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European Association of Public IT Service Providers

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EURITAS POSITION PAPER: *SUSTAINABILITY OF PUBLIC DATA CENTRES*

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Management Summary

- **Global demand for data centres is predicted to rise significantly** due to trends such as the general progress of digitalization and emerging technologies like AI or cloud computing. At the same time, existing data centres often operate below optimal energy efficiency levels. Striking a balance between the growing energy demand and environmental stewardship becomes more and more crucial, especially with regards to SDG #7, demanding **Affordable and Clean Energy**.
- Euritas sees **no alternative to a green transformation of data centres**, which, however, poses great challenges on data centre owners and users, such as increasing cost. **This transformation needs to be supported by a legislative framework**, considering existing standards, setting obligational targets and incentivizing highly ambitious players. Additionally, the existing high security requirements of public authorities must be considered.
- **Euritas and its members strongly commit to a sustainability transformation of their data centres**, seeking highest standards and hoping to become role-models for data centre efficiency. All members will work out and publish their current state of data centre efficiency and derive an action plan for their green transformation, accompanied by the implementation of an energy management system. Also, **Euritas is open to a constructive dialogue with relevant stakeholders**, such as the European Commission.

Introduction

Euritas is a network of European public ICT service providers, which aims at creating better ICT services for public administrations, businesses and citizens in Europe. Euritas considers itself as the voice of public IT service providers. In this role, Euritas presents position papers on topics of concern for public IT service providers. The last three such papers dealt with digital sovereignty, cloud services and Artificial Intelligence (AI).

Euritas as a network strongly cares about sustainability and supports the EU goal of achieving climate neutrality by 2050, with Euritas' organisations being committed to this goal as well as the respective national goals. In this context Euritas focusses on sustainability and carbon neutrality throughout the entire service portfolio of European public IT providers, with a focus on energy-efficient data centres. Global demand for data centres is predicted to rise significantly. In the public sector, trends such as the general progress of digitalization of government services, emerging technological trends like AI or cloud computing are forcing private providers and public bodies to ramp up on server and data storage capacities. While technological progress is not always linked to a proportional increase in infrastructure, the overall direction for data centres is evident.

Data centres rely on substantial amounts of electricity, accounting for 2.7% of electricity demand in the EU (76.8 TWh) in 2018. This demand is expected to increase by 28% to 98.5 TWh by 2030[1], nearly equalling Belgium's total electricity consumption in 2021 (99.5 TWh)[2]. At the same time, existing data centres often operate below optimal energy efficiency levels, with an average Power Usage Effectiveness (PUE)[3] of 1.6, despite the growing adoption of energetically optimized setups and best practices.[4]

[1] Montevecchi, F., Stickler, T., Hintemann, R., Hinterholzer, S. (2020): Energy-efficient Cloud Computing Technologies and Policies for an Eco-friendly Cloud Market. Final Study Report. Vienna.
[2] International Energy Agency (2024): Belgium (Country profile). Found at: https://www.iea.org/countries/belgium
[3] The PUE value is calculated from the ratio of the energy flowing into a data centre to the energy required to operate the IT. The closer the value is to 1, the more efficient a data centre is. However, the PUE value does not display data centre efficiency in general. It is possible that an increase in IT efficiency directly leads to a reduced cooling demand. If the electricity demand for cooling decreases by the same factor the electricity demand for operating the IT decreases, the data centre becomes more efficient while the PUE value remains unchanged.
[4] European Commission (2023): The EU Code of Conduct for Data Centres – towards more innovative, sustainable and secure data centre facilities. Found at: https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/eu-code-conduct-data-centres-towards-more-innovative-sustainable-and-secure-data-centre-facilities-2023-09-05_en

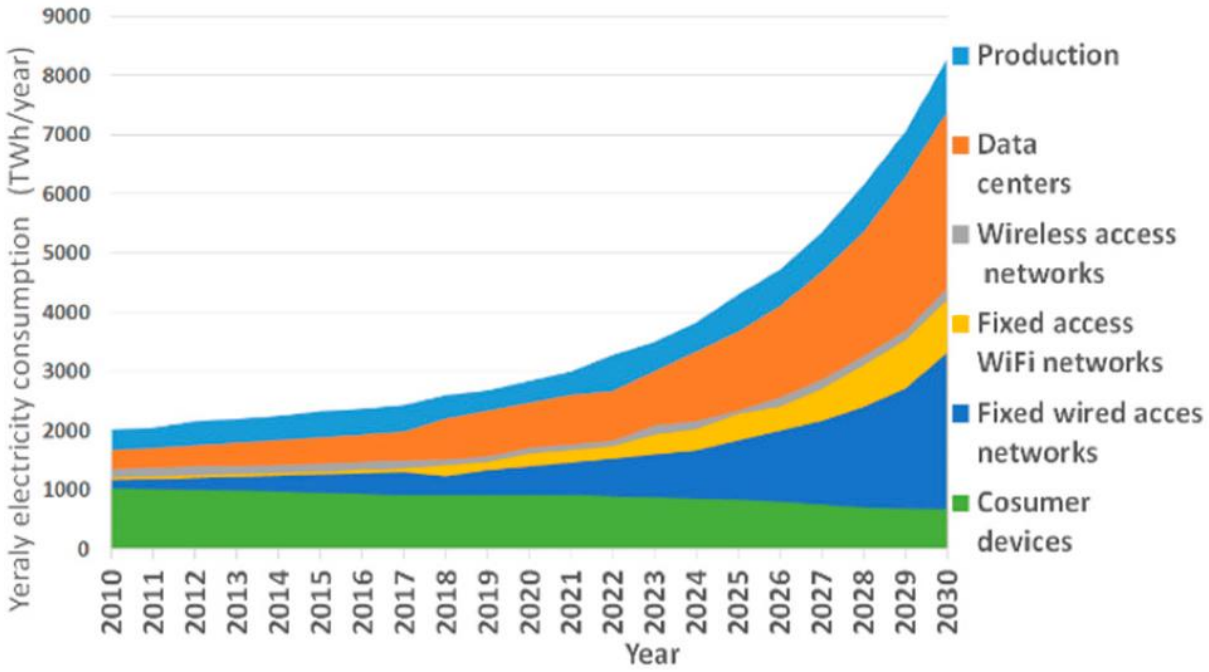


Figure 1: Expected total annual energy consumption per different ICT systems in period 2010-2030.[5]

To align with the Sustainable Development Goals[6], especially **SDG #7 Affordable and Clean Energy**, GHG emissions related to the electricity supply of data centres must be minimized. Therefore, a relentless expansion of infrastructure, necessary for the extensive use of renewable energies, and innovative approaches to increase energy efficiency are required, both accounting for **SDG #9 Industry, Innovation and Infrastructure**. Environmentally friendly data centres may also contribute to **SDG #11 Sustainable Cities and Communities** by providing waste heat to residents, as can exemplary be seen in Berlin, where the project DATA2HEAT fully supplies the demand of the innovation quarter "Marienpark" with heat with no additional carbon footprint.[7]

This paper aims at outlining the challenges a green transformation poses for public IT providers and data centre operators, as well as to underline the explicit responsibility they have, deducted from the above-mentioned SDGs. In this context, existing European certification and standards related to energy supply and energy efficiency of data centres are discussed, showing their importance as well as possible improvements within the current

[5] Lorincz, J., Capone, A., Wu, J. (2019): Greener, Energy-Efficient and Sustainable Networks: State-Of-The-Art and New Trends. Found at: https://www.mdpi.com/1424-8220/19/22/4864
[6] United Nations (2024): The 17 Goals. Found at: https://sdgs.un.org/goals
[7] GASAG (2023): GASAG Solution Plus uses waste heat from Data Centre for future-proof heating – in the heart of Berlin. Found at: https://www.gasag-gruppe.de/medien/presse/pressemitteilungen/20230911-pm-gsp-nutzt-abwaerme-aus-rechenzentren

European legislation. Following this discussion, a clear positioning of Euritas regarding the resulting data centre implications is established, seeking a discourse with the regulator as well as with other involved parties.

1. The importance of sustainable data centres

As data centres become increasingly indispensable to modern society, striking a balance between their growing energy demand and environmental stewardship becomes more and more crucial. Digitalization will and must continue, with the open question not being "Will it happen?" but rather "How fast and to what extent will it happen?". To secure autonomy as well as efficiency, European data centres are much more desirable for Euritas than either international data centres (which lack European self-sovereignty and also lead to a leakage of computing capacity and related carbon emissions[8]) or decentralized, small-scaled servers (which are less efficient). Thus, a situation where sustainable data centres are uneconomical in Europe must be prevented. Instead, the European Union, committed to a sustainable future with the central goal of becoming Net Zero by 2050, as outlined in the European Green Deal[9], may implement a new regulatory framework that drives energy efficient practices and hence reduces GHG emissions (as proposed by the beforementioned goal).

Status quo:

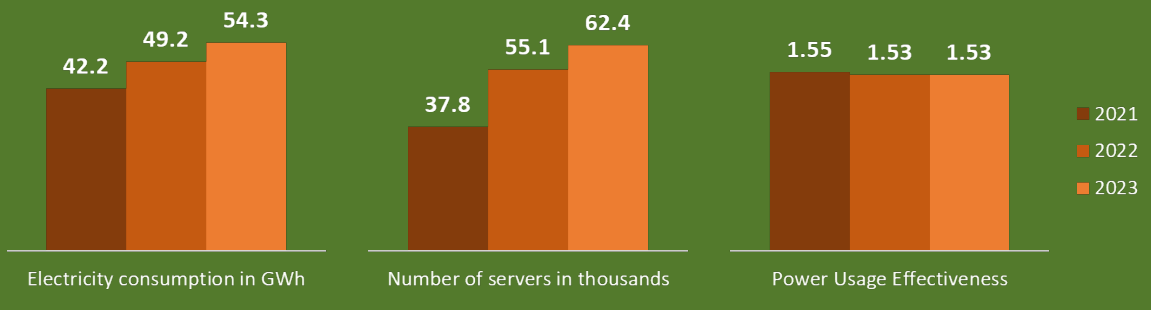
Rising demand for IT and processing capacity is expected to result in a rising electricity demand (see abstract above). In contrast, data centre efficiency rises (better PUE values) due to technological improvements/ better technical components. However, this usually does not compensate for the rising electricity demand (see Figure 2). Thus, there is a growing need to generate renewable electricity on-site/ nearshore and to reuse the energy in form of waste heat. In Germany, for instance, the Energy Efficiency Law[10] already stipulates that data centres put into operation as of July 2026 must meet a minimum PUE value of 1.2. In addition, the waste heat usage of data centres with at least 300 kilowatt grid connection power must meet a minimum share of 10% as of July 2026, 15% as of July 2027, and 20% as of July 2028.

[8] European Commission (2024): Carbon Leakage. Found at: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation/carbon-leakage_en
[9] European Commission (2024): The European Green Deal. Found at: https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en
[10] German Ministry of Justice (2024): Energy Efficiency Law. Found at: https://www.gesetze-im-internet.de/enefg/EnEfG.pdf

Figure 2: Practical example: Growing efficiency in ITZBund data centres does not compensate for rising IT and electricity demand

The Federal Information Technology Centre Germany (ITZBund) is the federal public IT service provider of Germany, operating eight co-location data centres. The total number of physical and virtual servers operated by the ITZBund grew from 37.8 thousand in 2021 to 62.4 thousand in 2023 (+65%), resulting in an increase in electricity consumption of 12.1 GWh (+29%). Those numbers imply two key messages:

1. As the number of servers grew relatively faster than the related power consumption, an increase in efficiency took place. This efficiency gain is expressed by the Power Usage Efficiency (PUE) which decreased from 1.55 in 2021 to 1.53 in 2023.
2. The electricity demand grew despite the aforementioned efficiency gain, meaning that increasing efficiency cannot be the only measure to limit the environmental impact of data centres. In addition, the increasing demand must be supplied by green electricity.



Goals:

Efforts to systematically optimize energy efficiency in data centres should focus on energy technologies. The framework for this is provided by energy management systems. German data centres (total energy demand > 3 GWh/a), for example, are obliged by the German Energy Efficiency Law to implement ISO 50001 or Eco-Management and Audit Scheme (EMAS) until June 30th 2026[11]. The implementation of energy management systems should be accompanied by using best-in-class technologies and hardware to maximize processing efficiency. In addition, energy loss should be minimized by implementing efficient power distribution systems, such as high-efficiency uninterruptible power supplies (UPS) and power distribution units (PDUs). Moreover, data centres should use a 100% renewable power supply, have a high share of waste heat reuse and use technical water less and more efficiently. Furthermore, the numbers of physical servers can be reduced by consolidating them through virtualization. And finally, cooling energy can be reduced by the following measures:

- Cold and warm aisle containment to maximize cooling efficiency
- Increase of final cooling temperature

[11] German Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection (2023): Energy Efficiency Law obliges energy management system introduction. Found at: https://www.emas.de/aktuelles/news/18-10-23-enefg

- Flexibilization of cooling temperature in connection with IT operation temperatures (instead of fixed temperatures)
- Upgrading the cooling infrastructure to a closed-loop system
- Utilization of a more sustainable cooling agent with lower global warming potential, e. g. ammonia (NH_3) or carbon dioxide (CO_2)
- Integrating variable speed fan control
- In the case of cooler climates, use economisers to utilise cooler outdoor air

While upgrading the server infrastructure is vital, it is also important to maximize the usage ratios of the already existing infrastructure e. g. by utilizing Cloud operating models that can contribute to an optimal infrastructure-demand allocation.

Next to these technological measures, it is key to accelerate necessary action and ensure that the aforementioned measures are target oriented. This requires an increased awareness in the data centre industry and more scientific research for evaluating efficacy of different efficiency strategies for different kinds of data centres. All these efforts need to follow a clear and target oriented approach consisting of two consecutive steps: First, estimate future required capacities and second, build technical components accordingly.

Challenges:

There are a couple of challenges that need to be addressed in order to enable the transformation towards energy efficient data centres. First, there is often limited space for on-site electricity generation. In addition, expensive and complex storage systems are needed due to fluctuating supply from renewables. Second, the demand for waste heat – either by relevant consumers or by properly dimensioned district heating grids nearby – is often lacking. Third, cooling usually requires either poisonous refrigerants or a constant water supply. Fourth, a green transformation goes along with high costs and the resulting need for financing. Fifth, partial capacity utilization, especially at the beginning of an investment, reduces efficiency. This makes estimation of future required capacities even more relevant. Sixth, large-scale data centres are more efficient but face a variety of involved parties, such as owners, users and tenants. As a result, there is a limited scope of action for tenants in co-location data centres. And finally, there is no European framework or common obligatory standard for increasing data centre efficiency in place.

Euritas Position:

It is clear that there is no alternative to a green transformation of data centres. This transformation, however, poses great challenges on data centre owners and users. Mitigating these challenges, calls for collective action and support on a European level. Under the stewardship of the EU, the involved parties can be brought together and support each other, for instance by sharing knowledge and best practices. This requires the

establishment of a common European framework that sets obligational targets as well as incentives for highly ambitious players.

2. Setting a clear path through certification and standards

Status quo:

A common all-encompassing framework for achieving more energy efficient data centres does not exist. The Directive (EU) 2023/1791[12] is the only binding piece of legislation in that regard. It obliges public data centres to monitor and report their energy performance, submit it to a database at EU-level and to either implement energy management systems or to conduct regular energy audits. However, it only aims at assessing data on the energy efficiency to suggest further measures for improvement, but does not claim improvement by itself.

Next to the mentioned directive, there is a variety of different standards, labels and management systems in place. The benefits for data centre owners for sticking with the existing standards/ labels are limited. In addition, these standards do not entail any binding obligations and they have differing objectives:

- The European Code of Conduct for Data Centres (EU DC CoC) is a voluntary initiative that encourages and guides data centre operators and owners in cost-effectively reducing energy consumption without compromising the mission-critical function of these facilities. It sets ambitious standards for companies willing to participate and identifies and focuses on key issues and agreed solutions, as outlined in a best practices document[13]. Revised annually, this document includes the latest technological developments to be implemented.
- The European series of standards EN 50600 "Information technology – Data centre facilities and infrastructures" considers all aspects of a data centre's life cycle. Among other things, it provides the basis for planning the building structure, the electrical supply, air conditioning, cabling and necessary security systems. The standard also describes the requirements for data centre operation and maintenance. EN 50600's best practices are very similar to those of EU DC CoC.
- ISO 50001 is based on the management system model of continual improvement also used for other well-known standards such as ISO 9001 or ISO 14001. This makes it easier for organizations to integrate energy management into their overall efforts to improve quality and environmental management.

[12] Official Journal of the European Union (2023): Directive (EU) 2023/1791 of the European Parliament and of the Council. Found at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32023L1791

[13] Joint Research Centre (2023): 2023 Best Practice Guidelines for the EU Code of Conduct on Data Centre Energy Efficiency. Found at: https://e3p.jrc.ec.europa.eu/publications/2023-best-practice-guidelines-eu-code-conduct-data-centre-energy-efficiency

- EMAS helps organisations optimise their internal processes, achieve legal compliance, reduce environmental impacts, and use resources more efficiently. EMAS is suited for all kinds of organisations – public and private, large multi-national companies as well as small and medium sized enterprises (SMEs) with few financial resources and limited in-house environmental management expertise.
- The Blauer Engel ("Blue Angel") is a German ecolabel for Servers and Data Storage Products. It sets high minimum requirements for the energy efficiency of servers, data storage products and power supply units, as well as for the elimination of pollutants in the plastic materials used in the products. The Blue Angel certifies data centres that are operated in a particularly energy efficient and resource-conserving manner.

In addition to the existing landscape of standards and labels, there are various indicators in place for measuring data centre efficiency. The PUE, for example, is a wide-spread indicator that is easy to calculate, representing a ratio of the energy flowing into the data centre and the energy required to operate the IT. The CER (Cooling Efficiency Ratio[14]) is wide-spread as well, however not as common as the PUE. The CER helps generating a more wholistic view on data centre efficiency, as it indicates changes in cooling efficiency. In addition to the simpler indicators PUE and CER, there is also the option of using wholistic KPI (key performance indicator) systems. These systems, such as KPI4DCE[15] (Key Performance Indicators for Data Centre Efficiency), are intended to generate a complete image of data centre efficiency. Although they display data centre efficiency much more accurately than PUE and CER, they are not commonly used, as their calculation requires high efforts.

Goals:

European legislation should set a clear path for data centres by establishing a common European label or a comparable international standard based on the abovementioned existing standards and certificates. This would grant planning security and enable data centre owners to execute long-term planning. In all this, certification and standards should be both ambitious enough to result in significant efficiency gains as well as practical with regards to the implementation effort. It is key to allow for flexibility regarding data centre owner vs. co-locator, data centre size and capacity utilization. This can be provided, for instance, by partial label fulfilment, enabling a continuous improvement and facilitating and incentivising certification for implementors. In addition, regulations need to be verified by independent third parties (e.g. TÜV or national authorities) to ensure their functioning and a strong impact. Moreover, as certification processes are expensive, they should only apply to data centres of a minimum size (the threshold still needs to be worked out). For smaller data

[14] The CER value is calculated from the ratio of the total amount of heat produced by a data centre to the energy required for cooling. The higher the value is, the more efficient the cooling system works.
[15] Umweltbundesamt (2015): KPI4DCE: The resource-efficient data centre – key figures and indicators. Found at: https://www.umweltbundesamt.de/publikationen/kpi4dce-das-ressourceneffiziente-rechenzentrum

centres, benchmarking must be established as an alternative option to increase energy efficiency.

Challenges:

There are a few aspects that hinder the united sustainability transformation of public data centres. To begin with, the requirements for data centres in terms of security and high availability have increased and continue to grow. In addition, there is no Europe-wide binding obligation for data centres that goes beyond achieving climate neutrality by 2050, monitoring and reporting energy performance and implementing energy management systems or conducting regular energy audits. Therefore, a sustainability transformation needs to be supported by ambitious legislation, specifically designed to increase the energy efficiency of data centres. For current benefits alone (such as cost reduction through energy savings, environment protection, image gains) do not seem to incentivize transformation measures strong enough. The existing labels and certificates focus strongly on work safety and how to deal with toxic materials. However, it is desirable to place a stronger emphasis on climate protection and energy efficiency. And finally, the large number of auditors needed to verify the implementation of standards does not appear to be covered by the available experts.

Euritas Position:

It has been demonstrated that the lack of a comprehensive common framework is a barrier to a coherent, targeted transformation at the European level. The variety of labels and standards as well as the lack of a clear, EU-wide regulation that suggests concrete measures and sets obligational targets is rather confusing and discourages ambitious action. Therefore, Euritas calls for a higher degree of standardisation in general, focusing on both commercial providers of co-location data centres and public IT providers. Relevant labels and certificates should be unified and stronger concentrated on energy efficiency and the reduction of GHG emissions. Moreover, Euritas urges for the further development of Directive (EU) 2023/1791 to become a clear, easy and supportive legislation, closely oriented towards common standards and guiding principles, to support the green transformation, expansion, and modernization of data centres, including grants and subsidies for highly ambitious public sector actors. Such legislation should also set hard sustainability standards for public procurements, while considering the high security requirements of public authorities. And last but not least, Euritas supports the goal of the mentioned directive to collect data about the efficiency of European data centres and requests an agreement on common indicators. To this end, Euritas aims at establishing PUE and CER as such indicators for data centre efficiency, suggesting the combination of both to become the standard for European data centres, with ambitious target values to be binding for public authorities. Also, Euritas offers its expertise in this field to support the further development of the mentioned legislation, including establishing minimum performance standards and an assessment on the feasibility of transitioning towards a net-zero emission data centres sector.

3. Euritas' next steps and recommendation

With this position paper, Euritas seeks to underline the importance of sustainability for its member organisations. Euritas' members are strongly committed to a sustainability transformation of their data centres, seeking highest standards and hoping to become role-models for data centre efficiency.

To achieve these goals, Euritas' members wish to tackle three points of action: First, work out and publish a clear picture about the current state of their data centres' energy efficiency, including the number of facilities, the total electricity consumption, the related Green House Gas (GHG) emissions and the average PUE and CER values. Second, derive an action plan that enables a green transformation of the existing data centres with a focus on energy efficiency and 100% renewable energy supply until 2026. Third, implement energy management systems in all their data centres to monitor and support the green transformation until 2028.

Euritas strongly recommends the implementation of the above-mentioned legislation adjustments. Not only will the adjustments support Euritas' ambitions, but will also help other data centre owners and operators on their path to climate neutrality. Alongside this process, Euritas looks forward to a constructive dialogue with the European Commission and other data centre operating organisations and networks to share and learn from best practices.

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