CHART OF THE MONTH

Vol.33

Data at the Center: An AI-powered Future

HAEE
HELLENIC ASSOCIATION *for* ENERGY ECONOMICS

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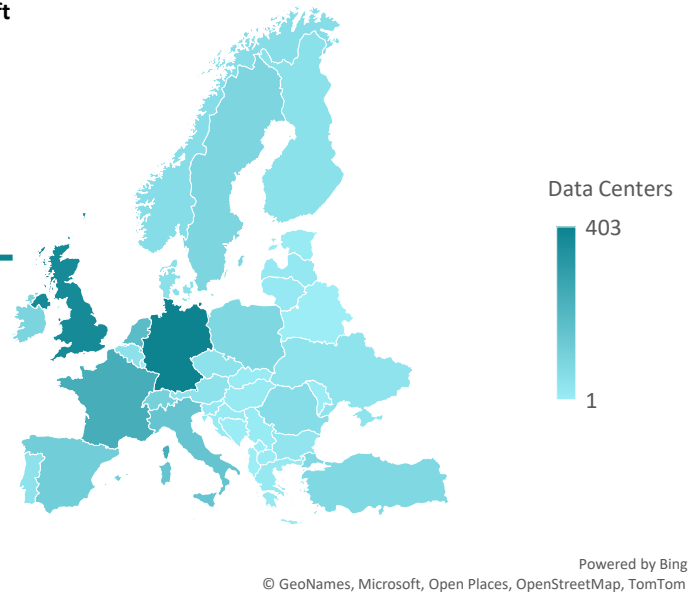
Locations of hyperscale* data centers

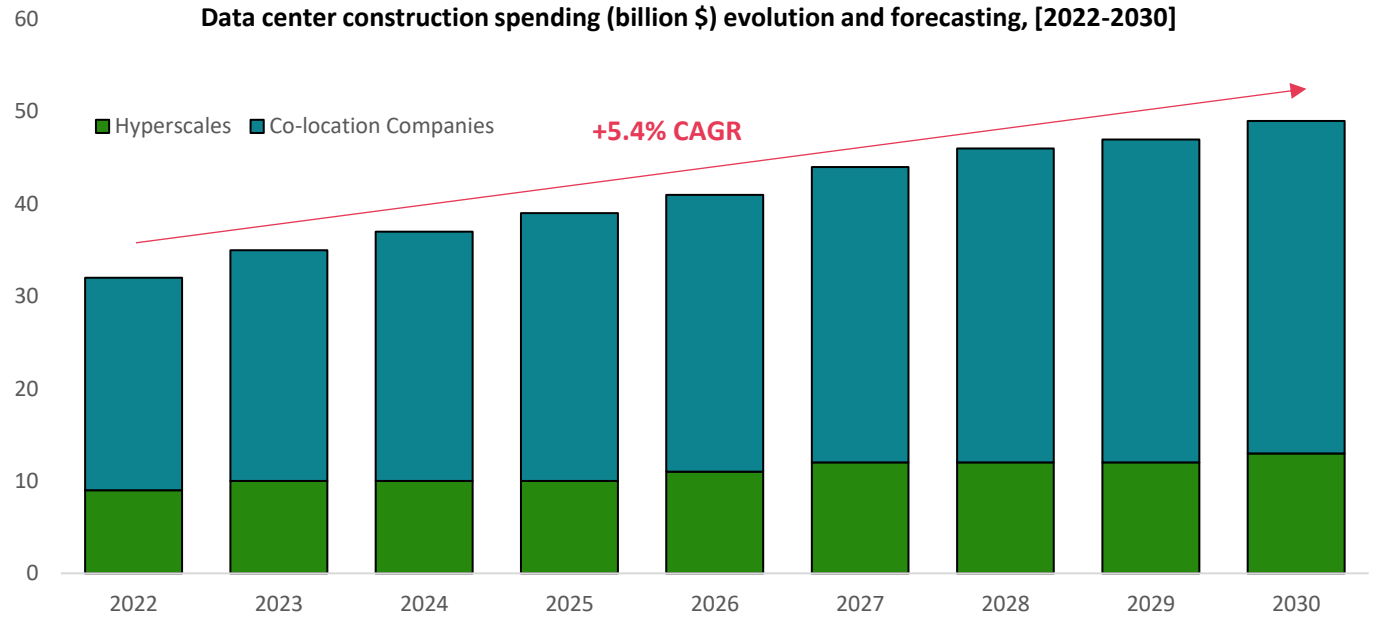
Country	Google	Meta	Microsoft
Ireland	x	x	x
Belgium	x		
Netherlands	x		x
Finland	x		
Denmark	x	x	
Sweden		x	

***at least 5,000 servers and at least 10,000 square feet of physical space. Energy draw: Over 100MW.**

Distribution of all Data Centers across Europe



Data center construction spending (billion $) evolution and forecasting, [2022-2030]



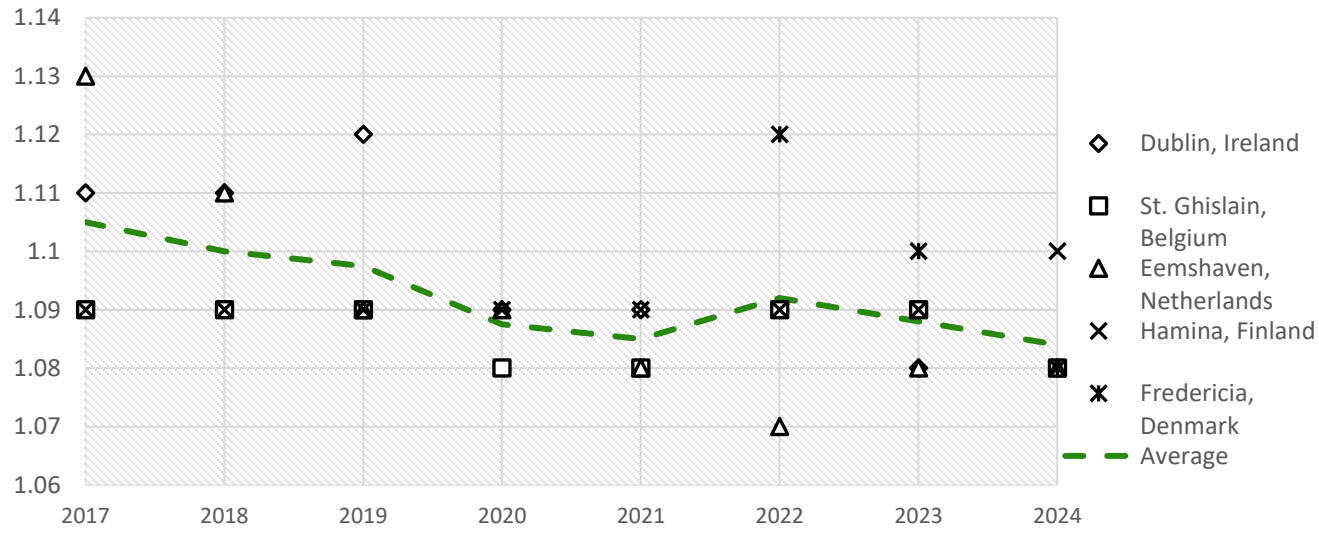
Overview of the electricity use* of data centers per country, [2024]

COUNTRY	TOTAL ANNUAL ELECTRICITY CONSUMPTION	% OF NATIONAL ELECTRICITY CONSUMPTION
Belgium	1,5 TWh	2 %
Denmark	1,3 TWh	4,7 %
Finland	0,7 TWh	1%
France	10 - 12 TWh	2,2 %
Germany	18 TWh	3%
Ireland	5,25 TWh	18 %
Italy	4,25 TWh	1,5 %
Netherlands	3,7 TWh	3,3 %
Norway	1,5 TWh	1,2 %
Poland	2 TWh	1 %
Spain	2,9 TWh	1,2 %
Sweden	3 TWh	2,3 %
United Kingdom	9-10 TWh	3 %

***data used in the table are approximations**

Evolution of PUE in selected EU locations [2013-2024]

***PUE= Total Energy Consumption/IT Equip. Energy Consumption**



Source: European Commission, Google, DataCenterMap, HAEE analysis

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Efficiency at the Center

As data centers scale up to meet demand, energy efficiency is of paramount importance. PUE remains a critical benchmark, with leading facilities achieving values as low as 1.1, thus indicating room for improvement. AI-driven energy management, advanced cooling systems, and renewable power integration could lead to energy efficiencies. Moreover, heat reuse projects, where excess heat from data centers provides heating to nearby buildings, exemplify the convergence of digital and energy solutions. Efficiency is not only a sustainability goal but also a competitive advantage.

Data Centers in EU

Europe hosts over 2,000 data centers, with the highest concentration in Western Europe, particularly in Germany, the Netherlands, and the UK. These countries benefit from robust digital economies, favorable regulations, and resilient electricity grids. However, data centers are increasingly expanding into Nordic countries due to lower energy costs and access to renewable power. Overall, the sector's electricity consumption in the EU has remained relatively stable over the past years.

Greece at the forefront

Greece is emerging as a hub for data centers in Southeast Europe attracting global leaders like Microsoft, Google & Amazon to invest in the country, positioning itself as a gateway for data traffic between Europe, the Middle East, and Africa. The Greek government actively supports the development through reforms both in digital transformation and energy infrastructure. Combined with its geographical advantage and scheduled subsea cable infrastructures, Greece plans to integrate itself into Europe's digital and energy transition future.

Future of Data Centers

The future of data centers is shaped from the growing digital demand and sustainability goals. Innovative solutions such as liquid cooling, modular designs, and AI-powered efficiency optimization are becoming the new standard. At the same time, the push for carbon neutrality is accelerating the adoption of renewable energy, waste heat recovery, and energy storage solutions. By 2030, the global data center construction spending is projected to almost reach $50 billion.

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Meet the Team

HAEE Research Team

Prof. Dr. Kostas Andriosopoulos
Editor-in-chief
Alba Graduate Business School;
BoD Member, HAEE

Konstantinos Sfetsioris
Senior Project Manager, HAEE

Ilias Tsopelas
Energy Analyst, HAEE

Deloitte Team

Konstantinos Eleftheriadis,
Partner | Strategy & Transactions, Energy,
Resources and Industrials Leader, Deloitte Greece

Dr. Konstantinos Bergeles,
Principal| Strategy & Transactions,
Energy, Resources and Industrials, Deloitte Greece

Ioannis Kouloumpis,
Assistant Manager | Strategy & Transactions,
Energy, Resources and Industrials, Deloitte Greece

Energy, Resources & Industrials | Deloitte

info@haee.gr
www.haee.gr

Hellenic Association For Energy Economics (HAEE)

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