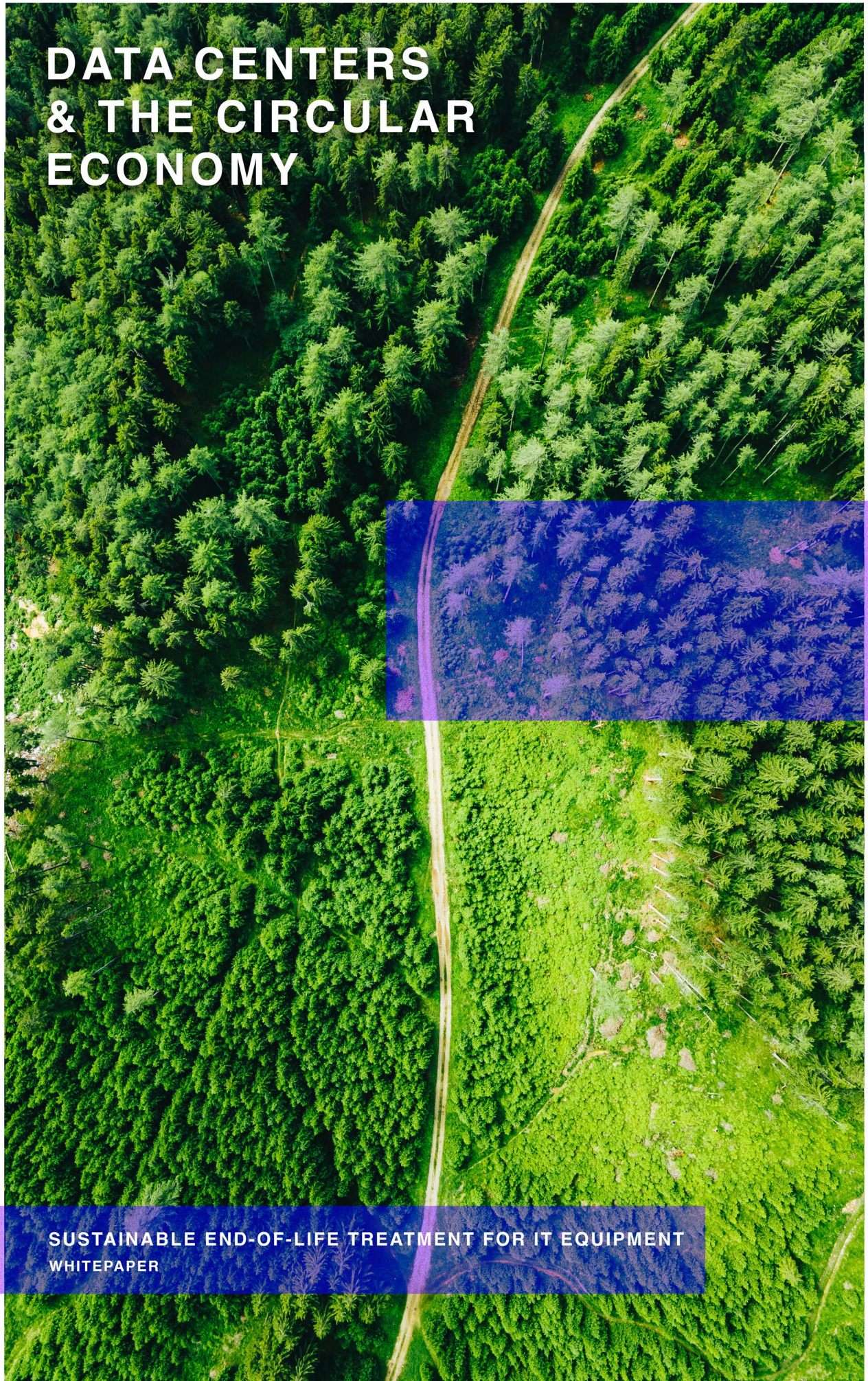
DUTCH DATA CENTER ASSOCIATION

SIMS LIFECYCLE SERVICES

DATA CENTERS & THE CIRCULAR ECONOMY



DATA CENTERS & THE CIRCULAR ECONOMY

SUSTAINABLE END-OF-LIFE TREATMENT FOR IT EQUIPMENT

WHITEPAPER

C O L O

P H O N

Data Centers & the Circular Economy has been produced by Sims Lifecycle Services (SLS) and the Dutch Data Center Association (DDA). It focuses on Information Technology (IT) within the data center landscape and provides recommendations to support the just transition towards a circular business model for data center IT hardware.

To support the Whitepaper SLS and DDA surveyed individuals representing companies operating within the data center industry in The Netherlands. The results of this survey support the analysis of the current situation relating to IT circularity in the region and form the baseline scenario upon which recommendations are based. The survey informing this Whitepaper was administered in 2023 and reflects the information provided anonymously by invited individuals from within the industry, to the best of their knowledge, at that time.

The Whitepaper focuses on IT hardware and does not include HVAC and Infrastructure equipment (such as UPS/ Generators). This is a potential area for an extension of this study. The Whitepaper focuses on the data center landscape in the Netherlands. This is a potential area for an extension of this study.

We would like to thank the members of the DDA and clients of SLS for supporting this research by participating in the survey.

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Edition
Data Centers & the Circular Economy
2023

Availability
Our publications are free to download on
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CONTENT

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01 INTRODUCTION

The demand for data center services continues to grow as businesses and individuals seek to store and process larger amounts of data cost-effectively and securely. Data centers offer flexibility and scalability, allowing organizations to rapidly expand their operations as needed. As organizations increasingly rely on technology and digital platforms, the use of data centers has seen exponential growth. With the continued expansion of digital technologies and the Internet of Things (IoT), it is expected that the importance of data centers will only increase in the future.

Data centers are essential for the storage and processing of vast amounts of data. Data centers consist of OT and IT. OT, Operational Technology, is needed to run the critical IT, Information Technology, in the data center facility. In private and hyperscale data centers, IT and OT are owned and managed by the same entity. In colocation data centers, the data center operates the OT, while the IT is owned and operated by the customer of that colocation data center.

Data Center	
OT Operational Technology • Power • Cooling • Batteries	**IT** Information Technology • Compute • Storage • Connectivity

In this paper, we focus on the environmental impact of IT equipment. The impact can be attributed to the electricity consumption of IT hardware, as well as the production and disposal of IT equipment. Both contribute to the Greenhouse Gases (GHG). Additionally, IT equipment generates electronic waste that has the potential to harm the environment when disposed of incorrectly.

Sustainability is becoming increasingly important for organizations in the data center industry. Data centers invest in renewable energy sources and implement energy-efficient technologies to reduce these impacts. In addition, recycling and responsible disposal of IT equipment can reduce electronic waste. Data centers still have plenty of opportunities to minimize their environmental impact.

Data centers house a wide range of IT hardware, including servers, data storage devices, networking equipment, and power and cooling systems. The specific types of hardware used in a data center can vary depending on factors such as the size of the facility, the needs of the clients it serves, and the latest advancements in technology. The value of IT hardware in data centers can be significant and represents a substantial investment for organizations.

There are several ways to recover value from IT equipment that is no longer needed. Recovering the value can be done through redeploying, reselling, trading in, parts harvesting, and recycling assets or components. Refurbishing and reusing equipment is the best option for both sustainability and value return. Recycling ensures that the equipment is disposed of responsibly and that any valuable materials are recovered. Implementing a strategy for recovering value from IT equipment can reduce costs and promote sustainability.

An IT asset disposition (ITAD) program for data centers is a set of procedures and policies that ensure the proper redeployment and/or disposal of IT assets, such as servers, storage devices, and networking equipment. ITAD programs are designed to securely manage the end-of-life of these assets and help prevent data breaches, environmental damage, and regulatory violations. By implementing an IT asset disposition program, data centers can ensure that their assets are disposed of securely and environmentally friendly while maximizing any potential residual value. ITAD programs can help to reduce costs, minimize risk, avoid carbon production, and promote sustainability.

02
IT REUSE AND THE CIRCULAR ECONOMY

The circular economy is a model that aims to minimize waste and maximize the use of resources. The circular economy model promotes sustainability and reduces environmental impact. For data centers, it involves design, production, use and disposal of IT hardware. To achieve a circular economy, practices such as refurbishing, repairing, and recycling equipment, as well as using renewable energy sources and optimizing energy efficiency, should be introduced. The circular economy model can also create additional business opportunities and **reduce costs for companies in all areas of the data center ecosystem.**

The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (Greenhouse Gas Protocol Standard), introduced in 2001, is a widely used framework that enables companies to holistically evaluate their carbon impact. This standard categorizes direct and indirect carbon emissions and was developed by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI).

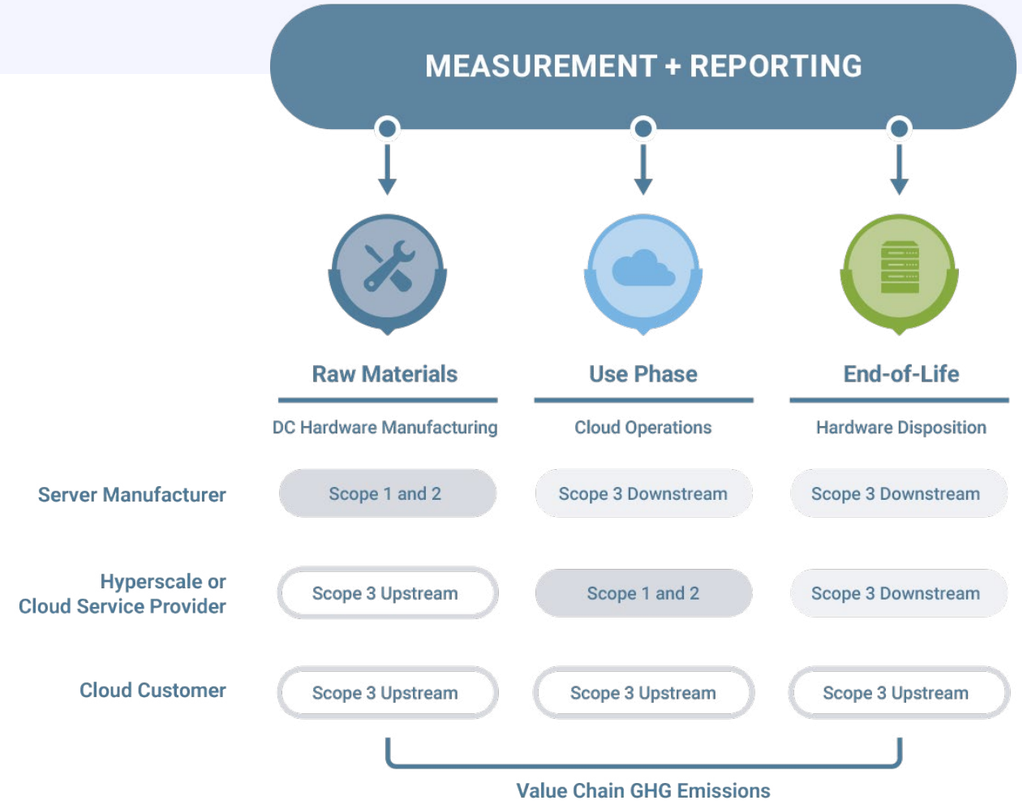
Carbon emissions are categorized as Scope 1, Scope 2, and Scope 3 emissions:

Scope 1 emissions result from sources owned or controlled by the company (such as fuel combustion in a vehicle fleet or backup generator).

Scope 2 emissions result from energy purchased to enable the company's operations.

Scope 3 emissions are indirect emissions that arise from the products, goods, and services that support the company's operations. Scope 3 emissions may be upstream or downstream activities in the value chain. Examples include goods and services purchased, leased assets, and transportation activities to deliver the company's products to customers.

When a company disposes of a server or networking product, emissions from the end-of-life treatment of that device form a part of the Scope 3 emissions for the company.



An important driver for reducing these emissions is the identification of opportunities to reuse and redeploy equipment, which extends the useful life of IT equipment, avoiding the need to manufacture new products. Reuse avoids the emissions associated with manufacturing new products, reduces reliance on raw materials, and avoids landfill or incineration. Additionally, it can contribute to localizing supply chains.

INCORPORATING ITAD REPORTING INTO THE CORPORATE SUSTAINABILITY REPORTING FRAMEWORK

As noted previously, carbon emissions related to the disposition of a company's retired IT assets are considered Scope 3 emissions for that company. Most ITAD vendors will provide documentation related to Scope 3 emissions avoided by recycling IT equipment. Some more advanced vendor reporting can even include Scope 3 emissions avoided through the reuse of IT assets and IT program transportation emissions. This information can quantify carbon avoided through the reuse of materials and can contribute to a company's corporate environmental reporting requirements.

The following examples analyze three different roles in data centers and how their operations relate to Scope 1, 2, and 3 emissions. The Scope 3 emissions for one organization are the Scope 1 and 2 for another company. Scope 3 emissions, sometimes called value chain emissions, can often represent most of a company's total carbon emissions.

Applied to the Linear Economy Model, simplified Scope 1, 2, and 3 emissions categories for an original equipment manufacturer are shown in the diagram below.

SERVER MANUFACTURER

When a company manufactures an IT product such as a server, the emissions generated by that product while it is used (primarily from the electricity it consumes) will form part of the manufacturer's Scope 3 downstream emissions. The emissions from the end-of-life treatment of that device also form a part of the Scope 3 emissions for the company.

DATA CENTER OPERATOR

A hyperscaler or colocation data center is responsible for the operation of the server while in use. Their reporting framework for emissions looks different from the server manufacturer. The use of the server and energy consumed during server operation make up the data center's Scope 1 and Scope 2 emissions. Data center operators will calculate the manufacture of the server as a Scope 3 upstream emission. When operators remove the server from their live environment, they will calculate the carbon emissions, avoided by reusing and recycling the equipment, as Scope 3 downstream emissions.

CLOUD CUSTOMER

The carbon emissions for organizations that purchase cloud services, supplied by a Cloud provider, are discussed above. All activities associated with the manufacture, use of the cloud servers, and subsequent secondary reuse and recycling are considered Scope 3 upstream emissions by the cloud customer.

03
TODAY'S OPERATING ENVIRONMENT

Data centers can demonstrate their commitment to sustainability by increasing reuse and responsible recycling of their equipment. Many European data center operators have made a commitment to do this by signing the Climate Neutral Data Centre Pact. The Climate Neutral Data Centre Pact supports both the European Green Deal, which aims to make Europe the world's first climate-neutral continent by 2050, and the European Data Strategy by making EU data centers climate-neutral by 2030. This self-regulated commitment has ambitious, measurable targets in five areas to achieve in 2025 and 2030:

Energy Efficiency
By January 1, 2025, new data centers operating at full capacity in cool climates will meet an annual PUE target of 1.3, and 1.4 for new data centers operating at full capacity in warm climates. Existing data centers will achieve these same targets by January 1, 2030.

Clean Energy
Data center electricity demand will be matched by 75 percent renewable energy or hourly carbon-free energy by December 31, 2025, and 100 percent by December 31, 2030.

Water Conservation
By 2022, data center operators will set an annual target for water usage effectiveness (WUE), or another water conservation metric, which new data centers will meet by 2025, and existing data centers by 2030.

Circular Economy
Data centers will assess for reuse, repair, or recycling of 100 percent of their used server equipment, and operators will increase the number of server materials repaired or reused and will create a target percentage for repair and reuse by 2025.

Circular Energy Systems
Interconnection with district heat systems to reuse heat of data centers is envisaged as practical, environmentally sound, and cost-effective.

TYPES OF DATA CENTERS

There are different types of data centers that are essential for the operation of the digital infrastructure, including single-tenant (private and hyperscales) and multi-tenant data centers (regional, national, international). Each type of data center is a crucial link in the digital ecosystem.

	SINGLE TENANT	COLOCATION DATA CENTER			SINGLE TENANT
Type	**PRIVATE/ENTERPRISE** incl. server rooms	**REGIONAL**	**NATIONAL**	**INTERNATIONAL**	**HYPERSCALE**
Customer	SME Enterprise Public Semi-public	SME Public Semi-public	SME Enterprise Cloud Public Semi-public	SME Enterprise Cloud SaaS	Cloud SaaS
Space **Impact**	> 10 m^2 Small	> 200 m^2 Small	> 2000 m^2 Small	> 5000 m^2 Medium	> 5 ha Medium/Large
Energy **Impact**	0,01 - 10 MW Small	0,5 - 10 MW Small/Medium	1 - 10 MW Medium	> 5 MW Medium	> 50 MW Large
Location *(estimate)*	In every province	In every province	In (regional) hubs	Amsterdam hub	Outskirts

SPAN OF CONTROL

Each data center has a different span of control. Private data centers and hyperscales have control over the facility (Operational Technology) and the IT equipment. Whereas, multi-tenant data centers only have control over the facilities/OT, as the IT equipment, such as servers, are the property of its customers.

04
IT IN THE DATA CENTER - DELVING INTO THE HARDWARE

CHARACTERISTICS OF DATA CENTERS IN NL

The Netherlands is a premier data center destination, boasting one of Europe's largest international colocation hubs in Europe. Strategically located in the Amsterdam region, data centers in the country have exceptional connectivity, proximity to numerous multinational corporations and millions of consumers, and a favorable electricity price environment. The Netherlands has a high density of domestic data centers, businesses have access to professional colocation services within a 30-minute drive. In recent years, the data center landscape has witnessed the emergence of hyperscale facilities beyond the confines of Amsterdam, with notable players such as Google and Microsoft establishing their presence.

The Dutch colocation market consists of 100 providers and 189 colocation facilities. The retail colocation market continues to perform well compared to the wholesale segment. In the MRA, data centers continue adding modular expansions within their existing shells to meet growing customer demand (note: our market data does not reflect these expansions). The regional colocation data centers continue to expand, with new facilities planned for the remainder of 2023 and beyond. Interestingly, the hosting providers that offer colocation are returning to building their own data center facilities. A key reason is the increased focus on delivering cloud services to local customers with data sovereignty concerns. As a result, over the past 12 months, more colocation data center operators were added than lost to consolidation.

As of 2023, the Dutch data center market has an IT power capacity of 1150 MW. This includes colocation, enterprise, and hyperscale data centers. The Netherlands has roughly 6400 enterprise server facilities and three hyperscale facilities. The number of enterprise data centers is decreasing every year, companies are choosing to fully move to a cloud. Many others organizations are choosing to move servers into a colocation data center, and use the services provided by colocations to manage their servers.

In recent years, the journey for data centers in the Netherlands has been fraught with challenges. For example, the electricity infrastructure in and around Amsterdam continues to face congestion issues, and the electricity network is unable to keep up with the rapid electrification of the economy. In addition, decentralized power generation and the growing demands of energy-intensive industries, including data centers, challenge the growth of data centers. As a result, local municipalities have introduced growth restrictions on new data center developments, followed by further local and national regulation. However, Pb7 Research forecasts that the Dutch data floor space will grow at a moderate but healthy compound annual growth rate (CAGR) of nearly 7 percent. The power growth is significantly higher, at roughly 9 percent per year. The research shows that growth will pick up after two moderate years. New construction has begun, and there are many expansion plans. However, the MRA will likely continue to underperform the other FLAP-D markets and Tier 2 data center hubs such as Warsaw, Madrid, and Milan.

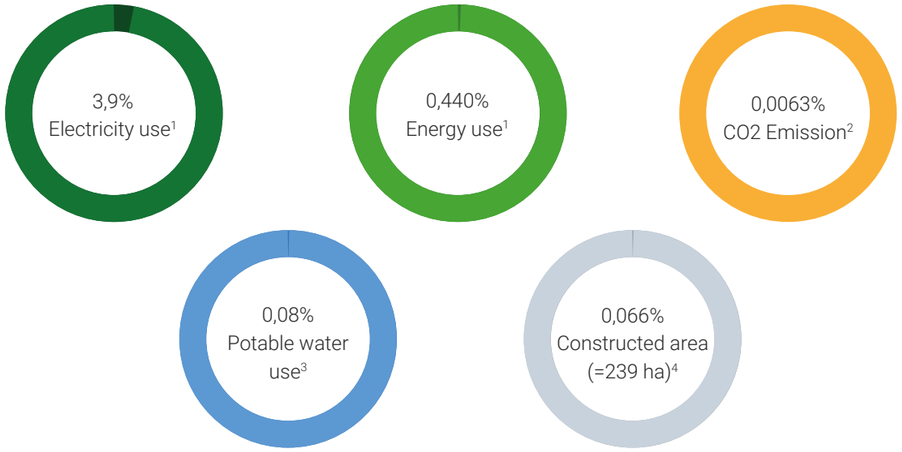
SIZE OF THE DUTCH SECTOR

The Dutch data center industry is one of the largest in Europe, with an estimated market value of 2.7 billion euros and over 180 colocation data center facilities.

The Dutch data center market includes a total of 6,400 data center facilities, of which over 300 are larger than 100 m2. Due to the outsourcing from on-premise server rooms to off-premise data centers and the Cloud, the number of facilities is decreasing every year (approx 400 from '21 to '22) in the Netherlands.

Data floor (m^2)	Enterprise Companies	%	Colocation Companies	%	Hyperscale Companies	%	Total Companies	%
10-100	5.020	94%	36	36%			5.056	93%
100-399	209	4%	15	15%			224	4%
400-9.999	94	2%	39	39%			133	2%
10K-19K	3	0%	5	5%			8	0%
20K or more	1	0%	5	5%	2	100%	8	0%
Total Operators	**5.327**	**100%**	**100**	**100%**	**2**	**100%**	**5.429**	**100%**
Total Facilities	**6.444**		**189**		**3**		**6.636**	

IMPACT OF THE DUTCH SECTOR



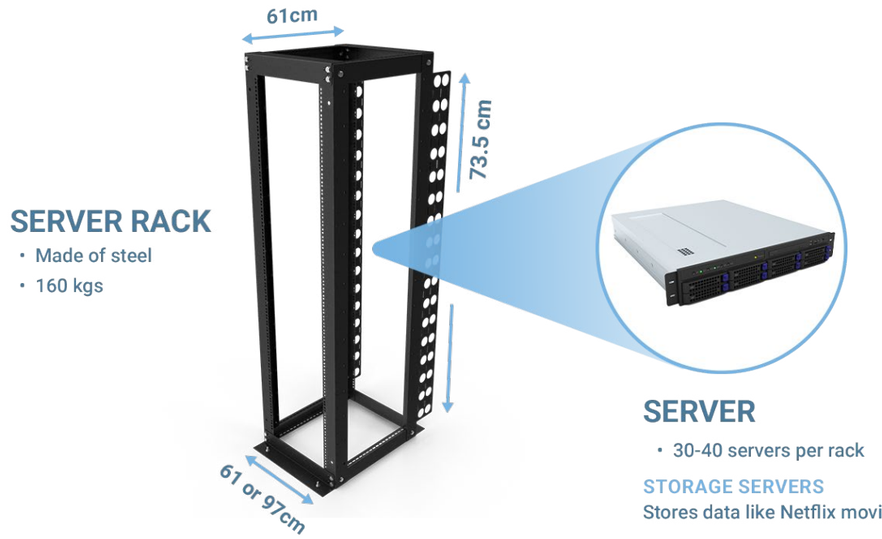
Sources: [1]CBS 2022, [2]NEA 2021, [3]CBS 2022, [4]CBS 2020, DDA 2021, MJA RVO

To keep the Internet running 24/7, data centers are running at all times of the day. Consequently, the data center sector is an energy-intensive industry; running data centers requires a considerable amount of electricity.

The data center sector is fully electrified, using almost no fossil fuels. The sector now runs 90 percent on renewable electricity. This makes the data center sector a leader in sustainable innovation, both in energy efficiency within data centers and the use of renewable electricity supply. The graphs above showcase the percentage of resources used by data centers, compared to the total of the Netherlands

EQUIPMENT IN DATA CENTERS

A server usually contains hardware components such as a motherboard, CPU, RAM, hard drives or solid-state drives for storage, power supply, and networking equipment. A server in a data center will also have additional components such as cooling fans and a chassis (rack) to house the units.

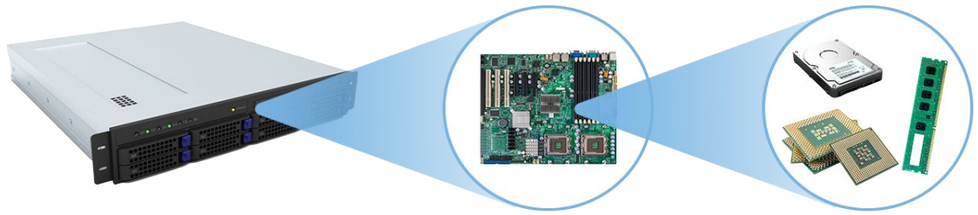


SERVER RACK
- Made of steel
- 160 kgs

SERVER
- 30-40 servers per rack

STORAGE SERVERS
Stores data like Netflix movies

PROCESSING SERVERS
Manages data like Artifical Intellegence



SERVER

MOTHERBOARD

OTHER
- Processors
- Memory
- Hard Drives

PROCESSOR

- Executes instructions, performs calculations, and coordinates input/output operations
- One or two processors per server

MEMORY (DIMM)

- Gives applications a place to store and access data on a short-term basis
- 4-8 DIMMs per motherboard

HARD DRIVES

- Core data warehouse, where all software and user data are stored

MECHANICAL DRIVE (HDDs)

- Spinning platter
- Less expensive per G8
- Older technology
- Slow and energy intensive

SOLID STATE DRIVE (SSDs)

- No moving parts
- More expensive per G8
- Future
- Fast and energy efficient

Additional components in the rack include PDUs, switches, cables and fans.

RECYCLABLE MATERIALS IN DATA CENTERS

Plastics
Traditional plastics production involves the transformation of petroleum or natural gas into their constituent monomers. The process is highly energy intensive and has been estimated to account for 1 percent of total greenhouse gas emissions. The carbon footprint of recycled plastics is a mere fraction of that of virgin plastics.

Aluminium
Traditional aluminum production uses a large amount of electricity to break the bond between oxygen and aluminum in aluminum oxide. According to the US Energy Information Administration, recycling aluminum saves 90-95 percent of the energy needed to make aluminum from bauxite ore. There is no limit to how many times aluminum can be recycled.

Steel
Recycling one ton of steel saves 1,100 kg. of iron ore, 630 kg. of coal, and 55 kg. of limestone. Steel recycling uses 74 percent less energy, 90 percent fewer carbon emissions and 40 percent less water than virgin steel production. It also produces 76 percent fewer water pollutants, 86 percent fewer air pollutants, and 97 percent less mining waste.

These materials make up the majority of material, by weight, in a typical data center. Additional valuable materials reside within the printed circuit boards (PCBs), processing chips and power supplies within the server units, such as valuable precious metals (i.e. gold, copper and silver).

Gold
One ton of modern PCBs might contain five ounces (around $6,000 worth) of gold.

Tantalum
This is commonly found in processors and capacitors. Tantalum is a critical raw material with a current end-of-life recycling rate of less than one percent.

Lead
This is found in batteries in data center universal power supplies (UPS). Lead is highly toxic when disposed of irresponsibly. Professional recycling diverts this dangerous waste from landfill and avoids environmental and human health impacts.

Copper
This is a key component in wiring and printed circuit boards. Although newer wiring contains less copper than older units, like all metals, copper can be infinitely recycled to avoid raw material mining and associated energy emissions.

Some of the minerals used in server production have been identified as conflict materials. These usually involve materials mined in the eastern provinces of the Democratic Republic of Congo and its neighboring countries. Resulting revenues from the purchase of these raw materials are known to be financing, directly or indirectly, armed groups engaged in civil war resulting in serious social and environmental abuses.

Materials included in the conflict materials group, known as 3TG, include Tin, Tantalum, Tungsten and Gold. These are all commonly found in data center equipment. Redeploying and recycling materials helps divert revenues away from mining enterprises for these conflict materials.

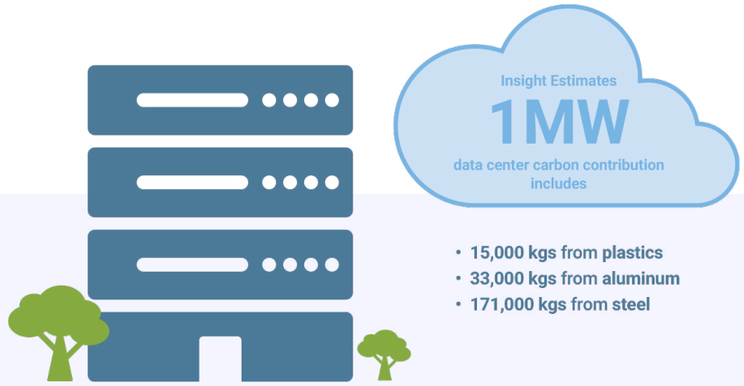
ENVIRONMENTAL FOOTPRINT OF THE EQUIPMENT

One major technology company identified in their environmental responsibility report that "…the carbon footprint of our manufacturing processes represents the largest portion of our impact on climate change. Every year we investigate more deeply into our supply chain, constantly analyzing inefficiencies and developing ways to help our suppliers make less of an impact on the planet." Many of the resources used to create data centers are finite.

LCAs FOR NEW HARDWARE

A life cycle assessment (LCA) for a server in a data center analyses the environmental impact of the server throughout its entire life cycle, including production, use, and disposal. This assessment considers factors such as energy consumption, material sourcing, and waste management. The goal of an LCA is to identify areas where environmental impact can be reduced and to inform sustainable design and decision-making.

According to product LCAs produced by manufacturers, between 16 - 65 percent of a server's carbon footprint derives from production, with an average of 22 percent.



LCAs FOR MATERIALS

In FY21 there were estimated to be 85 million units suitable for repurposing in the cloud. Enterprise data storage is expected to grow 250 percent over the next 5 years.

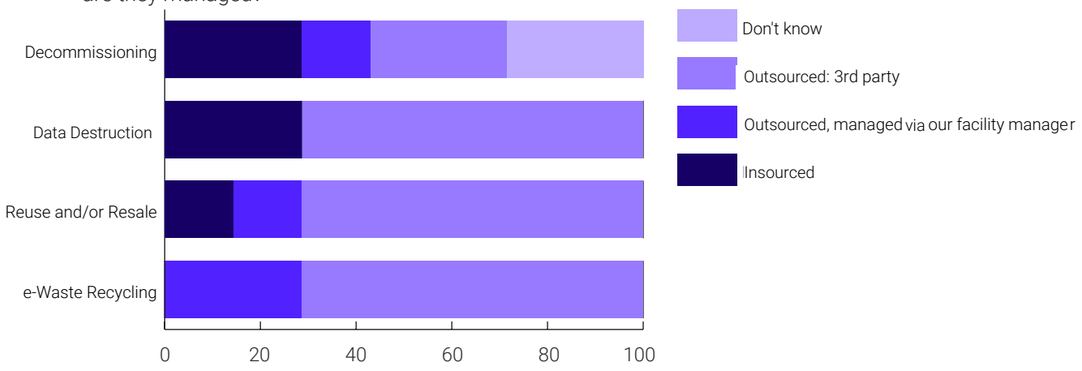
A typical server carbon savings….

Unit CO2e kg/unit	Repurposed - embodied carbon	Recycling - avoided carbon
Server	807	40.0
Hard Drive	24	3.0
DIMMs	27.8	0.84
CPU/Processor	7.7	0.03

SURVEY RESULTS

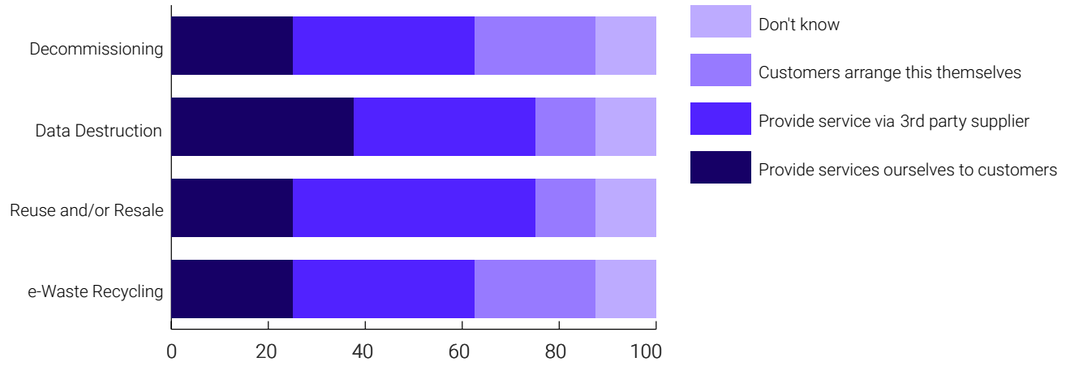
It is difficult to provide an exact figure for how much data center equipment is reused, as it can vary depending on the organization and their specific practices. However, many data center operators do prioritize the reuse of equipment whenever possible, as it can be more cost-effective and environmentally friendly than constantly purchasing new equipment. Additionally, some organizations may donate or sell their used equipment to others who can make use of it.

Circular Economy Services - Which IT hardware lifecycle management services do you use and how are they managed?



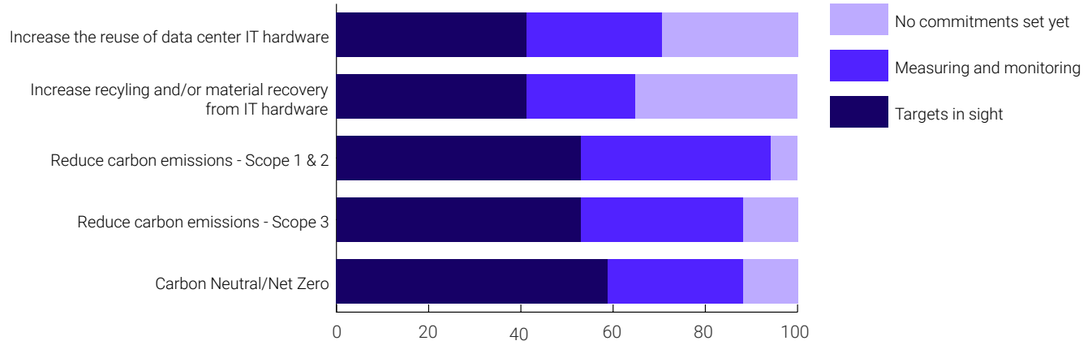
The results from the survey shows that 71,4 percent of the respondents fully outsource their Data Destruction, the Reuse and/or Resale of hardware and e-Waste Recycling services to third parties in the industry. For Decommissioning, we see that the results are equally divided. For example, 28,6 percent of the participants use both insource and outsource (via third parties) for decommissioning their equipment.

Circular Economy Services - Which IT hardware lifecycle management services are you engaged in?

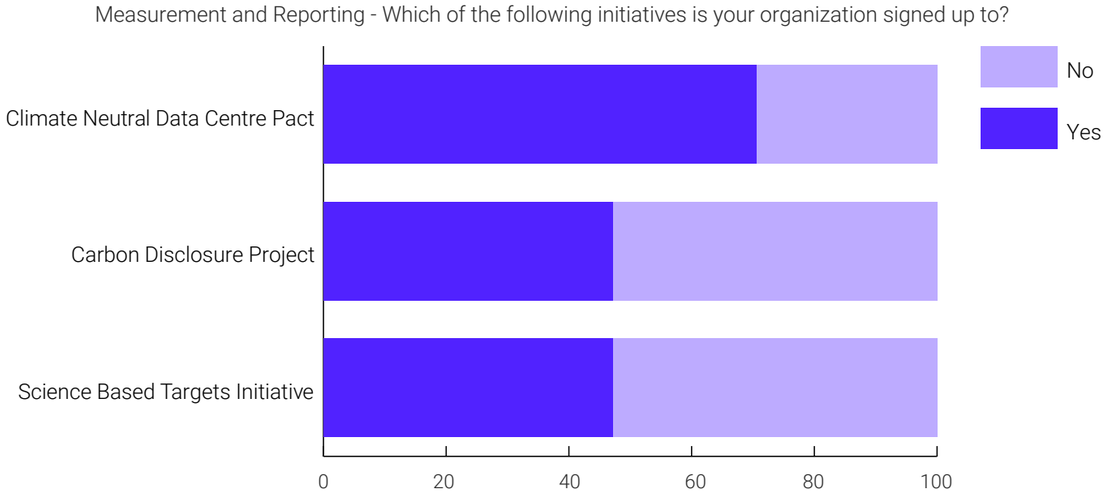


Respondents were asked to what extent they are engaged in their IT hardware lifecycle management services. The results showed that 37,5 percent of the respondents provide their Decommissioning, Data Destruction and e-Waste Recycling via third party suppliers. For the Reuse and/or Resale of equipment, 50 percent of the respondents hire these suppliers. Interestingly to note, 37,5 percent of the data center operators provide data destruction services themselves to customers, compared to the other three services (25 percent).

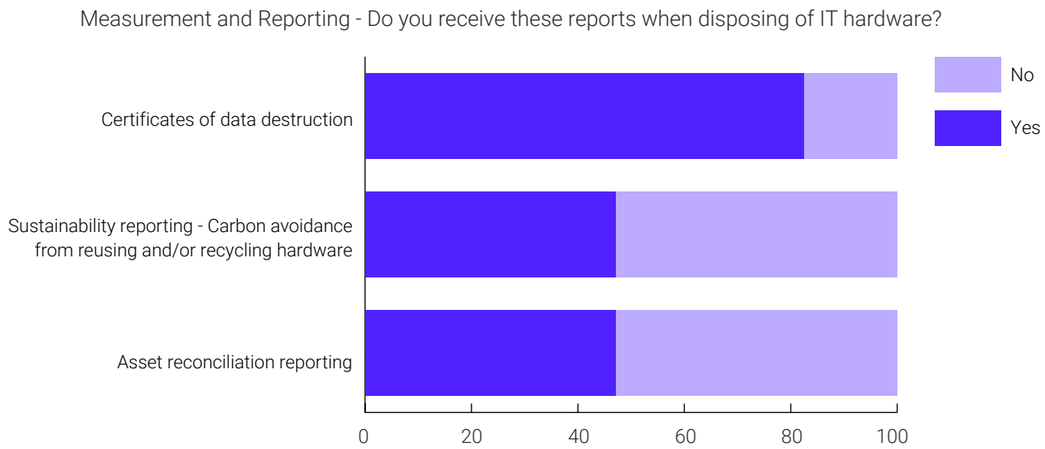
Sustainability - What commitments has your organization made relating to the Circular Economy?



Many data center operators are aware of the actions related to the sustainability goals. For example, 52,9 percent of the respondents indicated that they have set targets in order to reduce their carbon emissions for Scope 1, 2 and 3. In addition, 41,2 percent of the data center operators indicated that they are measuring and monitoring this for Scope 1 & 2. Furthermore, nearly two-third of the respondents (58,8 percent) have targets in sight related in becoming carbon neutral.



According to the results, over 70 percent of the respondents are signed up to the Climate Neutral Data Centre Pact. Over 100 data center operators and many trade associations are committed to the European Green Deal, achieving the ambitious greenhouse gas reductions of the climate law, and leveraging technology and digitalization to achieve the goal of making Europe climate neutral by 2050.



The results showed that 82,4 percent of the respondents receive certificates of data destruction. However, over 50 percent of the data center operators indicated that they do not receive Assets reconciliation reportings or reports from reusing and/or recycling hardware.

05
THE ROAD TO CIRCULARITY - MILESTONES FOR THE CIRCULAR ECONOMY

OPPORTUNITIES

There are multiple opportunities for data centers to adopt the circularity approach of IT equipment. The 2025 goal of achieving net zero requires a proactive understanding of a transformation that is on its way. Implementation means attracting multiple stakeholders of the industry: users, investors, regulators, employees, and legislators. In more detail, the opportunities are:

- Distinctive selling proposition compared to competitors
- Reduction of energy and raw material use
- Establishing a benchmark of CO2 avoidance to set future goals
- Revenue from the resale of IT equipment
- Secure disposal of data bearing assets
- Compliance with new EU regulation
- Increased knowledge of future circular models
- Corporate sustainability: A commitment to sustainability helps enhance a company's environmental reputation

OPTIMUM LIFECYCLES FOR EQUIPMENT – CONSIDER END OF LIFE AT INSTALLATION STAGE

The optimum lifecycles for equipment differ from various points of view, including cost, performance, and sustainability perspectives.

Cost perspective

From a cost perspective it is important to forecast the service and maintenance cost for each extra year an asset remains in use. In addition, energy consumption may rise after a certain amount of time; once the lifetime of a product is exceeded, the costs increase.

Performance perspective

Most in-house servers would start to lose their ability to adapt to increasing workloads after four years. The optimal end of a lifecycle (from a performance perspective) would be the moment an operator cannot guarantee the service for their users. The longer an asset remains in production while past its typical deployment time, the greater the risk to your business. Monitoring risk and improving operational outcomes are key aspects of data center management, and failure to do so can lead to component failure, downtime, or compromised performance.

Sustainability perspective

On a sustainability level, the optimum end-of-life cycle would be the point where a server would still be usable for a second life, after thorough refurbishment.

REUSE VS RECYCLE

There are multiple components within a data center that can be reused, including, but not limited to:

- Server hardware like CPUs, RAM, and network interface cards (NICs) which do not contain sensitive data
- Networking equipment like switches, routers, and firewalls can be reused
- Power distribution units (PDUs)
- Uninterruptible power supplies (UPS)
- Cooling systems comprised of fans, air conditioners, and chillers
- Racks and enclosures including server racks, cabinets, and cable management systems
- Copper and fiber optic cabling
- Security systems

DATA DESTRUCTION OPTIONS

There are three main options for data destruction:

Overwriting

Also called data erasure, this is one of the most common methods of deleting data. While time-consuming, overwriting allows hard drives to securely be reused, extending their lifecycle and delivering value back to data centers.

Degaussing

Destroying data through the high-powered magnet, degaussing is a quick and cost-effective method of data destruction. This renders the hard drive inoperable, however, meaning it cannot be reused.

Physical destruction

A secure and inexpensive method to destroy drives, however physical destruction eliminates the possibility of reuse.

	REUSE	RECYCLE		
	Erase	Degauss	Crush	Shred
MAGNETIC DRIVES	✓	✓	✓	✓
SOLID STATE DRIVES	✓	✗	✓	✓
TAPES	✗	✓	✗	✓
BENEFIT	Financial Return	Quick and Cost Effective	Quick Visual Confirmation	High Volume Visual Confirmation
NIST 800-88 R1	CLEAR	PURGE		DESTROY

COMPLIANCE WITH EU LEGISLATION

According to the European Commission "a circular economy aims to maintain the value of products, materials and resources for **as long as possible** by returning them into the product cycle at the end of their use, while **minimizing the generation of waste**. The fewer products we discard, the fewer materials we extract, the better for our environment. This process starts at the very beginning of a product's lifecycle: smart product design and production processes can help save resources, avoid inefficient waste management, and create new business opportunities."

Other definitions of processes in the circular economy require similar precision.

Recycle

Recycle is "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations." (EU definition, Waste Framework Directive, 2008).

Reuse

Reuse "means any operation by which products or components that are not waste are used again for the same purpose for which they were conceived" (Article 3, Waste Framework Directive, 2008). "Used again for the same purpose" could be broadened by "used again" in general, meaning reusing even for a different purpose (ex: the server for storage).

Regulation is already key regarding the circular economy and the objectives below need to be taken into account regarding what is legally mandatory. Regulation on eco-design is currently being reviewed; the WEEE directive can potentially be reviewed in the next years, and in February 2021, the Parliament adopted a resolution on the new circular economy action plan. Finally, in March 2022, the Commission released the first package of measures to speed up the transition towards a circular economy, as part of the circular economy action plan.

The 'Study on Greening Cloud Computing and Electronic Communications Services and Networks: Towards Climate Neutrality by 2050' (European Commission, March 2022) contains substantial information on the circular economy performance of data centers and cloud providers (see in particular p.37 and onwards).

INDUSTRY COMMITMENT

Data center operators and trade associations are committed to the European Green Deal, achieving the ambitious greenhouse gas reductions of the climate law, and leveraging technology and digitalization to achieve the goal of making Europe climate neutral by 2050. To ensure data centers are an integral part of the sustainable future of Europe, data center operators and trade associations have taken this responsibility upon themselves and agreed to make data centers climate-neutral by 2030 via the Climate Neutral Data Centre Pact (CNDCP).

The industry is setting goals within the CNDCP. The reuse, repair, and recycling of servers, electrical equipment, and other related electrical components is a priority for data center operators.

Data centers will set a high bar for circular economy practices

- First assess for repair and reuse server equipment, fostering an extended lifetime of server equipment within data centers responsible for IT (customers of colocation, server manufacturers, hyperscalers, enterprise data centers)
- Data centers will set a high bar for circular economy practices and will assess for reuse, repair, or recycling 100 percent of their used server equipment
- Data center operators will increase the quantity of server materials repaired or reused and will create a target percentage for repair and reuse by 2025

Data center operators responsible for IT (customers of colocation, server manufacturers, hyperscalers, enterprise data centers) will increase the number of server materials repaired or reused.

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CONCLUSION

A critical time for engagement throughout the supply chain.

Changing approaches
The entire lifecycle of IT and infrastructure equipment must be considered when building and operating data centers. A complete lifecycle approach encompasses all data center activities, including the extraction of raw materials, the construction, and installation of the data centers, their operations over their lifetimes, and their decommissioning, recycling, and disposal stages.

Opportunity to increase revenue and improve sustainability
Proactive planning will give data centers direct control over the environmental impact of their facilities. Initial measures include taking sustainable measures during the construction phase of a new data center, environmentally friendly cooling, and roadmapping Scope 3 emissions in the value chain.

Drive further innovation in circular economy business models
Data center operators should participate in the circular economy through recycling programs. The aim is to establish, normalize, and drive further innovation in circular economy business models and practices. And to focus on repairing and reusing equipment to reduce the consumption of natural capital.

General remarks
A clear definition of data centers and their responsibilities has to be defined to set effective regulations. Their roles and locations are different, and so are their responsibilities:

- Colocation operators are only responsible for the facility
- Customers of colocation (cloud providers, for example) and server manufacturers are responsible for the IT
- Hyperscalers and enterprise datacenters are responsible for both the facility and the IT

For instance, in order to have data on the recycling of IT equipment, colocation operators have to know whether their customers use recycling services.

Geography and types of data centers are additional parameters to take into account. To facilitate reuse and repair, servers and equipment have to be designed accordingly. Recycling has to be optimized. Monitoring collection is a challenge, and colocation operators do not have this control. However, companies specialized in recycling can help. Data collection is key.

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RESOURCES

The Greenhouse Gas Protocol Corporate Accounting and Reporting Standard
https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf

Climate Neutral Data Center Pact
https://www.climateneutraldatacentre.net/

European Data Strategy
https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

State of the Dutch Data Centers 2023
https://www.dutchdatacenters.nl/publicaties/state-of-the-dutch-data-centers-2023/

Impact Dutch Data Centers
https://www.dutchdatacenters.nl/en/statistics/

Organisation for Economic Co-operation and Development
https://www.oecd.org/

US Energy Information Administration
https://www.eia.gov/

European Circular Economy Stakeholder Platform
https://circulareconomy.europa.eu/platform/en

SIMS Investor ESG Presentation
https://www.listcorp.com/asx/sgm/sims-limited/news/investor-esg-presentation-2641603.html

Waste Framework Directive
https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32008L0098

Study on Greening Cloud Computing and Electronic Communications Services and Networks: Towards Climate Neutrality by 2050
https://digital-strategy.ec.europa.eu/en/library/study-greening-cloud-computing-and-electronic-communications-services-and-networks-towards-climate

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ABOUT US

DUTCH DATA CENTER ASSOCIATION

Dutch Data Center Association (DDA) is the trade association for data centers in the Netherlands; the bedrock of the Dutch economy. The DDA unites leading data centers in The Netherlands in a common mission: to strengthen the economic growth and awareness of the data center sector to government, media and society.

The DDA works from three focus areas: Energy & Sustainability, Education & Employment and Digital Economy & Mainport. We are committed to make the power usage of the industry more sustainable and efficient, and we focus on the reuse of data center residual heat. Furthermore, in close cooperation with education institutions, we create data center courses and enthuse students to choose a career in the data center industry. Lastly, we promote our industry and our position as Digital Gateway to Europe.

SIMS LIFECYCLE SERVICES

Sims Lifecycle Services (SLS) provides solutions to extend the life of IT and electronic devices, and the company recognizes the value in end-of-life electronic assets, components and materials. SLS supports Fortune 500 companies in navigating ongoing technology shifts by securely and responsibly managing the disposition of IT equipment and recycling of electronic products. SLS works with enterprises and major cloud providers to deliver decommissioning of corporate IT assets and data center equipment.

IT asset disposition (ITAD) and electronics recycling services offered at SLS support the evolution of the electronics industry movement towards circularity. SLS' clients benefit from data security, maximum IT value recovery, global compliance and sustainable IT use. As a responsible corporate citizen, and in alignment with the United Nations Sustainable Development Goals, SLS continuously seeks new ways to contribute to the circular economy.