



**Digital
Infrastructure:**
the foundation for economic
recovery and competitiveness





Introduction: Digital infrastructure holds the key to recovery

Digital technologies have redefined the way businesses operate and are acting as a disruptive force in most industries. The pandemic has accelerated this change, as customers have been pushed to digital channels. New entrants are taking advantage of the new rules, and sectors considered more traditional, such as agriculture, are also undergoing a fundamental transformation.

The scope of this transformation goes beyond businesses and sectors: a country's competitiveness is now measured in digital terms. Dozens of rankings have appeared, rating economies according to digital indicators, and global investment decisions are determined by digital metrics at country level. Technology not only holds the key to competitiveness; it is also the main driver of recovery. After COVID, a large portion of revenue creation is taking place in the digital space. Therefore, new business creation is following a digital-first approach, and existing businesses have to accelerate their transformation if they don't want to miss on growth opportunities. The points above work on an assumption: technology is available for Greek companies to find a differential advantage and accelerate their growth. For this assumption to be true, it is required to have a robust digital infrastructure base, which can make technology accessible to organisations.

Given that the infrastructure layer is not immediately visible – what is visible is the technology user layer, such as digital media or social networks -, it is tempting to infer that digital infrastructure is not essential, or that cloud access covers all needs. The fact is that value-added, technology intensive businesses have specialised infrastructure requirements (e.g. artificial intelligence or blockchain), and tend to locate where it is available. This also applies to industries operating in real time, such as finance or gaming. It is no surprise that competition among countries for this infrastructure is intense, the Nordic region being a clear example¹.

¹ Source: <https://www.computerweekly.com/news/450418539/Nordic-region-competes-for-datacentre-dominance>

“Technology not only holds the key to competitiveness; it is also the main driver of recovery”.

Therefore, having digital infrastructure locally represents the opportunity to pilot Greece’s technological future, rather than depending on the conditions of external suppliers. Greece has a geo-economic advantage that can be exploited: it is located at the crossroads of three continents, close to emerging markets representing a population larger than 400 million (Balkans, Central and Eastern Europe, Turkey, Egypt, Israel or Jordan among others). In the same way that the Piraeus port is a node for the physical trade of goods, Greece could become a landing point for submarine cables connecting mainland Europe with Africa, Middle East, India and Asia.

The country has access to a cost-effective and stable infrastructure, which it is attracting new submarine cable connections: recent announcements have been made to establish interconnections between Greek Islands with mainland Greece as well as to strengthen international connectivity. One example is the high-capacity international fibre route linking Greece with Italy (IONIAN)².

On top of that, there is currently a window of opportunity for Greece. The pandemic has diminished the attractiveness of Europe’s major cities such as London or Paris, therefore stimulating interest in other regions. Furthermore, Amsterdam – one of the greatest digital nodes in Europe – seems so have reached a saturation point in the amount of data centers it can absorb³. The time is right to not only to reinforce digital infrastructure in Greece, but also to position it in the technological map of Europe and the world.

² Source: <http://www.islalink.com/islalink-announces-the-construction-of-ionian-a-new-submarine-system-connecting-greece-with-italy/>

³ Source: <https://www.datacenterdynamics.com/en/news/amsterdam-pauses-data-center-building/>

Engineering a technology-driven Recovery

Technology is going to play a pivotal role in recovery, as customers have become digital and added value is created from data-driven products and services. However, this entails the introduction of technology into the economic fabric of Greece, and requires the coordination of the following mechanisms:

Building the foundation: digital Infrastructure

Conventional wisdom would assume that the key to stimulating technological growth lies in the attraction of digital businesses and, as their volume grows, digital infrastructure is created, following the demand. In practice, a reverse dynamic is taking place; digital infrastructure comes first in the sequence, acting as a magnet to attract technology-intensive businesses. They have specialised technology needs, and they favour locations where this infrastructure is available.

This is why the European recovery and resilience plan (“Greece 2.0”)⁴, will allocate **4,6 billion €** to the reinforcement of digital transformation and infrastructure in Greece, from the pre-installation of fibre optics in buildings, to the deployment of 5G technology, as well as the acceleration of digital transformation of the public and private sectors.

⁴ Source: <https://primeminister.gr/wp-content/uploads/2021/03/Greece-2.0-April-2021.pdf>

Enabling growth: infrastructure accessible to Greek companies

The second mechanism is making digital infrastructure accessible to businesses in the way they need it; this will enable them to develop a competitive advantage. In this respect, there is a broad spectrum of possibilities between two ends: the on-premise approach, where a company creates its own infrastructure, and the public cloud option, as a pure as-a-service model. Both ends are available options to companies all around the world.

However, the challenge lies in the middle: creating a robust multi-tenant hybrid offering.

Organisations want to have a degree of choice between the two extremes (pure on-premise and public cloud), in order to meet their specific needs: they wish to have control over their technology, but they may not have the time or resources to build or operate all the infrastructure they need.

A healthy multi-tenant market acts as an airport, allowing companies to access infrastructure and connectivity, share costs and enjoy synergies, sparing them the need to build their own airport. This option represents also an intermediate step for global providers to establish presence in a country before building their own hyperscale data centers and sometimes avoiding the need to invest directly. One example is Madrid, where infrastructure growth has been led and spurred by multi-tenant suppliers, serving both technology users and service providers, prior to the decision of the large Internet providers to invest partially in their own infrastructure in Spain⁵.

⁵ Source: <https://www.de-cix.net/en/locations/spain/madrid/madrid-a-digital-hub-for-southern-europe>

Accelerating growth: data gravity and clustering in a virtuous cycle

As the digital infrastructure market keeps growing, at some point it will reach a critical mass of installed capacity in the region, which will put in motion a set of dynamics. The first one is data gravity: data concentration in a given location exerts a pull force similar to gravity⁶, attracting more data applications and services. The second one is clustering: technology intensive companies concentrating in a geographical area, creating a pool of talent as well as an ecosystem of suppliers and adjacent businesses. That will help Greece in two aspects: retaining expertise and talent, and closing the digital gap in the economy.

These forces act as a virtuous cycle, where infrastructure attracts more data-driven businesses, which in turn stimulate investment in infrastructure, in a positive feedback loop. All of this will create a signalling effect, ultimately turning the cluster into a data exchange center, attracting investment not only in data centers, but also in telecommunications infrastructure. For example, Marseille has attracted a significant community of interest consisting of 12 colocation data centers, 169 cloud service providers, 110 international connectivity networks, 20 CDN & content platforms, and 21 submarine cables.

“A reverse dynamic is taking place; digital infrastructure comes first in the sequence, acting as a magnet to attract technology intensive businesses.”

⁶ Data gravity refers to how data attracts services, applications and more data, similarly to the physical gravitational pull. <https://blog.mc-crory.me/2010/12/07/data-gravity-in-the-clouds/>

The return – capturing the gains

The growth mechanisms described in the previous section create significant benefits for the economies where they unfold. In the first place, digital infrastructure by itself represents a stimulus for the region. However, there is a broader return, derived from the consolidation of the digital economy, accelerating economic recovery and enabling sustained growth. The different impact levels are described below:

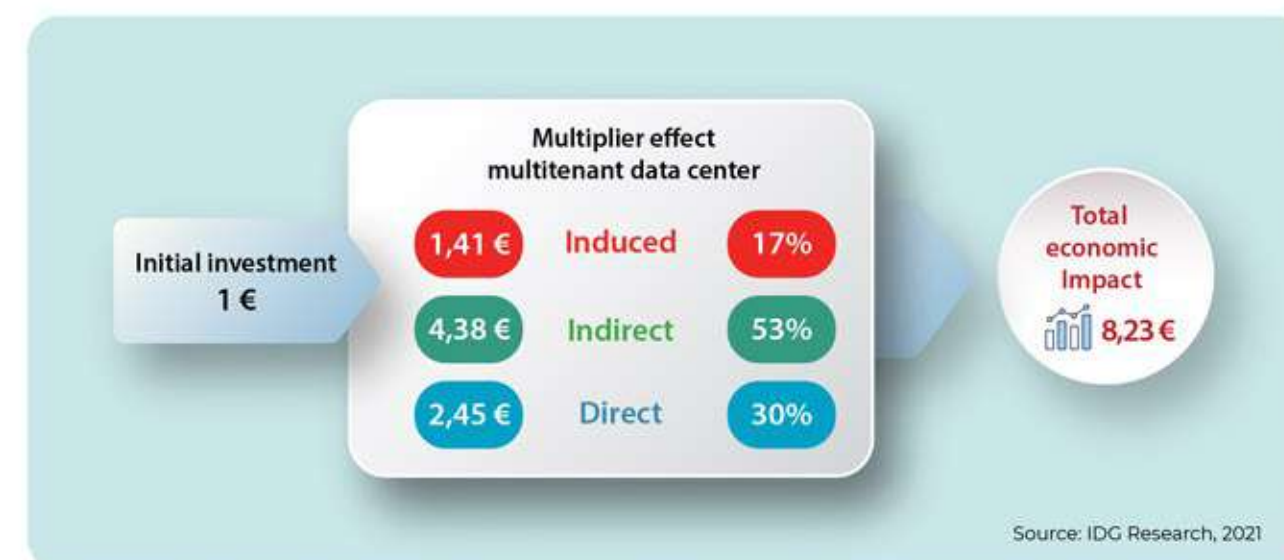
Impact in the Greek economy:

The construction and operation of a data center entails a number of activities that generate wealth and job creation. This effect can be quantified and divided into three categories: direct, indirect and induced.

- **Direct impact.** This category comprises the activity directly related to the building and operation of a data center, such as the construction work and, along the lifecycle, the upgrades, repairs and maintenance of facilities. On top of that, data centers contain technology assets that are accounted for: software and hardware equipment that is purchased, installed and maintained, as well as telecommunications technology.
- **Indirect impact.** This item measures the activity related to the data center from the supply side, as the actors involved in the construction and operation activate their own supply chain. This encompasses the procurement of construction material, as well as the outsourced activity.
- **Induced impact.** This element captures the result of the economic activity derived from the actual job creation in relation to the data center (directly or indirectly): employees spending their salaries on aspects such as transport, food or accommodation.

According to the model developed by IDG Research, 1 € invested in a multitenant data center in Greece generates a 8,23 € return to the economy. This return can be split into the effects described above: 2,45 € come from direct effects, 4,38 € from indirect effects, and 1,41 € from induced effects.

Fig. 1 Multi-tenant Data Center Economic Impact in Greece: Economic Multipliers



Ripple effects: capturing wealth creation at scale

This represents the broad effect on the economy. If the growth strategy described in the previous section is well orchestrated, it can create a competitive advantage for the region, spreading to the country on the whole. The main qualitative gains are described below:

- **Resilient economic growth.** Digital infrastructure brings stable growth to the regions where it is established, insulating them from fluctuations in the economy. A clear case is the state of Virginia (USA), showing sustained growth even during periods of economic recession.
- **Quality employment creation.** Data centers generate highly specialised (and high income) jobs along their lifecycle, from construction to operation and maintenance, as well as IT and telecom operations. This is also the case of auxiliary services (e.g. design and maintenance of refrigeration systems), which are in high demand.

- **High-value foreign investment.** Technology-intensive companies across the globe have strong infrastructure requirements. Therefore, regions capable to meet those requirements with a large enough infrastructure base, enjoy a differential advantage. This could be the case of real-time businesses such as financial investment, digital media, or online video games.
- **Synergies with other technologies.** Digital technologies are interrelated, as they work as building blocks of innovative products and services. For instance, investment in IoT and artificial intelligence stimulates investment in 5G or cybersecurity deployments. In this respect, Greece ranks among the top three European countries in terms of 5G readiness.

To achieve these gains, the main economic actors need to work in coordination. In this respect, governments can take a leading role in promoting investments, accelerating approval processes, and developing strategies and policies.

“According to IDG Research, 1 € invested in a multitenant data center generates a 8,23 € return to the economy”

Driving responsible growth

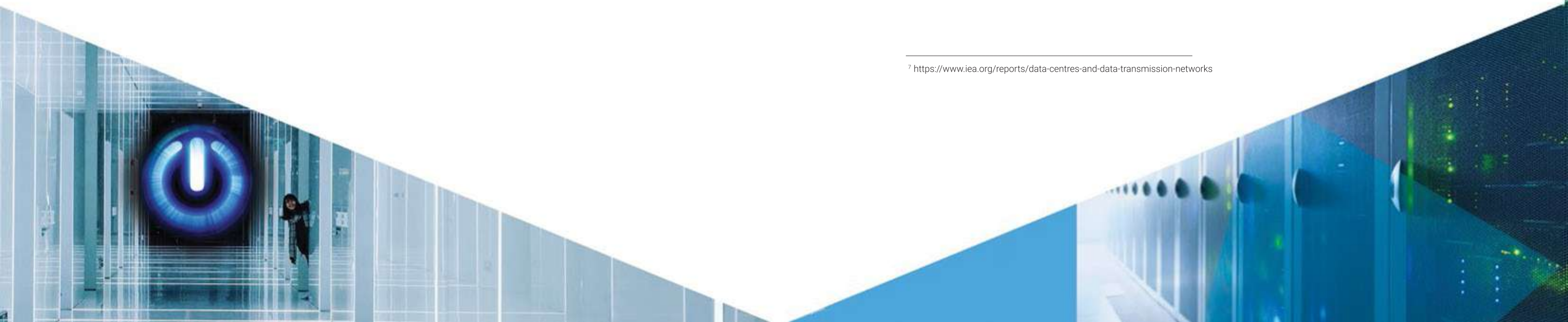
During the last 10 years, the data center industry has embarked into a sustainability journey, driven by two objectives: increasing energy efficiency and using renewable sources. The sector has also made an effort to transfer the improvements to customers, suppliers and consumers, and therefore society on the whole.

Pushing the efficiency frontier

Energy efficiency has been a driver for this sector for years. For instance, according to IEA, “since 2010, the number of internet users worldwide has doubled while global internet traffic has grown 12-fold. However, rapid improvements in energy efficiency have helped to limit energy demand growth from data centers and data transmission networks, which each accounted for around 1% of global electricity use in 2019⁷.”

Since 2010, hyperscale players started to share best practices with the multitenant companies, reinforcing the efforts in the industry. Technological advances are continuously introduced to improve efficiency ratios. Some examples are: modular designs, improved power and cooling strategies, better server utilization, and innovative power management software incorporating artificial intelligence to forecast and adjust consumption levels.

⁷ <https://www.iea.org/reports/data-centres-and-data-transmission-networks>



Green energy as a self-imposed commitment

Sustainability has become a top priority for this industry; the main players rate themselves publicly in different organisations, to turn public accountability into a reputational advantage. Hyperscale data centers build their own clean energy farms, whereas multitenant players make agreements with utilities, therefore compelling them to shift their energy generation mix towards green sources.

Change agents in the economy

The data center industry is extending the drive towards sustainability along the entire value chain, reaching customers, suppliers and consumers.

- **Demand side:** a leap to sustainability. Many companies have outdated data center infrastructures, as well as obsolete cooling systems, in buildings far from optimal for the current infrastructure needs. The digital infrastructure market makes efficiency gains and green practices accessible to all businesses.
- **Supply side:** green policies as procurement criteria. Data center players are demanding sustainable practices to their supply chain, and they are increasingly requiring them to document their procurement processes, to ensure the entire chain is environmentally friendly.
- **Consumers:** benefits are passed on to them. Customers are ultimately beneficiaries, as they are at the end of the chain. They are increasingly willing to verify compliance with best practices, as part of their heightened awareness on environmental issues.

“Sustainability has become one of the top priorities in the technology sector; not only are commitments made in terms of sustainability, but they are also publicly rated in different organizations”.



Methodology

Multitenant Data Center: economic impact in Greece

To estimate the economic impact of a multitenant data center in Greece, IDG Research has used an input-output methodology. The initial investment data in a typical multitenant data center has been provided by Interxion Greece (previously known as Lamda Hellix). Other sources include references such as CBRE or the Uptime Institute.

Direct investment data, combined with Greece GDP input-output tables, have made possible to obtain the economic multipliers, establishing the impact of every euro invested in a data center in the local economy. In other words, these ratios show the relationship between investment in multitenant data center and change in GDP.

“The digital infrastructure market paves the way for businesses to access efficiency gains and green practices”



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Alberto Belle
Fernando Maldonado
🐦 @FmaldonadoF

Principal Analysts of
IDG Research
🐦 @IDG Research_ES



Calle Velázquez, 105 - 5ª planta
28006 Madrid

Tel. +3491 349 6600
research@idg.es