MedOne, Bezeq, and others.[127]

In parallel, two significant government projects are being advanced:

- "Nimbus": a central channel for the Israeli government to procure public cloud services in line with government needs. The tender winners, AWS (Amazon) and GCP (Google), have established and

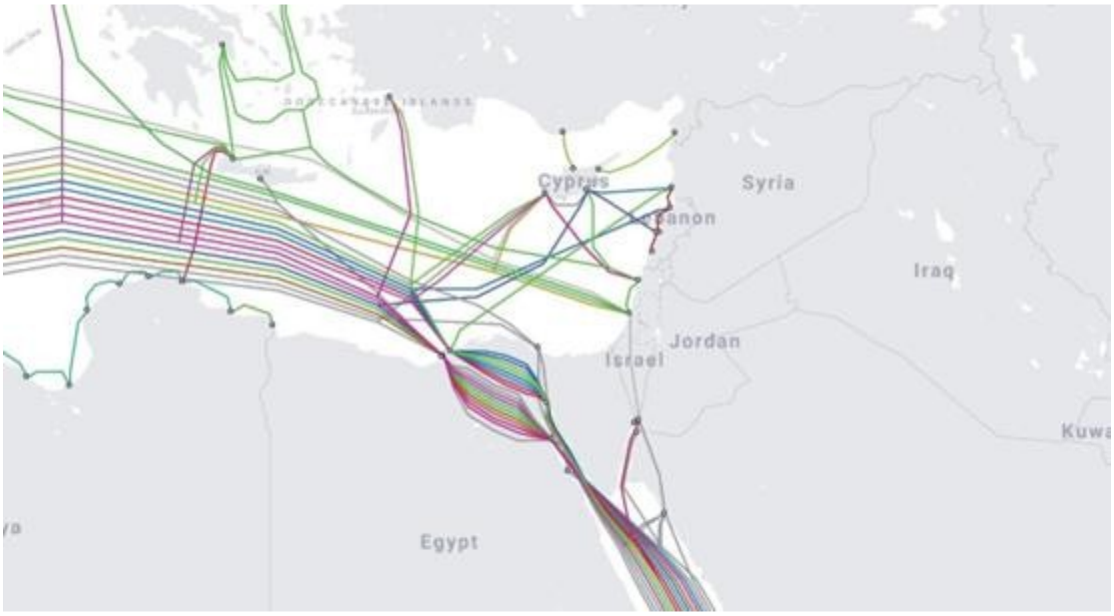
120. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
121. Eugene Kandel et al., "Israel's Entrepreneurial Ecosystem."
122. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
123. Joe White and Serena Cesareo, The Global Artificial Intelligence Index — Methodology Report.
124. Mordor Intelligence, Israel Data Center Market SIZE & SHARE ANALYSIS — GROWTH TRENDS & FORECASTS UP TO 2030.
125. IEA, Energy and AI, 63.
126. Mordor Intelligence, Israel Data Center Market SIZE & SHARE ANALYSIS — GROWTH TRENDS & FORECASTS UP TO 2030.
127. Data Center Colocation Market Size, Share & Trends Analysis Report By Colocation Type (Retail, Wholesale), By Enterprise Size, By Tier Level (Tier 1, Tier 2), By End Use (BFSI, Retail), By Region, And Segment Forecasts, 2025–2030.

operate public cloud regions in Israel. The engagement is valid for seven years from July 2021, with the possibility of extension for up to 23 years.[128]

- Establishment of a supercomputer: in 2025 Nebius was selected to build the infrastructure for a supercomputer (HPC) with a capacity of 16,000 PFLOPS. It is expected to enter operation at the end of 2025 or beginning of 2026 and to be available to businesses and academic researchers for training AI models.[129]

As for communications infrastructures, in recent years the deployment of advanced 5G networks has been expanding, yet Israel is still ranked only 66th in the world in average download speed via cellular networks. The deployment of fiber optics to households is also expanding, and here Israel ranks 15th in average download speed via fixed broadband networks.[130] Alongside this, Israel currently has four submarine communications cables connecting it to European countries, and three more are expected to be added in 2026–2027.[131] Today, the vast majority of the submarine cables connecting Europe and Asia pass through Egypt, and roughly a third of the world relies on Egypt for internet access. Israel's geographic location makes it possible to offer an alternative to Egypt and to spread the risk.[132]

Map of the submarine cables connected to Israel



To these infrastructures one may add Israeli expertise in chip design. This expertise is admittedly not a direct infrastructure on top of which systems in Israel operate, but it constitutes an important tier of Israeli infrastructure capabilities. The most significant example is Nvidia's development centers in Israel, which lead the development of three of the company's four main product lines — and in particular of communications chips. In this framework, Nvidia also built Israel-1, the most powerful supercomputer in Israel and ranked 34th in the world (as of this writing), which, in addition to being used within the

128. Accountant General — Government Procurement Manager, "Project Nimbus."
129. Meir Orbach, Investment of Half a Billion Shekels: A Group of Investors Establishes Israel's Supercomputer; Israel Innovation Authority, Nebius Selected to Establish Israel's National Supercomputer.
130. SPEEDTEST, "Israel Median Country Speeds"; Mordor Intelligence, Israel Telecom Industry Size & Share Analysis — Growth Trends & Forecasts (2025–2030).
131. TeleGeography, "Submarine Cable Map | Israel."
132. Sebastian Moss, "Google Plans $400m Blue-Raman Cable Connecting India, Israel, and Italy."

company, is also intended to serve Israeli industry and academic organizations for research and development.[133]

Data Layer

In the data layer as well, Israel stands relatively low compared with leading AI countries. Oxford Insights' Government AI Readiness Index ranked Israel 25th in data accessibility and 23rd in data representativeness (how well the data represent the population).[134] Likewise, a 2021 report showed that the degree of fragmentation of Israel's data reservoirs is high, with 55% of government ministries reporting that "only a limited number of systems and databases are synchronized with other ministries in the cases where this is desired", and even where synchronization was carried out, it was not done in real time.[135] In this context, one should note favorably the healthcare system, which has implemented a world-class advanced medical information sharing platform that makes Israel's data reservoir unique in its scope and in the medical history it contains.[136]

Beyond this, in July 2025 the Innovation Authority, together with additional government ministries, issued a call for proposals to establish AI R&D data reservoirs of up to ₪44 million — as phrased in the call, "for the development, opening, and accessibility of high-quality data reservoirs for use by researchers, technology companies, and industrial bodies operating in Israel". These reservoirs will provide data infrastructures for the life sciences and health, advanced manufacturing, DeserTech, climate, AgroTech and FoodTech, as well as security and hi-tech industries.[137]

Another important aspect of Israel's data layer is the regulatory field, which is still being shaped and consolidated. While many countries, and European countries in particular, restrict the use of copyright-protected material for training AI models, a 2022 opinion of the Ministry of Justice presented a permissive position according to which, except in exceptional cases, "use of copyright-protected content for the purpose of machine training falls under the permitted-uses arrangements of copyright law" and therefore does not constitute copyright infringement.[138] This opinion effectively makes much data accessible for training systems that could otherwise constitute financial and regulatory barriers in other countries. At the same time, the Privacy Protection Authority is acting and passing regulations on the subject, including restrictions on scraping data from the internet for the purpose of training AI models — something that may pose barriers before bodies that train and develop models.[139]

Model Training and Development Layer

As noted, Israeli strengths have always stood out in fast and flexible solutions, and so it is in the AI stack. Despite the sluggish start in the lower layers, the higher layers — namely, the model training and development layer and the model deployment layer — stand out for their world-class quality. Thus, Israel

133. Omer Kabir, "Why Nvidia's AI Strategy Runs through Israel."
134. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
135. National Digital Agency, Report on Governmental Data Interfaces.
136. Amir Gilboa, The Implementation of a National Health Information Exchange Platform in Israel.
137. Innovation Authority, "Government Investment of ₪44 Million in Establishment of R&D Data Reservoirs in AI: A New Call to Achieve a Leap through Technology in Israeli High-Tech."
138. Ministry of Justice, Opinion: Uses of Copyrighted Works to Train Machines for Learning Purposes.
139. Privacy Protection Authority, Guidance — Application of the Privacy Protection Law to AI Systems.

is ranked sixth in AI development and seventh in AI research, and first in the average number of citations per paper and in the number of AI experts per capita.[140]

The most prominent player in the field of developing models in Israel is AI21 Labs. This company is valued at $1.4B,[141] and according to a PitchBook survey updated as of June 2024, it is one of only 18 companies producing foundation models suited to a wide range of AI uses — alongside giant companies such as Google, OpenAI, and Anthropic. Additionally, according to the survey, there are 73 companies in Israel developing specialized AI models (Vertical AI) — a fact that places Israel third in the world in the number of such companies.[142]

Beyond local companies, there are in Israel development centers, and within them development laboratories, of global giants such as Microsoft, Google, IBM, Nvidia, and Amazon, as well as research branches in the fields of machine learning algorithms, natural language processing, and image processing at leading universities in the country.[143] And yet, in the surrounding academic environment, in recent years there has been a drop in the volume of scientific articles on AI systems in Israel (at a rate of 28%, versus an average decline of 7% in OECD countries).[144] Similarly, Israel is ranked ninth in the growth rate of AI talent over the last eight years,[145] which represents a significant decline in leading AI talent, according to Stanford research.[146] These data point to a trajectory in which Israel may lose its status as a magnet-center for leaders in the field.

In parallel, a 2023 Innovation Authority report determines that the Israeli hi-tech industry is closely tied to investment from the private sector: 91% of local R&D is executed by the private sector — the highest ratio among OECD countries — and only 9% of R&D, carried out at academic institutions, is financed by the state — the lowest ratio among OECD countries. In addition, the report shows that 75%–80% of venture capital investments in Israeli companies are made by foreign funds.[147]

All of this casts a shadow on Israel's contribution to the sovereign development of leading AI models and infrastructures and on accessibility to advanced models, in more cases limiting the ways in which sovereign decisions can be made. These are also contributions to positioning Israel as a global leader in AI systems and in the human capital reservoir in the field (as illustrated by Ilya Sutskever and Daniel Gross, who stood at the front line of the leading AI models in the world).

140. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
141. Tracxn, "AI21 Labs — Company Profile."
142. Israel Innovation Authority, Study on Gen-AI Companies in Israel 2024.
143. Gil Press, "In 2024, Israel Became A Global Leader In Applied AI Innovation."
144. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
145. Yolanda Gil and Raymond Perrault, Artificial Intelligence Index Report 2025.
146. Yolanda Gil and Raymond Perrault, Artificial Intelligence Index Report 2025.
147. Israel Innovation Authority, A Global Comparison: High-Tech in Israel Relies Almost Entirely on the Private Sector, and Primarily on Foreign Investors.

| Security and AI safety

Alongside the various models being developed and advanced, together with the race toward artificial general intelligence — Artificial General Intelligence (AGI), which is meant to perform a wide range of tasks at human level and above — a whole world arises around ensuring the safety of models in their operation. Securing the models includes protecting them from bad actors seeking to use them for harm, and constraining AI intelligence itself in a process called *Alignment*, so as to prevent an autonomous model from leveraging high power for purposes that endanger humanity. These two aspects appeared in one of the most influential articles on AI in 2024, Situational Awareness, by Leopold Aschenbrenner, formerly a researcher at OpenAI who was dismissed after criticism concerning safety. In the article that made waves in the industry, Aschenbrenner argued for the need to treat AGI as a matter of nuclear-arms significance in the contest between nations, and pointed to the risk in the case that the first winner takes the lead. Aschenbrenner further argued that the risk of a hostile nation being the first to reach AGI could lead to disaster. He also argued that in the "black box" of the machine intellect, without appropriate alignment guardrails, it may slip out from under humanity's sovereignty and reach apocalyptic scenarios of a machine takeover.[148] Precisely here, in aspects related to information security and cyber security, and in both the defense sector and the civilian sector, Israel can lead in securing and adjusting (aligning) AI models — services already needed today, which will certainly be required even more so in the coming years.

Model Deployment Layer

This is the strongest layer in Israel's AI stack. Israel is ranked third in the world in the Tortoise Global AI Index in the number of commercial AI applications, and a large historical share of the largest Israeli technology companies supplies its services to major applications in the deployment layers. Thus, for example, Wiz provides services to identify possible vulnerabilities in the customer's existing infrastructure, Waze provides a navigation application, Monday.com provides task and project management services, and Lemonade — insurance services, and so on. All of this and more uses existing capabilities (whether AI capabilities or not), based on intelligent decision-making and a user experience convenient and pleasant for the customer.

In a Remagine Ventures report updated for July 2025, it was written that there are 342 Israeli startups based directly (and not as a secondary use) on generative AI, which have collectively raised over billions of dollars. 198 of them were added since May 2024, mainly in areas of cyber defense, health, and LLMOps — processes for leading and running large language models, in which most of the leading AI models and technology standards are put to similar use. In total, Israeli generative AI startups have raised over $20B so far.[149]

That report also states that the startups that succeeded in raising the largest amounts are characterized for the most part by two features: access to unique data at a scale large enough to leverage — accompanied by a high rating; and fields with many restrictions and obstacles, for example regulations, obsolete systems, clear positioning for go-to-market strategy, and a promising plan for meaningful

148. Leopold Aschenbrenner, "Situational Awareness."
149. Eze Vidra and Kevin Baxpehler, Mapping Israel's $20B GenAI Boom: 342 Startups and Counting.

innovation in products above.[150] These characteristics also underscore the strong potential in investments in the lower layers, where unique models and innovative technological infrastructures can be built on at least two of the four characteristics and strengthen an additional industry of AI services and providers in Israel.

Governance Layer

The governance layer, including the broad view of national AI strategy, policies, regulations, and public trust in it, is especially weak in Israel. Israeli government strategy is ranked 32nd (out of 62) in the Tortoise Global AI Index, and the operating environment, including regulations and laws, public opinion, and brain drain of talent, is ranked 65th (out of 83) in the index.[151]

Even so, Israel does have a national AI strategy — the National Program for AI announced in 2021. Its central goals are strengthening AI infrastructures and research, creating leaps in the adoption of AI in industry, embedding AI in public services, establishing the State of Israel's position as a global tech-leader in the field of AI, and promoting AI at the national level.[152] However, in the Nagel report on accelerating AI in Israel (August 2025) it was written that "the State of Israel is not positioned at the pace and level of the desired push in the domain of AI acceleration". Israel has significant assets in the field, but their advantages are not fully exploited. The central problem stems from the absence of a clear and coordinated national strategy. Activity is fragmented among different ministries and many bodies, without full coordination and vision, and with a low budget standing that is not relevant to the scope of the challenge. The report determines explicitly that Israel lacks both a "national strategy united and legislated in law" and "delays in the adoption of supportive, enabling, and responsible regulation".[153]

A special State Comptroller report from November 2024, on the subject of national readiness for AI, determined that "there is no long-range national strategy for artificial intelligence in Israel, and also that the government-approved strategy is not fully implemented and is not standing to the schedules laid down". In this framework the government-approved program of the years is being carried out with disruption, unrealized, and stands in the schedules that were provided. It was also written that "the program's approved budget is only a few million dollars, most of which has yet to be actually implemented", and that the government's approved budget stands in a state as funded in the resolution of the TELEM committee of December 2020 and successive appropriations of the National Recommendations of December 2020. The Comptroller further points out that regulations are not approved by the government; powerful compute infrastructures at the cutting edge (HPC) are still lacking; the budgets allocated to promote research and industry are not fully aligned with academia; budgets that were assigned in 2020 have yet to be allocated; and beyond the deficits in implementing the plan. Under all of these, the Comptroller mentions (as already noted) that Israel's ranking in AI readiness indices is dropping. That is to say, there is a wide chasm between the approved programs and their actual implementation.[154]

Regulatory-wise, we have already surveyed above a number of privacy regulations concerning uses of artificial intelligence. In addition, in 2023 the government published a policy paper on principles, regulation, and ethics, which conveys the formal government philosophy on the subject. The document recommends, among other things, aligning with regulation in developed countries and international

150. Eze Vidra and Kevin Baxpehler, Mapping Israel's $20B GenAI Boom: 342 Startups and Counting.
151. Israeli Ministry of Innovation, Science & Technology, National Priority Areas in Science and Technology: Artificial Intelligence.
152. Innovation Authority, National AI Plan | Status Snapshot — April 2025.
153. Prof. Yaakov Nagel et al., Report and Accounts of the National Committee for Accelerating AI — August 2025.
154. State Comptroller, National Readiness in the Field of Artificial Intelligence.

bodies, promoting a process of managing risks for the sake of AI development and use, preserving fundamental civil rights and public interests in promoting artificial intelligence, and acting with transparency and reasoning for the decision-making of AI systems.[155] Together with this, the Nagel Committee report decisively determines that "Israeli privacy regulation is not adequate, generally speaking, for Big Data and AI to date" and states that key elements are missing in adopting supportive, meaningful, and responsible regulation for AI systems in the State of Israel. The report explicitly notes that Israel does not yet have foundational regulatory principles for AI-appropriate ethics that would enable acceleration in the field, and that the gap between development capabilities and monitoring and enforcement mechanisms is growing.[156]

The combination of lagging regulation and the deficiencies in implementing the national plan has meant that, "on paper," Israel excels in its readiness for the AI era and receives full marks on most preparation indices, yet on performance indices it receives particularly poor scores. This gap is clearly visible in the AGILE index, in which Israel receives full marks on criteria such as building a national strategy, an implementation plan for the strategy, incorporating ethical considerations into the strategy, and more; but a score of zero on criteria such as: whether AI governance bodies have been established; whether metrics have been presented for evaluating the impact of AI; and whether the government has enacted, or is in the process of enacting, a comprehensive AI law.[157] That is, although Israel has privacy, human rights, and information-security laws that also apply to AI systems, there is no dedicated, unified framework for regulating the development and use of these systems.

The AGILE index also shows the trust and belief that the Israeli public should have in AI applications — in the weighted question about the strength of positive positions or neutrality regarding the use and development of AI, the average is 33 out of 100. This stands alongside a high valuation of AI applications and their impacts (65 out of 100).

If the regulatory environment allows fast and innovative activity, it also runs the risk of accidents such as private information leaks, autonomous vehicle accidents, and the like. This, in essence, is a domain in which the safety net is public trust that it can "fall back on." The two situations above together create a weak operating environment that stalls AI advancement in Israel.

Summary and SWOT

Strengths Opportunities Weaknesses Threats

155. Ministry of Justice, Policy Principles, Regulation and Ethics in the Field of Artificial Intelligence.
156. Prof. Yaakov Nagel et al., Report and Accounts of the National Committee for Accelerating AI — August 2025.
157. Global AI Governance Observatory, AI Governance Capability Analysis.

Infrastructure Layer

• World-class expertise in chip development. • Government investment in and deployment of HPC. • Established local data-center providers. • Ongoing activity of technology giants, both in R&D and in data centers, including a full Israel region of all major cloud providers.	• Access to HPC could enable a leap forward in research and development. • Full implementation of the "Nimbus" project would enable significant efficiency gains in public services. • Establishing a connectivity alternative to Egypt, together with data-center and HPC infrastructure, would consolidate Israel's position as a Middle East "hub".
• A relatively low starting point. • Heavy reliance on international cloud services. • Second-tier domestic broadband and cellular infrastructure. • Limited geographic space. • Current gap in high-performance compute (HPC) capabilities.	• The near-total reliance on international companies could prove problematic under pressure from global public opinion or from the states where these companies are registered, in addition to the security risks this could create. • The current electricity grid may be unable to sustain the required loads. • Significant infrastructure could become a target for attacks.

Data Layer

• A unique unified medical-data repository. • Relative freedom in using data to train AI models. • Plans for developing and opening access to data repositories. • Unique access to Hebrew-language data.	• Access to substantial data repositories could serve as a significant springboard for all sectors. • Positioning Israel as a global leader in health technologies through access to the medical-data repository. • Development of Hebrew-language models.
• Data that is hard to access and not very representative. • High fragmentation and lack of synchronization of data.	• An opaque regulatory environment that could create barriers and challenges. • Consolidated data repositories could become a target for attacks and leaks.

Model Training and Development Layer

• First place in AI experts and in article citations — a substantial academic environment. • A vibrant ecosystem of startups and multinational R&D centers. • A local company developing a foundation model, among only 18 such companies worldwide.	• The combination of a high concentration of expertise and a vibrant startup environment, together with access to unique data and to compute power, could form fertile ground for innovative and successful AI solutions. • Global leadership in vertical (domain-specific) AI. • Israel's security expertise could provide an opportunity for leadership in the security and Alignment of AI models.
• Slow growth of the expert pool relative to demand. • Decline in the number of scientific articles. • Brain drain. • Near-total reliance on foreign private investment.	• The significant rise in compute infrastructure required to train AI models could push local research and development to less relevant positioning if these infrastructures are not made accessible. • Brain drain and slow growth in the number of new experts could push Israel out of the front ranks of leading expertise. • International pressures could lead to reduced investment in Israel.

Model Deployment Layer

• A substantial history of service-provider and application companies. • A world-leading environment of AI model-deployment startups. • Global leadership in specific niches, for example cyber and health.	• Positioning Israel as a global leader in AI applications, especially in specific niches such as cyber and health.
• A small domestic market, including a small number (in absolute terms) of talents. • Brain drain. • Near-total reliance on foreign private investment.	• Brain drain and slow growth in the number of new experts could push Israel out of the front ranks of leading expertise. • International pressures could lead to reduced investment in Israel.

Governance Layer

• An orderly and broad national plan for the AI era. • Participation in international forums. • Soft regulation that enables a creative and flexible environment, and avoids the rigid regulations found in other jurisdictions.	• Using soft regulation to study the evolving landscape and to craft creative, world-leading regulation. • Full implementation of the national plan would propel Israeli AI forward.
• Significant gaps in the implementation of the national plan. • Absence of dedicated AI governance bodies. • Low public trust. • An operational environment ranked very low.	• The missing regulation, together with low public trust, could trigger a backlash in the event of a disaster, including overly rigid and paralysing regulation. • Regulatory uncertainty could lead to a decline in investment in Israeli AI companies. • A lack of alignment between Israeli and international regulation could create obstacles for Israeli companies operating outside the country's borders.

7 The Israeli Energy Sector as the Critical Change Enabler

The National Perspective: The Israeli Electricity Sector

There is no doubt that a national policy of investment in AI infrastructure requires the energy sector to prepare in advance to secure the electricity demand that will be required. Israel is an "energy island," and developing its energy sector — including the generation and transmission infrastructure required — is a long and complex process in terms of planning, regulation, construction, and operation. In this chapter we characterize the Israeli electricity sector in depth and recommend principles for accelerating the development of infrastructure with an integrated view.

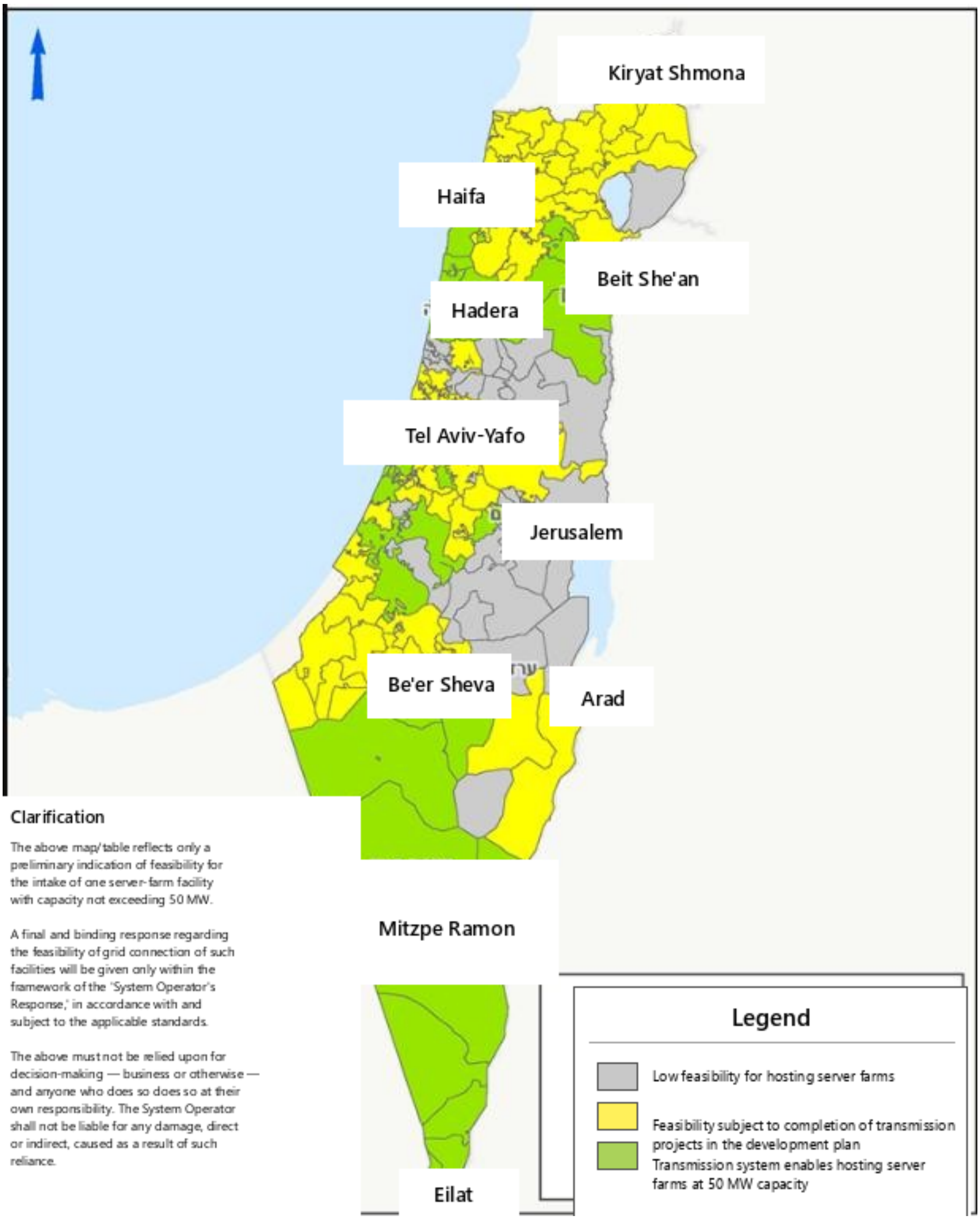
The Israeli electricity sector is characterized by steady growth in demand driven by economic growth, population growth, and improvements in the standard of living. The long-term electricity demand forecast of the system operator (Noga) sets average annual growth at 2.8%.[158] As of the writing of this document, this growth rate does not include the demand arising from new data centers. As we saw earlier in the international comparison, private companies and countries are being required to update their policies on the construction of power stations in order to meet the demand of this specific sector. In Israel there is no tendency toward energy contraction: only recently (31.10.2024) Government Resolution 2282 was approved, setting out electricity needs through 2040 — including the construction of 13 additional power stations, at a total installed capacity of roughly 8,000 MW by that year, five of which are to come online by 2035.[159]

As part of the government policy to encourage and enable the construction of additional power stations, that same resolution also addressed regulatory relief for stations built to serve the self-consumption of a consumer located on the station's site or immediately adjacent to it. For such stations, it was determined that their installed capacity may not exceed 125% of the consumer's peak consumption. In addition, a detailed national outline plan was approved regulating the construction of storage facilities, including facilities at extra-high voltage and permits for facilities at high voltage. Thus the regulatory and planning infrastructure required for the construction of power stations and storage facilities has already been approved, and it also supports the needs of data centers.

Nevertheless, the development of these facilities faces challenges arising from the layout of the electricity grid. Israel's electricity-generation infrastructure is located mostly in the north and south of the country, while most demand is in the center. This layout creates a major challenge for building transmission infrastructure to move electricity from conventional generation sources and from renewable energy toward the demand centers. This challenge is illustrated by the feasibility map for hosting data centers (up to 50 MW) in transmission terms, published by Noga in December 2024:

158. Electricity Authority, Work of the Electricity Authority on the Criterion of Real-World Economic Needs for Planning the Generation System.
159. Government Resolution 2282, Promoting the Energy Security of the Israeli Electricity Sector: Amendment and Repeal of Government Decisions of 31.10.2024.

Feasibility map for hosting data centers (up to 50 MW) in transmission terms (Noga, December 2024)



The grid-layout challenge is reflected in government policy on electricity-generation facilities, including renewable-energy facilities, storage facilities, and conventional facilities:

- Renewable-energy facilities: in view of the targets for renewable-energy generation and reduction of greenhouse-gas emissions, the aim is to establish such facilities on a nationwide footprint, subject to the physical availability of the grid and to the ability to absorb the electricity generated. The statutory national electricity plans (TAMA 10), which allow only limited construction of significant renewable-energy generation facilities in the center of the country, as well as facilities built in the south or the north, run up against grid constraints and require additional infrastructure to move the generated energy. As such, they narrow and complicate the flow of electricity to the national grid and to the demand areas. The constraint stems largely from the inability of the distribution and transmission infrastructure to carry additional energy. It can be moderated by building storage facilities alongside generation or by increasing demand adjacent to generation facilities.

- Storage facilities: these, especially large facilities at extra-high voltage, can support the electricity sector by absorbing generation surpluses in the north and south and releasing them to the grid during peak-demand hours. On the other hand, building such facilities far from the sources of the generation surpluses creates a major challenge for the electricity grid, since it means loading additional demand onto the network without available generation sources nearby. To address this challenge, Noga limits the locations of these facilities, as reflected, among other things, in the competitive process the Electricity Authority held for extra-high-voltage storage facilities. Below is the map published as part of the process documents, in which the areas eligible to host participating facilities are highlighted:

Regions in Israel permitted for the construction of storage facilities

Likewise, in the Electricity Authority's decision to add a quota for extra-high-voltage storage facilities outside a competitive process, it was clarified that their location "shall be restricted so that they cannot be built in the central region, in which the sector does not, at this stage, require standalone storage facilities."

Storage facilities can therefore support the electricity sector so long as they are not built in the demand centers, particularly Gush Dan and the Jerusalem area.

- Conventional facilities: following on from the challenge of absorbing energy into the grid in the north and south and transferring it to the center of the country — a challenge that stems largely from renewable-energy facilities — building conventional facilities at large installed capacities is expected to compound the challenge, to the extent that additional power stations are built in parallel with renewable energy. In effect, this is the "mirror image" of the sector's need for storage facilities. It is no accident that, as part of Government Resolution 2282, a map was published showing areas by priority level for the construction of new conventional power stations:

Priority levels under Government Resolution 2282 for the siting of new conventional power stations

According to the map, the farther a power station's location is from Gush Dan, the lower the priority level, to the point that Noga opposes advancing a station situated outside the marked buffer zones — at least within the sector planning through 2040.

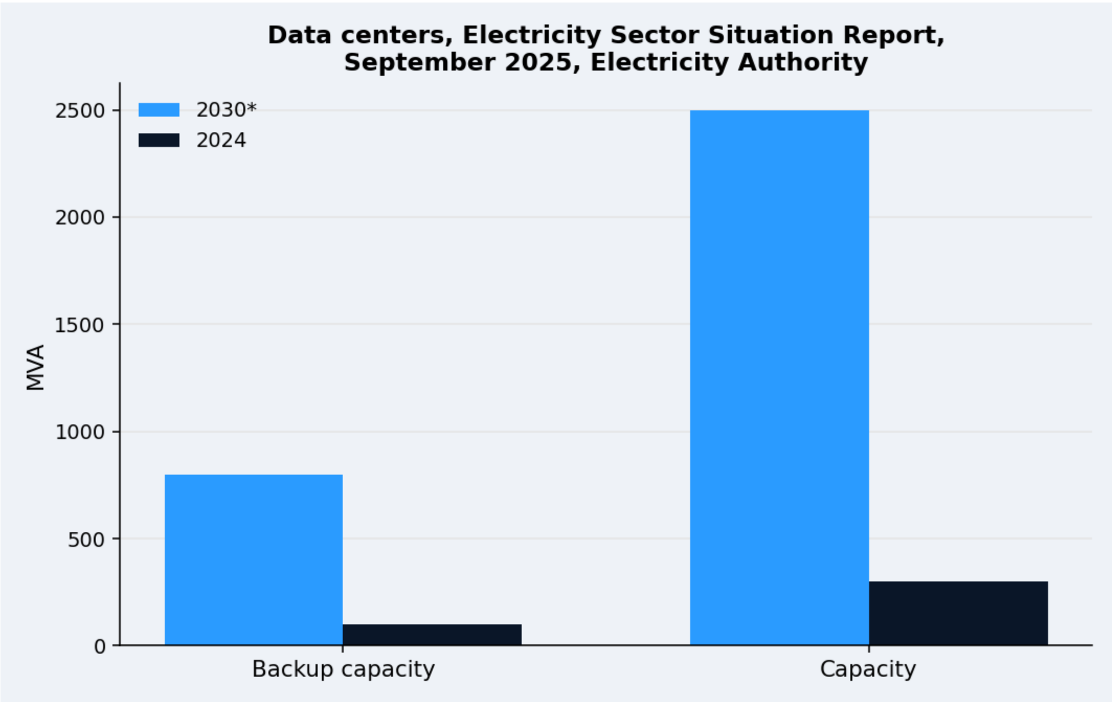
Alongside the aspects related to electricity-infrastructure development, the electricity tariff in Israel is competitive in international comparison. Despite an upward trend in recent years, driven mainly by the needs of electricity-sector development and by coping with security challenges, the tariff is still relatively cheap, especially in off-peak hours. Against the backdrop of Israel's planned renewable-energy targets, which lean on solar energy as an almost exclusive source, the expectation is that solar facilities will continue to be built and will drive the generation of cheap energy during midday hours, alongside a higher price in the afternoon and evening hours.

In summary of the readiness assessment of the Israeli electricity sector, it is clear that Israel's electricity-generation capacity will continue to grow (in installed-capacity terms), as the policy of the government and of the bodies subordinate to it is to continue developing conventional generation capacity in parallel with advancing renewable-energy targets. However, in light of the uneven geographic distribution of generation capacity across the country, transmission challenges are created, and these are expected to accompany the Israeli electricity sector into the future as well.

The Local Perspective: The Energy Needs of Data Centers

The Electricity Sector Situation Report 2025, published by the Electricity Authority, indicates that in 2024 the electricity consumption of data centers was estimated at about 0.5% of sector-wide consumption. According to a preliminary assessment in the report, data-center electricity consumption is projected to reach roughly 5–7% of sector-wide consumption by 2030. Today, no data centers in Israel are connected at extra-high voltage, although several data centers are at various stages of connection. At high voltage, about 60% of the capacity of existing connection orders is in the center of the country (the Netanya-Modi'in-Rishon LeZion triangle).

Data Centers, Electricity Sector Situation Report, September 2025, Electricity Authority



As noted, data centers are facilities with high energy demands. While small data centers can be built at scales of a few megawatts, the vision we propose focuses on turning Israel into an international hub of artificial intelligence, which will require large data centers. The base assumption is therefore that these will need electricity supply on the scale of tens of megawatts each. In addition, these are facilities that require reliable supply and backup at every level of the electricity system: backup of the supply system (generation), backup of the conducting and connecting grid, and backup for a case of generation or transmission interruption via a generator or a separate, distinct generation facility. Given their energy needs and the necessity of continuous operation, it is not plausible that a data center will be built without some means of ensuring energy continuity. Such means can range from basic — for example, a small battery providing immediate response to transient electricity-supply problems — to more extensive, up to the establishment of adjacent power stations to feed the data center. The decision on the backup components chosen, all or some of them, depends on the required investment scope, the ongoing operating costs, and the alternatives available to the party building the facility.

In Israel, which is characterized by relatively cheap electricity during most hours of the day and by reasonable electricity reliability, there is an advantage in basing the construction of these facilities on a certain volume of consumption from the grid. However, because of the high costs of continuous electricity consumption in the afternoon and evening hours — especially at peak-consumption hours under extreme weather conditions in winter and summer — relying exclusively on the electricity grid can lead to higher costs than building some local generation capacity. Given the likelihood that a data center will be built while relying to some degree on its own electricity-generation capacity for functional continuity and cost reduction, the options facing the party building the facility are as follows:

- Renewable energy: building a renewable-energy facility, in particular solar canopies, will supply energy during sunlight hours. However, this is unstable energy, and the electricity is generated in parallel with the daytime hours when buying electricity from the grid is in any case cheap. As a result, the relative benefit of building such a facility to serve a data center's energy needs is not high.
- Storage facility: a storage facility will increase data-center energy consumption during daylight hours (renewables) / nighttime (conventional at low cost), so that the stored electricity can be used to feed the data center fully or partially during the afternoon and evening hours, when electricity is expensive. In addition, modern storage facilities can provide an immediate response to supply-continuity problems arising from transient grid faults. However, a storage facility is inherently limited in the amount of electricity available for use, and charge and discharge times must be planned while preserving a sufficient reserve of electricity to respond to grid events.
- Conventional facility: a conventional facility will enable continuous electricity consumption based on the generation facility itself, with little or no dependence on the electricity grid. Self-generation enables a high level of continuity and energy security, but requires a large initial capital investment as well as planning challenges relating to connection to infrastructure and to obtaining the required approvals. As noted, in light of the current regulation, such facilities can be built at an installed capacity of up to 125% of the consumer's demand, so that the data center will receive full service from the generator adjacent to it.

In summary, a data center in Israel is likely to be built with a storage facility or adjacent to an existing conventional power station. The planning, permitting, and scheduling challenges of building conventional facilities are expected to deter most developers in this field from going in that direction, especially when the option of building a storage facility is faster and can address most fault types. However, to the extent that a high level of energy security is required for data centers that serve as critical infrastructure, storage facilities will not be able to provide a full solution, and the same lengthy planning process will be required to build a conventional facility at a sufficient scale.

The Connection Between the National Need and the Local Need

The connection between developer ambition and the state of the sector creates a challenge in developing a data center, in terms of matching the geographic location to the electricity-generation means incorporated in it. Data centers built in the north and south of the country will find it difficult to obtain approvals to build conventional facilities, given the government's position and that of the professional bodies in the electricity sector, which oppose adding power stations in these areas. Conversely, centers built in the center of the country will find it difficult to obtain approvals to build storage facilities, given the existing transmission congestion and the fact that both data centers and storage facilities add load to an already burdened grid. To build them, resource-intensive and time-intensive projects will be required to expand transmission capacity.

Therefore, in connecting the national need with the local one, it is possible to produce a complementary policy that addresses these challenges and turns data centers into a lever for meeting the national energy need. In view of the challenges described and their implications, action should be taken to encourage or require data centers to be built together with a geographically matched generation means: data centers in the north and south should be required to be built with storage facilities. In this way, they will increase electricity consumption in the areas characterized by large volumes of conventional and renewable generation, and will reduce the load on the transmission system toward the center. The combination of a data center and a storage facility will also enable renewable-energy generation facilities to be built in these areas, since data centers are large and steady electricity consumers. Data centers built in these areas should be prohibited from building conventional power stations.

Conversely, data centers in the center should be required to be built with a conventional generation facility. In this way, they will not add load to the electricity grid, and will even help by providing stable and continuous generation capacity in the central region. Because the energy infrastructure required to build power stations passes through this area — in particular gas and diesel lines — the connection processes to those infrastructures will not pose a significant planning challenge relative to the periphery. Additionally, siting a generation facility adjacent to a data center is expected to help in the permitting process, given the twofold national interest. It is recommended that for generation facilities built in the center adjacent to data centers, the 125% cap be removed. This would encourage developers to build modern power stations at larger installed capacity and allow them to sell electricity to additional suppliers, thereby improving the economics of the power stations. Data centers built in the central region should be prohibited from building storage facilities.

As the Electricity Authority detailed in its work on the sector-wide reliability criterion,[160] increasing installed capacity — including conventional capacity — leads to lower emissions of pollutants and greenhouse gases. This is because modern generation facilities are more efficient and use up-to-date technology, and thus push aside older generation facilities. Consequently, building data centers along the lines described above will not only not undermine the policy of reducing greenhouse-gas emissions, but

160. Electricity Authority, Work of the Electricity Authority on the Criterion of Real-World Economic Needs for Planning the Generation System.

will support it: building a data center combined with storage in the north and south will help reduce transmission loads and thereby enable additional renewable-energy facilities to be built; whereas building in the center of the country combined with conventional generation will reduce the volume of generation from old, polluting power stations at peak demand.

In summary, in the proposed model, data centers become a factor that supports the policy of, and the challenges facing, the electricity sector. Effective policy in this respect can serve as the critical change enabler for positioning Israel as a global leader in artificial intelligence — in terms of supportive and enabling energy regulation, in an environment characterized by high electricity reliability and low prices, alongside high accessibility to infrastructure.

8 Policy Recommendations

The story is told that when Niels Bohr, one of the fathers of the atomic bomb, came to see the plant that had been built to develop it at Los Alamos, he said to his colleague Edward Teller: "I told you it could not be done without turning the entire country into a factory — and that is exactly what you did." Then as now, states that aspire to first place in the arms race are turning themselves into data-center factories. The policy recommendations below rest on the assumption that Israel does not have the economic and geographic resources to win this race and become an AI-infrastructure superpower in the way Saudi Arabia and the United Arab Emirates are planning. Nonetheless, by drawing on its unique strengths and by developing and leveraging its regional and global ties, Israel can preserve its standing as a leader in the field — even if not at the infrastructure layer.

Israel has a number of significant strengths: (I) a human-capital resource that is among the best in the world, and by some measures the best in the world; (II) a technological ecosystem — both in terms of investment and in terms of the number of companies and collaborations — that is likewise among the strongest in the world; (III) a unique geographic location that allows it to serve as a bridge between East and West, and which sits close to countries that are preparing to become AI data-center superpowers; (IV) unique and usable data reservoirs; and (V) defense industries — and in particular cyber security — that are among the strongest in the world and can serve as a key factor in the AI arms race and in ensuring the appropriate use of AI. In light of all of this, we recommend the following steps, which build on Israel's strengths alongside developing infrastructure to the required level, with the aim of promoting the broad use of AI across the country:

1. Formulating a national strategy. Israel's future in the AI era does not lie in becoming an infrastructure superpower, but in positioning itself as a small, knowledge-intensive country that connects its human and technological advantages to local, regional and international infrastructure. This combination — together with smart energy regulation and technological trade agreements in a regional and global framework — will secure a leading position in the era at hand.

2. Defining sovereign On-Premise infrastructure needs. Demand forecasts should be produced for data centers dedicated to storing the volume of sensitive and classified information that must be kept within the borders of the State of Israel alone. These forecasts will make it possible to (I) derive the required scope of data-storage infrastructure, (II) derive the required scope of compute needed to train AI models on this information, and (III) derive the required scope of supporting infrastructure (energy, building area, connectivity, etc.). In line with the expected demand, land reservations, expedited planning procedures and the required electricity infrastructure must be secured. It is important to emphasize that demand forecasts are expected to change frequently, and flexible update mechanisms must be created for both the forecasts themselves and the planning aspects.

3. Ensuring access to On-Demand cloud infrastructure. Most use cases do not require sovereign infrastructure in Israel, but do require guaranteed access to substantial compute and storage resources. To meet these requirements, the state can secure — through commercial agreements in G2G (government-to-government) and G2B (government-to-business) format — a certain quantity of compute resources in foreign countries: resources reserved for Israeli companies and entities, guaranteeing Israel preferential allocation in terms of availability and cost effectiveness. The "Abraham Accords" can

serve as a basis for strategic cooperation with the United Arab Emirates, Saudi Arabia and other countries in the region. Such an arrangement can position Israel as a key regional player that supplies expertise and human capital and receives preferential access to data centers.

4. Accelerating the development of the energy sector. To ensure an adequate electricity supply for local data centers, it must be ensured that data centers do not become a burden on the energy sector but rather a lever for national energy policy, through integrated infrastructure planning. Storage facilities will thus be built adjacent to data centers in the north and south, and conventional generation facilities will be built adjacent to data centers in the center; and with the removal of the 125% cap, they will also be able to supply electricity to the areas surrounding the data center. More broadly, development of Israel's energy sector must be accelerated in order to meet future demand arising from artificial intelligence and from the technologies that will follow in its wake.

5. Data infrastructure. The consolidation and accessibility of public data reservoirs — and in particular those unique to Israel, such as the health data reservoir and the Hebrew-language reservoirs — should continue to be advanced. In parallel, large portions of the government information systems should be consolidated and made interoperable, so that AI systems can begin to be embedded within them. Alongside this, work should continue to regulate the field concerning the use of data in AI systems and the use of data generated by AI systems — while keeping in mind regulatory compatibility with Israel's main partners, including Europe and the United States, and balancing innovation against information-security considerations.

9 Appendices

Appendix 1

Metric	Israel	US East (N. Virginia)	Ireland	Zurich
Data transfer to the Internet price per GB	$0.11	$0.09	$0.09	$0.09
(price diff. vs. Israel — rounded)		−22%	−22%	−22%
Data transfer to another AWS region price per GB	$0.08	$0.02	$0.02	$0.02
(price diff. vs. Israel — rounded)		−400%	−400%	−400%
Standard storage (S3) price per GB	$0.025	$0.023	$0.023	$0.02695
(price diff. vs. Israel — rounded)		−9%	−9%	+7%
Standard compute (EC2 c5.large) price per hour	$0.101	$0.085	$0.096	$0.107
(price diff. vs. Israel — rounded)		−19%	−5%	+6%
Advanced storage (EBS GP3) price per hour	$0.101	$0.085	$0.096	$0.107
(price diff. vs. Israel — rounded)		−32%	−20%	+8%

(As of September 2023 on AWS.[161])

161. Avi Keinan, AWS Region in Tel Aviv, Israel — Price Comparison versus Other Regions.

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