DUTCH
DATA CENTER
ASSOCIATION

# 2019 REPORT

## Digital Awareness is Near

DUTCH
DATA CENTER
ASSOCIATION

Dutch Data Center Report 2019

*State of the Dutch Data Centers*

# *Digital Awareness is Near*

# COLOPHON

The Dutch Data Center Report is an annual study initiated by the Dutch Data Center Association. The main focus is to provide a quantitative overview of the Dutch data center market, the Netherlands as Digital Gateway and the direct and indirect way the data center industry impacts the Dutch (digital) economy. The report is a combination of research exclusively done by Pb7 Research, CBRE Data Center Solutions and the Dutch Data Center Association itself.

The Dutch Data Center Report 2019: State of the Dutch Data Centers is published by the Dutch Data Center Association.


**Edition**
State of the Dutch Data Centers 2019:
Digital Awareness is Near
June 2019, year 5

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**Print quantity**
First release, 11 June 2019: 1000

**Availability**
Our publications are free to download on
**www.dutchdatacenters.nl**




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"WITH ALMOST **50% OF THE GLOBAL GDP DERIVING FROM THE DIGITAL ECONOMY,** DIGITAL AWARENESS IS INEVITABLE!""

# PREFACE | DIGITAL AWARENESS IS NEAR

When going online via a phone or laptop, something billions of people do every day, most people are unaware of the mechanisms operating behind the screens and the implications 'going online'. People often just take it for granted. It is there and it is, most of the time, working well. And that is good. However, since we are becoming more and more data-dependent every day - to communicate, to work, to study and to relax - digital awareness is starting to become highly important. Moreover, with a digitized global GDP going towards 50% in 2021, should we still be so unaware of this digital reality we are living in?

Foremost, this new digital reality and the extensive use of data keeps bringing us many good things. We are now able to accurately predict when the rain is going to fall or when there is a storm coming our way. Big data helps farmers speed up plant-growth and increase their yield, and it allows scientists to engineer plants that will grow in harsh climates to prevent famine. When it comes to healthcare, Big Data and Artificial Intelligence are used to find trends and treatments that have the highest rates of success. And smart, digital solutions bring us efficiency in transport, industry and in our energy use.

Data enables us to make better decisions, live longer and be more sustainable. New technologies such as Artificial Intelligence, IoT and Big Data are even accelerating that change. This change, often referred to as Digital Transformation, is revolutionizing business and society. It has been sparked by digitization and digitalization, making data easily accessible for use across platforms, devices and interface. And this transformation is far from over. We are only just getting started; we will only become ever more digitized and we will never return to the old world again.

This new reality has brought and is bringing a lot of new challenges every day. Rules and regulations of the old analog world do not fit into the new digital world. Cyber security demands different skills from police departments to maintain the law, and getting enough skilled people in is the number one headache for any tech company worldwide. And how are we going to expand power distribution networks at the same pace as the digital world of data centers, devices and connectivity, while at the same time extra capacity is needed for the energy transition towards a fossil-free world?

It is very positive that we see digital awareness growing: awareness that the reality is digital now. Society, traditional businesses and governments are slowly making constructive steps forward. Our Ministry of the Interior and Kingdom Relations made a well-received step to publish the first Dutch national data center strategy and the Ministry of Economic affairs has published a first National Connectivity policy. And it is the ambition of our government to heavily focus on Artificial Intelligence, 5G and Quantum Computing to accelerate our data-driven society and keep the Netherlands competitive.

Artificial Intelligence, 5G and Quantum Computing will generate and process data at rates we have never seen before. The ambition voiced by the Dutch government can only be successful if there is a strong, efficient and reliable data center, cloud and connectivity infrastructure in the Netherlands.
Digital awareness is the starting point. It must lead to more focus and action. The data center infrastructure is already a massive asset for the Netherlands and is, together with cloud, the largest magnet for foreign direct investment and future employment. In 2019, the data center sector has a huge economic impact on all of us, every day.

This 'State of the Dutch Data Centers' report, in its fifth year, gives an overview of one of the important building blocks of our Dutch digital economy and the need to become more digital aware.

**Stijn Grove**
*Managing Director*
*Dutch Data Center Association*

DUTCH DATA CENTER ASSOCIATION

2019
DIGITAL AWARENESS IS NEAR

**AMSTERDAM**
**#1**
**EUROPEAN**
DATA CENTER & HYPERSCALE HUB

Larger than London, Paris, Frankfurt & Dublin

**80%**
of DDA members use green power

All Dutch data centers together (multi- & single tenant) use
**1503 MW**

**€**
**1.5 BILLION**
total impact of the multi-tenant data center market on Dutch GDP

**12.500 FTE**
jobs created by the data center industry

**20%↑**
Datafloor growth in Netherlands in 2018

**189**
colocation data center facilities

**369.000 m²**
**datafloor**

**72%**
located in the Amsterdam region

**79%**
of DDA members re-use waste heat or has plans for the near future

**18%**
Dutch multi-tenant data center growth in MW in 2018 to a total of
**771 MW**

**90%**
of total Dutch colocation datafloor is operated by DDA-participants

**55+**
DDA-partners from the data center ecosystem



# EXECUTIVE SUMMARY

**Digital awareness is near.** Every day we are becoming more data-dependent. However, most of us are not aware of the mechanisms operating behind the screens. Digital Awareness is starting to become very important. The digital economy *is* the economy. now Developments such as AI, 5G and Quantum Computing will generate more data than we have ever seen before and can only be made possible if there is a strong, efficient and secure digital foundation. Data centers are at the pinnacle of our current and future developments.

**The Netherlands is a top location for data centers.** This year, the Dutch multi-tenant data center market grew by 18% in MW, and 91% of our members expect their data center to grow in the next year. Data centers from all over the world choose the Netherlands because of its perfect connectivity. Due to the GDPR and the Brexit, more cloud companies choose The Netherlands as their Digital Gateway to Europe.

**Around 72% of all Dutch data centers is located in the Amsterdam region.** Outside of Amsterdam, we see high quality multi-tenant data centers that are available everywhere within a 30-minute drive. There are 189 large multi-tenant data center facilities in the Netherlands, with a total of 369.000 m2 data floor space, of which 90% is represented by the DDA via 32 participating data center operators.

**Dutch data centers contribute €784 million directly to the GDP.** The total direct, indirect and induced impact of the Dutch multi-tenant data center market to the GDP was just over €1,5 billion in 2018! This will continue to grow significantly, well above the GDP average. All the Dutch data centers combined employ around 5.000 people directly and overall the industry has created around 12.500 jobs. so far This makes data centers the robust heart of an economy that is increasingly digital. If data is the new gold, data centers are the new vaults *and* factories.

**Amsterdam has become the largest colocation and hyperscale market of Europe.** Over the last eight years, the region had an average yearly growth of 18,5%. This year, the Amsterdam hub grew by 20% in MW. Compared to other top European data center regions – London, Frankfurt & Paris - Amsterdam is unique as it is the only market that combines a colocation hub with large hyperscale clusters. With the current fast growing hyperscale developments, this frontrunner position is expected to further expand.

**80% of DDA-participants are using green energy.** The power consumption of data centers has been discussed extensively over the past years. Data centers have reacted by investing strongly in durable energy solutions: not only have multi-tenant data centers been reducing the amount of power they require to house and cool computer equipment, they have also started to embrace green power consumption.

**79% of DDA-participants re-use residual heat or have plans for it in the near future.** Currently, the residual heat is re-used for office heating or via Aquifer Thermal Energy Storage (ATES). Around 13% of DDA-data centers are part of a heating network. That percentage will grow as the discussions between data centers and cities are evolving. The DDA is actively involved in accelerating residual heat projects, to make data centers an in-between station of energy – and not an end station.

**With growth comes opportunities and challenges.** Since our young industry is professionalizing and growing with double digits each year, we need to lead this growth in the right direction. To make sure the industry can continue to flourish, the DDA focuses on three themes: Energy & Sustainability, Education & Employment and Digital Economy & Hub. All with the aim to foster further growth of the Dutch data center sector and the digital economy.

"**DATA CENTERS** CONTRIBUTE
**€1,5 BILLION** TO **DUTCH GDP**"

# THE WORLD IS DIGITAL

## THE WHY OF DATA CENTERS

Everything that happens on the Internet, happens in a data center. Which means that you virtually visit a data center many times a day; to download files, to work in software, to simulate an experiment, etc. All these digital applications are all stored in a data center. Data centers thus form the foundation of the Internet and play a fundamental role in our society and digital economy. Yet many people know little about how the Internet actually works and how data centers ensure that it keeps running continuously.

Data centers are the main enablers of the digital economy. Data centers underpin a wide range of activities across government, business and society. They form an important part of our national critical infrastructure and bring energy efficiency. The Netherlands is benefitting greatly as Dutch data centers grow with double digits every year and are a magnet for bringing foreign investment and indirect growth.

Data centers form the heart of the digital infrastructure. This infrastructure includes Internet Exchanges, Cloud Exchanges, Cloud providers, Webhosters, Internet Backbone Carriers, Content Delivery Networks, Internet Access Providers and Fiber Operators. All centered in data centers to make the Internet and online services possible. In simple terms: our lives would grind to a halt without data centers.

### REASONS TO MIGRATE TO A DATA CENTER

| | |
|---|---|
| Reliability | A professionally managed data center has backup systems and redundancies in cooling, power and communicaiton systems to ensure a connection that is 'always on'. |
| Energy Efficiency | Data centers bring huge efficiency benefits by concentrating IT. Due to professional and efficient management, huge amounts of energy are saved. Society uses half of the energy it would use without data centers. |
| Cost | A data center is a low-cost solution to getting high-end, up-to-date equipment and services, it is our core business. Colocation is a fraction of the cost of operating and maintaining a data center on premise. |
| Scalability | When you devote part of your office space to IT equipment, expanding that area becomes a challenge. as your business grows. Data centers offer flexibility and can scale up when needed. |
| Risk Management | Emergencies happen. Whether you use the data center as primary location or a mirror site, you can ensure constant connectivity and access to your mission-critical equipment, even during an emergency. |

***The industry in perspective***

**Digital plays a huge part in modern day life. How important is this digital world now, in compared to other industries? These numbers put the digital & tech industry in perspective.**

**81%**

**Of the EU population is online every day. This is 94% in the Netherlands**

**51%**

**Of the EU population owns a car: 505 passenger cars per 1.000 inhabitants.**

**6**

**Ministers of Digital(ization) in EU-memberstates - the Netherlands has none**

**28**

**Ministers of Transport / Infrastructure in EU-memberstates, which is 100%**

**Source:** Statista, Eurostat, European Commission

# THE RISE OF TECH AND DIGITAL

The digital transformation is revolutionizing business and society. It has been sparked by digitization and digitalization, making data easily accessible for use across platforms, devices and interfaces. Applications that integrate these digitized data and digitalized applications all come together in data centers, the foundation of the digital economy.

More than half of the companies with the highest market capitalization are tech companies. Some have even passed the trillion dollar mark this year. Tech companies are becoming a larger and leading part of business. This new digital reality is bringing us many good things. We have seen breakthrough innovations, new prosperity, and fast communication all around the world. By crunching vast amount of data, we discover many possibilities. To name a few things, we can now cure diseases much faster, use simulation to decrease the amount of laboratory animals and give more people access to knowledge wherever they are.

There are many new applications attached to the digital economy. You can for now avoid traffic via real-time route planning, or in the future sit in a self-driving vehicle. Or work with team members in the cloud. And we are in a rush, as the growth of digital transformation does not stop. IDC predicts that in 2021 over 50% of the world GDP is coming from the digital economy. And AI, public cloud growth and IoT are yet to come.

All these applications and innovations, even though we encounter these on a daily basis he activities above are part of our daily lives, many of us don't realize the complexity of the underlying digital infrastructure that runs on the background. Technology is getting bigger, more sophisticated and more complicated every single day, and for the last 20+ years, our online world is provided for by our data centers. Indeed, data centers are the foundation of our digital lives and our digital economy.

### Time spent online is still increasing

Although online growth has been going on for a long time - more than half of the world is already 'online' - the amount of time spent online is still increasing.
Just over 50% of those hours are spent on mobile, which largely accounts for the overall growth in digital media consumption. As the global average selling price of smartphones continues to decline, smartphone adoption in the lesser developed markets increases, resulting in a growing need for good digital infrastructure everywhere.

**"VIRTUALLY,** YOU VISIT A DATA CENTER MANY TIMES A DAY**"**

*The industry in perspective*

**90,3 billion**
revenue in IT sector in 2017

**18,5%**
average growth by the Dutch data center hub (last 8 years)

**20%**
growth by the Dutch data center market in 2018

**7,1 billion**
revenue in marine engineering sector (including product supply)

**4,5%**
container growth by the Port of Rotterdam in 2018

**3,5%**
growth by Schiphol Airport in 2018

**Source:** ABN Amro, Port of Rotterdam, Schiphol Airport



# THE RISE OF TECH AND DIGITAL

## THE RISE OF TECH & DIGITAL COMPANIES IN THE LAST 20 YEARS

The largest global companies in terms of market value (market capitalization) in billion $, compared over the last 20 years.

| 1998 | | | 2008 | | | 2018 | | |
|---|---|---|---|---|---|---|---|---|
| Rank | Company | Market value ($ bn) | Rank | Company | Market value ($ bn) | Rank | Company | Market value ($ bn) |
| **1** | **Microsoft** | 270 | 1 | PetroChina | 728 | **1** | **Apple** | 890 |
| 2 | General Electric | 255 | 2 | Exxon Mobile | 492 | **2** | **Google** | 768 |
| 3 | Exxon Mobile | 170 | 3 | General Electric | 358 | **3** | **Microsoft** | 680 |
| 4 | Royal Dutch Shell | 163 | **4** | **China Mobile** | 344 | **4** | **Amazon** | 592 |
| 5 | Merck | 153 | 5 | ICBC | 336 | **5** | **Facebook** | 545 |
| 6 | Pfizer | 145 | 6 | Gazprom | 332 | **6** | **Tencent** | 526 |
| **7** | **Intel** | 143 | **7** | **Microsoft** | 313 | 7 | Berkshire | 496 |
| 8 | Coca-Cola | 140 | 8 | Royal Dutch Shell | 266 | **8** | **Alibaba** | 488 |
| 9 | Walmart | 123 | 9 | Sinopec | 257 | 9 | J&J | 380 |
| **10** | **IBM** | 120 | **10** | **AT&T** | 238 | 10 | JP Morgan | 375 |

**Source:** Milford Asset Management, Bloomberg, Google

*The industry in perspective*

**69.000**
jobs at tech startups and scale ups in AMS

**56%**
employment increase in multi-tenant data centers in five years

**200.000**
employees in Dutch IT sector

**39.000**
jobs in hospitality in AMS

**1,4%**
average employment growth in 2019

**99.000**
jobs in Dutch agriculture

**Source:** ABN Amro, UWV, Dealroom

# THE ECONOMY IS DIGITAL

Digital technologies have changed the ways in which organizations and their customers interact with each other. Businesses are increasingly using more data in order to run their operations. The digital economy will therefore continue to grow, causing a greater dependency on computer technologies and data (processing). The world is now connected through a sophisticated infrastructure of networks that is able to deliver data with real-time connections. All of this requires a solid and sophisticated digital infrastructure to carry the workload. Data centers are an important part of this infrastructure that enables the digital economy.

## Digital Harbors

Data centers are the modern equivalent of the harbours, as this is where all digital infrastructure comes together. They provide robust housing for international enterprises, SMEs, the public sector, the IT-sector and digital start-ups. Data centers are the physical manifestation of what many people see as cloud services.

The role of the digital economy within the Dutch economy as a whole is gaining importance. The cogs that turn and make the digital economy possible are mostly hidden from view, however, resulting in a lack of knowledge regarding the fabric of the underlying infrastructure, and what it means for our economy and society.

The Digital Economy model is an extensive, all-encompassing model used to show how the various elements fit together. Without solid, reliable infrastructure, the digital economy cannot exist.

The model shows the role that data centers and cloud and hosting providers play in enabling digital services. There is an interplay between the interconnected elements presented in the model, and the infrastructure that makes them possible.

The digital infrastructure serves as a prerequisite for Dutch industry, ranging from ensuring the operation of IT systems for energy providers, to laying the basis for online stores that are open for business 24 hours a day, 365 days a year.

"NO **INNOVATION AND GROWTH** WITHOUT INVESTMENTS IN OUR DIGITAL INFRASTRUCTURE"

*Future trends and growth*

**628**
hyperscale data centers at the end of 2021

**338**
hyperscale data centers at the end of 2016

**90%**
of the world's data was created in the last two years.

**20.6 ZB**
annual global data center IP traffic in 2021

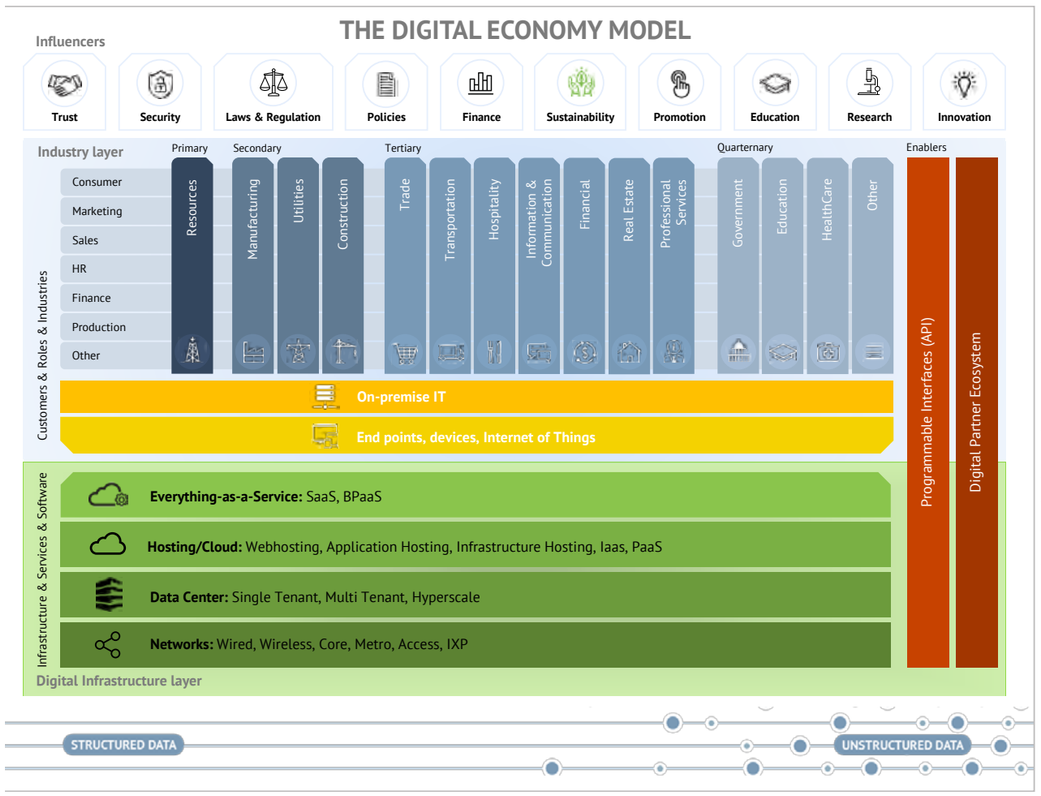
**6.8 ZB**
anual global data center IP traffic in 2016

**Source:** Cisco, 2019



# THE ECONOMY IS DIGITAL

"WITHOUT SOLID & RELIABLE INFRASTRUCTURE, THE DIGITAL ECONOMY **CAN NOT EXIST**"






*Future trends and growth*

**30%**
of data stored in data centers is big data in 2021

**18%**
of data stored in data centers is big data in 2016

**80%**
of enterprises will migrate away from in-house data centers and move to colocation, hosting and the cloud by 2025

**2.6 ZB**
data center storage capacity in 2021

**663 EB**
data center storage capacity in 2016

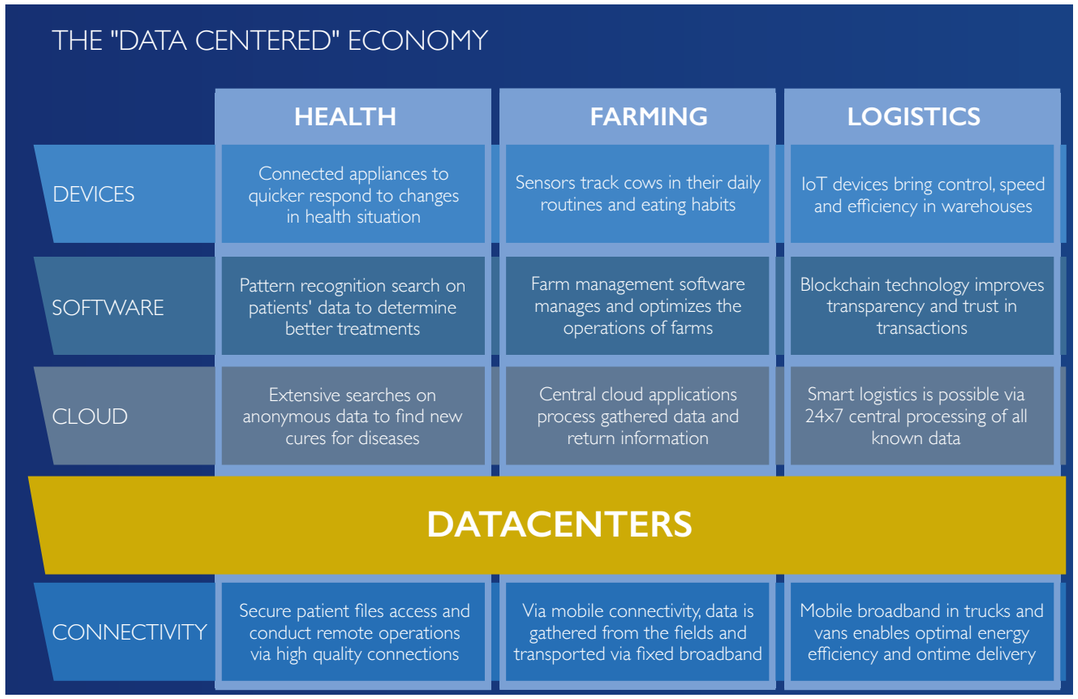
**Source:** Cisco, 2019

# THE "DATA CENTERED" ECONOMY

Every industry is in the process of becoming fully digitally transformed. In an age where data is at the center of it all, a strong data center infrastructure is the foundation for further improvements together with perfect connectivity via fixed and mobile broadband. The digital economy is the economy.

Some industries are ahead. Banking has seen huge transformation: almost all payments are done by phone or card. Dutch bank ING even calls itself a tech company with a banking-license. At government level there is a growing need for software from the market instead of developing their own, and large parts of their own cloud services have been moved to outside data centers.

Also farming equipment is using GPS and mobile equipment to improve productivity. New services have been created in processing and selling gathered farming data back to farmers. New technologies like 5G will accelerate the robotizing of the agricultural sector and helping at the same to tackle the shortage of farming personnel.




*Future trends and growth*

**20%**

**increase of connected capacity in 2018 at AMS-IX**

**6.3 TB/s**

**peaks per second at the AMS-IX Internet Exhange in 2018.**

**Dutch Internet Exchange NL-ix had a peak of 2.61 TB/s in 2018**

**24%**

**Expected growth of global IP traffic from 2016 to 2021**

**Source:** AMS-ix, Pb7, Gartner



# THE RISE OF REGIONAL

With the digital transformation at full speed, with new technology emerging, the underlying data center infrastructure changes in size, form and location. Increasing demand of more and faster access, need to be closer to the users of online services, changes in the regulatory landscape as GDPR and with the Brexit looming all have effect on how data center need to function, their location and the services they provide.

### Location is key

GDPR and Brexit are shifting demands for data location. With GDPR we see that data needs to stay within the territory of the European Community and therefore Cloud providers need to source data center space within the EC borders. With Brexit we see an additional shift of companies moving their core activity to the continent.

### Colocation is not enough

The times that data centers where only providing colocation services are gone. Additional services are getting increasingly important and data centers need to be able to provide them. This means giving access to cloud services, exchanges, connectivity and security services. The data center is the place where the digital economy connects.

### Data hubs are getting more important

The rise of cloud services will drive the need for more and better interconnectivity. This will directly grow the data hubs, that connect and concentrate all the cloud players. In the coming years the emergence of first Artificial Intelligence, and then Quantum Computing will drive the need for interconnection even further as these technologies generate and are in need of more data than we ever seen before.

### Edge and the growth of regional

With IoT, 5G, and larger media streams we see that cloud computing is moving towards the edge of the network. Data is simply getting too big to transport and/or the application need low latency services to be able to function. The roll out of 5G will boost the need for regional data center space as the 5G radio intelligence, at 4G still placed under the antenna, is virtualized and can be place up to a 25 km radius.

### Hyperscale moving nearer to the data hubs

With the increased need of SaaS applications and the interconnectivity we see hyperscales move closer to the data hubs (or super hubs in case of Amsterdam). The nearer a hyperscale data center is to other cloud services where it needs to interact with, the better the quality of the service for the users.

"EDGE COMPUTING & 5G WILL BOOST THE **DUTCH REGIONAL DATA CENTERS**"

*Future trends and growth*

**20.4 billion**

**Connected things that will be in use worldwide by 2021**

**$210 billion**

**Expected revenue of big data & business analytics related hardware, software and services in 2020**

**25%**

**Expected CAGR of data center IP traffic from 2016 to 2021**

**Source:** Cisco, Gartner

# MARKET RESEARCH

## STATE OF THE DUTCH DATA CENTERS

This State of the Dutch Data Center Report provides a quantitative and qualitative overview of the Dutch data center market. It focuses on multi-tenant data centers that rent out data center space in the form of housing or colocation. Many of these data centers will also offer hosting services. Since 2017, we also look at single tenant data centers that house server racks for internal use. That includes hyperscale data centers from digital giants such as Microsoft and Google.

### The Dutch data center landscape

Information technology has become ubiquitous. It has changed our everyday life. People carry a digital doorway to the world in their pocket that allows them to engage socially, consume and create rich content, shop, monitor their health, and be more productive. And even without a smartphone there are many ways to use keys, touch or voice to engage with the world in ways we couldn't have imagined a few decades ago.

And it seems this is just the beginning. Rapid advancements in technology such as cloud, artificial intelligence, mobile connectivity and networking, have a major impact on behavior and consumption and are disrupting business models as a result. Enterprises and the public sector alike engage in digital transformation in an attempt to keep up or get ahead. At the heart of these extraordinary dynamics, we find data centers. Data centers have one job to do: making sure our digital economy is always on.

The Netherlands is one the top locations for data centers. Multi-tenant data centers from all over the world choose the Amsterdam Metro Area because of its perfect connectivity. Connectivity via data cables and carriers, connectivity via the AMS-IX, the second largest Internet Exchange in the world, and direct connectivity via the (cloud) ecosystem. To cope with the growing demand, Dutch data centers are becoming bigger and bolder, but are also constructed modularly to manage the growth effectively. And also, hyperscale cloud data centers know how to find their way to the Netherlands and grow at an even more impressive speed.

With the presence of Schiphol as a major international airport, the Metro Region Amsterdam (MRA) is very accessible for international customers. Additionally, compared to the other top data center regions in Europe – London, Frankfurt and Paris - Amsterdam is more affordable in terms of property leasing, power, doing business, and living. Outside of the MRA we also see that high quality multi-tenant data centers are available to almost any organization in the Netherlands within a 30-minute drive. This unique situation provides companies the luxury of a make-or-buy decision when the time comes to expand or upgrade a server room or data center.

The strong growth of multi-tenant data centers is largely the result of the decline of the corporate data centers. A growing number of businesses decide to outsource their data center capacity and management, often by using colocation, and even more so by using cloud and hosting solutions. The key driver of this trend is the rise of the cloud. Cloud computing continues to shape the data center industry in various ways. It has resulted in the arrival and expansion of hyperscale data centers. At the same time, hosting companies bet big on selling virtual computer resources. As a result, many are moving out of the colocation market, leaving it to the colocation specialists. In the meantime, hosting companies have moved their servers to colocation providers. Most small and medium sized hosting providers that used to offer colocation as well have stepped out of this market, with a declining number of small data centers (less than 200 square meters) as a result.

"INTERNATIONAL DATA CENTERS CHOOSE THE NETHERLANDS BECAUSE OF **ITS PERFECT CONNECTIVITY**"

TABLE 1: SIZING THE DUTCH MULTI-TENANT DATA CENTER MARKET, MAY 2019

| | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|
| Gross surface (incl. office space, etc.) | 464.000 | 504.000 | 546.000 | 611.000 |
| Net surface (data floor) | 252.000 | 283.000 | 308.000 | 369.000 |
| Data center facilities (#) | 206 | 205 | 198 | 194 |
| Colocation providers (#) | 128 | 125 | 118 | 111 |

**Source:** Pb7 Research, May 2019

**Multi-tenant data centers**

Over the past 12 months, the number of multi-tenant data centers that are active in the market has declined further despite the arrival of new vendors. Small, non-specialized data centers such as hosting companies and systems integrators continue to stop offering colocation or have moved their colocation facilities to multi-tenant data centers. On the other side of the spectrum, major colocation providers continue to open new data center locations, but typically, at a much bigger scale than before and taking more time to fill the data floor using modular construction concepts. As a result, the total amount of data floor surface continues to grow, and we see a decrease in the number of service providers.

This year, we identified 147 multi-tenant data centers, seven less compared to last year. There have been a number of consolidations, such as Iron Mountain acquiring Evoswitch and QTS buying TCN Data Hotels and a number of regional acquisitions. E-shelter has made an entrance to the Dutch market. Other new initiatives have fallen behind schedule, such as Green Bay and DCValley, and have not yet entered the market. On top of that, Pb7 Research estimates that there are another 42 small data centers providers with up to 100 m2 of data floor (less than 2% of the total floor space) that have not been identified yet.

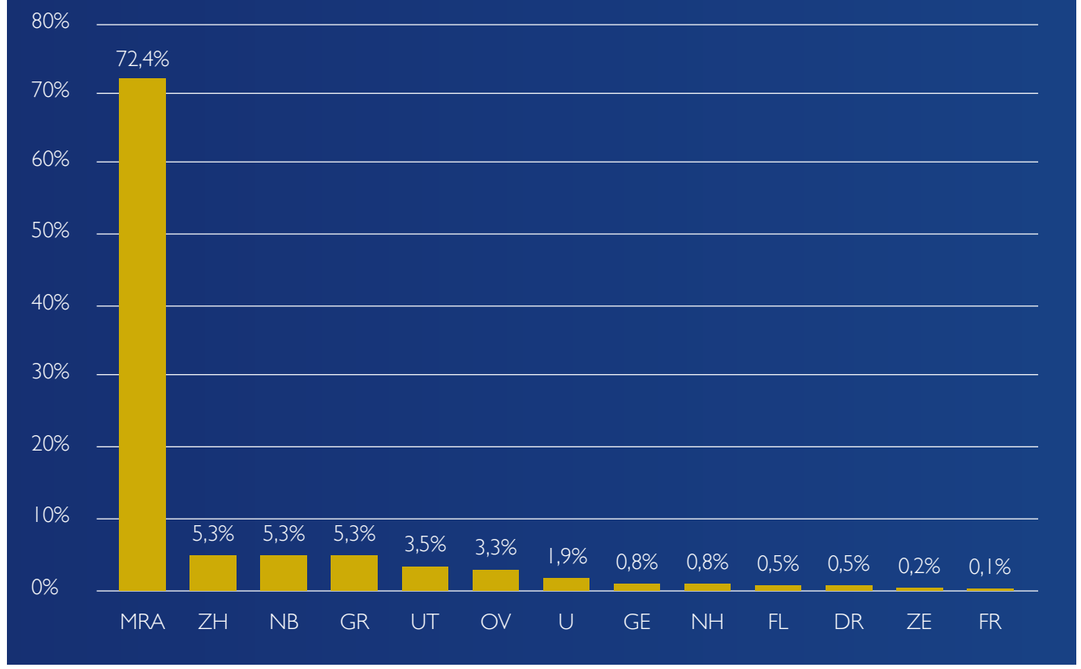
This may not sound like a high growth market, but the picture changes dramatically when we look at the combined size of all data floors: the year on year growth is plus 20%. That is a strong increase compared to last year's growth of 9%. There is strong growth in the high-end of the market with expansions from Interxion and the acquisition of one of the Switch data centers by Equinix, but also in the 400 - 10.000 m2 segment a significant portion of data centers has been expanding. There has been a lot of movement in the Dutch market. One of the main reasons is that capital and real estate investors have become very active. This has made it very attractive to sell medium sized colocation businesses to investors and we will see more ownership switches in the near future.

Looking forward, we continue to anticipate more strong growth in the market. In total we have identified plans for 179.600 m2, similar compared to what we found last year. If we find again that one in three square meters will materialize over the next 12 months, we might expect that the total data floor will grow with about 20%. Most of the additions, 88%, are expected to occur in the MRA. That means that the importance of the MRA in the overall data center landscape will increase even further. Last year, 71% of all data floor space was located in and around Amsterdam (Amsterdam, Almere, Aalsmeer, Haarlem, Hoofddorp/Schiphol, Purmerend). This has now increased to 72% (see figure 1).

"THE NET DATA FLOOR SURFACE HAS **GROWN BY 20%** OVER THE LAST **12 MONTHS**"

For the purpose of the Dutch Data center Report, Pb7 Research conducted a short survey among the members of the Dutch Data Center Association. The DDA has 32 participants that represent 84% of the Dutch multi-tenant data center market in terms of square meters data floor. 24 of the members completed the survey about growth, sustainability, and the impact of "edge". Earlier this year, we (Pb7 Research and the DDA) also completed a survey on labor market challenges. Some of the outcomes are used as well in the next sections.

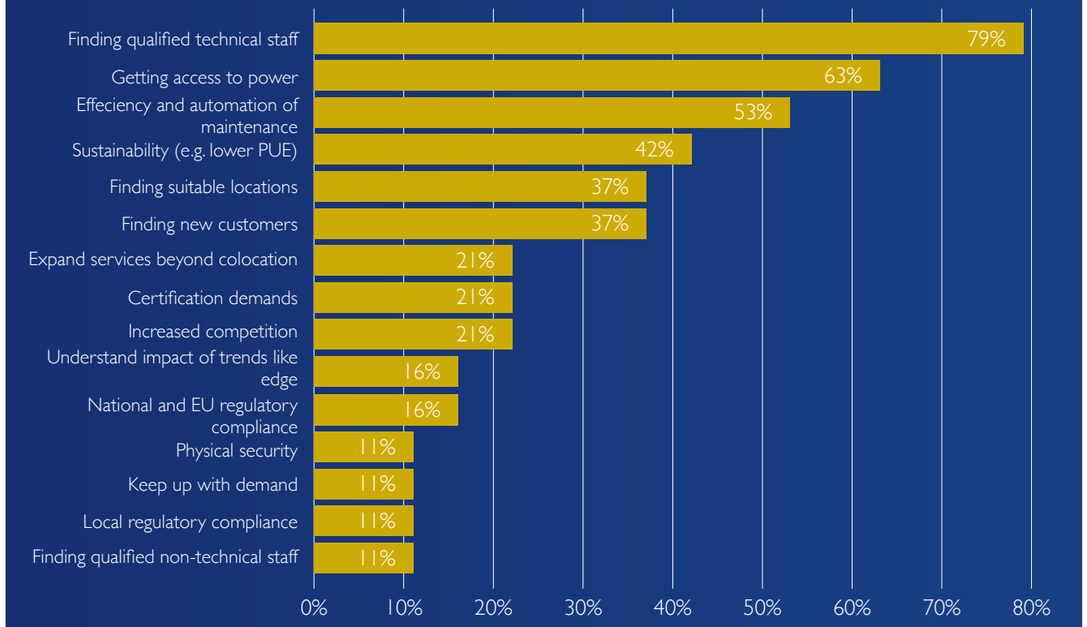
FIGURE 1: MULTI-TENANT DATA CENTER FLOOR SPACE (NET M2 * 1000, % OF TOTAL), BY PROVINCE, MAY 2019




**Source:** Pb7 Research, May 2019

"**72% OF THE DUTCH DATA CENTER** FLOOR SPACE IS LOCATED IN THE **AMSTERDAM REGION**"

FIGURE 2: WHAT ARE THE BIGGEST CHALLENGES FOR YOUR ORGANIZATION IN THE NEXT THREE YEARS? (MRA) (N=24)




**Source:** Pb7 Research, January 2019

The growth does not come without its challenges. As we saw last year, access to power is an ongoing challenge for multi-tenant data centers in the MRA. In a survey among 40 multi-tenant data centers earlier this year, Pb7 Research found that more than half of the data centers mention access to power as a key challenge for the next three years, as opposed to none of the data centers from other regions. In line with that challenge, MRA data centers are also very concerned about finding suitable locations.

As a result, we see initiatives emerge across the Netherlands to create new facilities or campuses that promise all the Dutch benefits, plus plenty of access to power.

Finding locations with a solid power infrastructure is not the only challenge for MRA data centers market.

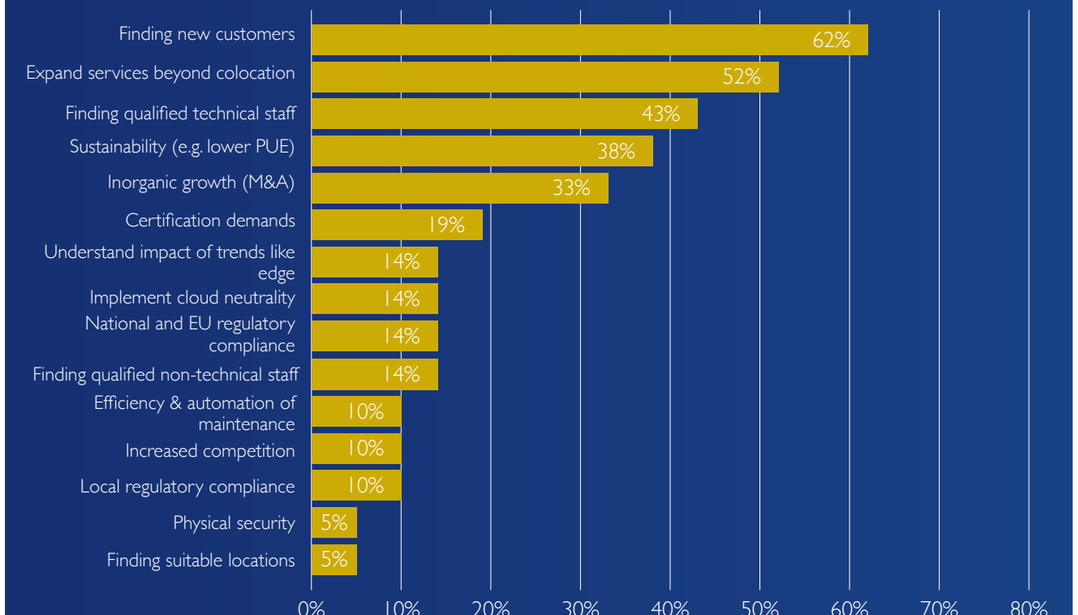
Most multi-tenant data centers struggle with finding and attracting qualified technical staff. This is not just a challenge to data centers in the MRA-region, but to data centers anywhere. Compared to last year, it is obvious the skills challenge has become much greater in the MRA region, while the challenge has stayed at the same level for data centers outside of the MRA. Sustainability has also gained more traction for data centers in both categories.

"NEW INITIATIVES EMERGE ACROSS THE NETHERLANDS TO CREATE NEW CAMPUSES WITH PLENTY **ACCESS TO POWER"**



STATE OF THE DUTCH DATA CENTERS

FIGURE 3: WHAT ARE THE BIGGEST CHALLENGES FOR YOUR ORGANIZATION IN THE NEXT THREE YEARS? (OTHER REGIONS) (N=24)




**Source:** Pb7 Research, January 2019

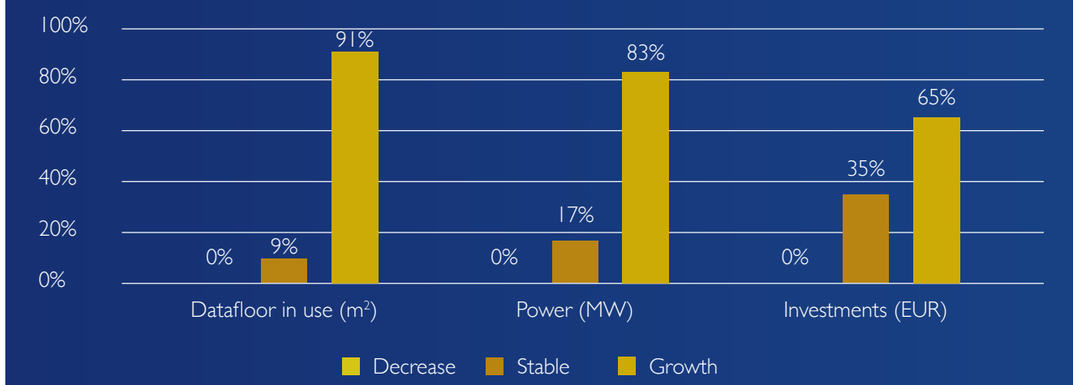
**Regional multi-tenant data centers**

The growth of regional data centers is typically more moderate compared to the big internationally focused data centers who grow on the back of major cloud and technology companies. We also see that the utilization rates are much lower and that there is still a lot of overcapacity in many parts of the market. Every year we see a number of regional data centers failing, that are not able to stand out compared to other data centers that keep investing in new services and in quality. But we also see a large number of data centers that better understands the changes in customer demand. Not only do they have much better utilization rates, but they have been expanding as well. They benefit from growing demand from the local public sector, such as municipalities, healthcare and education and local software and technology companies. As a result, we see medium sized incumbents growing and expanding their geographical footprint, while small generalists close their doors.

The dynamics for regional data centers outside the MRA are quite different. We see some concentrations of data centers e.g. in the region of Rotterdam, Eindhoven

"A RISING NUMBER OF REGIONAL DATA CENTERS ARE **GROWING AND EXPANDING THEIR GEOGRAPHICAL FOOTPRINT**"

FIGURE 4: MULTI-TENANT DATA CENTERS' GROWTH EXPECTATIONS FOR THE NEXT 12 MONTHS, MAY 2019 (N=24)




**Source:** Pb7 Research, May 2019

and South Limburg. And we see regions with limited competition in the Northern Provinces and in Zeeland. In concentrated areas the competition often leads to expanding portfolios. These regional data centers increasingly offer cloud services such as Infrastructure as a Service (IaaS), Backup as a Service (BaaS) or Disaster Recovery as a Service (DRaaS). Other regional data centers focus more on office automation and outsourcing.

Expanding the portfolio is one of the top-2 business challenges as we see in figure 3. But there are also data centers who differentiate by focusing on the core activity of colocation and creating operational excellence. For these types of providers, we can expect further consolidation into national data center networks. In the last year, the Data Center Group and Dataplace have actively expanded in this fashion.

**Growth**

As in the past two years, we observe that that most data centers anticipate continued growth for the next 12 months. Most, 91%, expect an increase in square meter usage. No respondent expects a decrease in square meter usage. Multi-tenant data centers are also very "optimistic" in terms of power: 83% anticipates growth of power usage and additionally, 65% expects an increase in investments. In previous years, the percentage of data centers that invested was higher than the percentage for growth in terms of surface and power usage.

Over the last 12 months we have seen this percentage gradually falling behind. It seems that innovation plans in Dutch data centers are slowing down somewhat due to macro-economic uncertainties. But at the same time, they anticipate strong growth in demand.

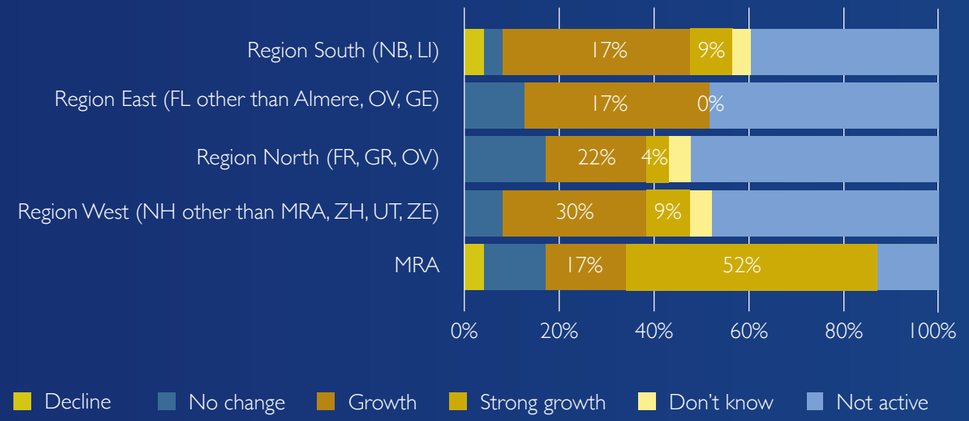
When we look in more detail at the growth per region

"**91% OF DATA CENTERS** ANTICIPATE AN INCREASE IN DATA FLOOR USAGE"





FIGURE 5: IN WHICH OF THE FOLLOWING REGIONS DO YOU EXPECT YOUR REVENUE TO GROW OR DECLINE OVER THE NEXT THREE YEARS? (N=24)




**Source:** Pb7 Research, May 2019

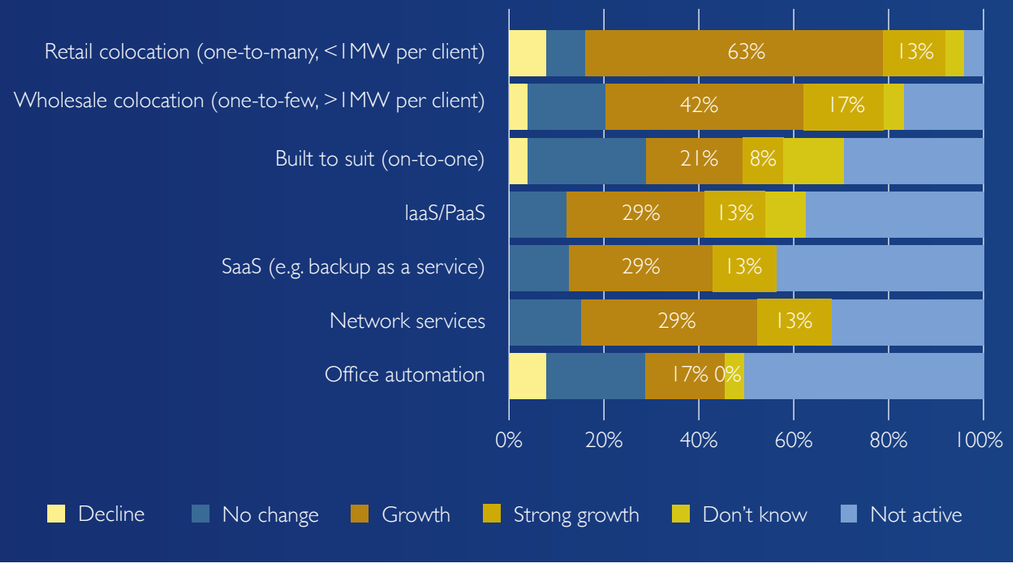
(Figure 5), we see more confirmation of the exceptional growth in the MRA region. 52% of all interviewed data center operators anticipate strong growth in the Amsterdam area. In other regions, most active data centers anticipate growth, but usually at a moderate level. It seems there are small differences between the attractiveness of different regions. Region South (Noord-Brabant and Limburg) and West (Zeeland, South-Holland, North-Holland other than MRA) have more traction than the North (Friesland, Groningen, Drenthe), while the East (Overijssel, Gelderland, Flevoland other than MRA) is somewhere in between.

When we look at types of services (Figure 6), most data centers anticipate growth in retail colocation, followed by wholesale colocation. But to really understand the data, we need to dig a little bit deeper. When we dive a bit deeper into the data, we see that data centers in the MRA clearly anticipate stronger growth from wholesale colocation and built to suit compared to more modest growth for retail colocation. In the other regions, it is the other way around: retail colocation continues to drive growth, while wholesale and built to suit activities show more moderate growth or are stable. In other words: the strong growth of the MRA-region is driven by big contracts with major international cloud and digital companies, while the underlying overall trend is based on the gradual decline of the corporate data center.

When we look at diversification, we also see strong differences between MRA data centers and regional data centers. In the MRA, the majority of data centers sticks to colocation, sometimes with additional network services. Regional data centers often have a more varied service portfolio. They find that customers increasingly ask for cloud

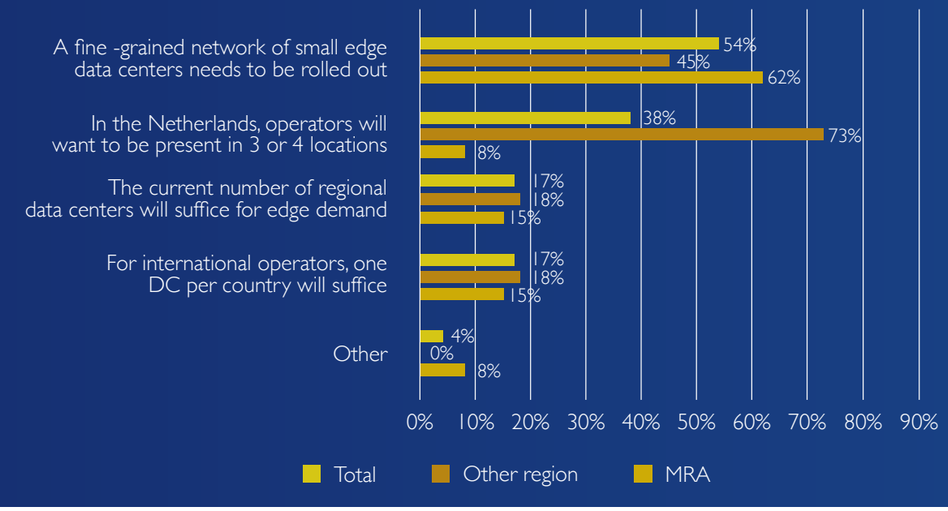
"OUTSIDE AMSTERDAM, **RETAIL COLOCATION** CONTINUES TO DRIVE GROWTH"

FIGURE 6: IN WHICH OF THE FOLLOWING REGIONS DO YOU EXPECT YOUR REVENUE TO GROW OR DECLINE OVER THE NEXT THREE YEARS? [N=24]




**Source:** Pb7 Research, May 2019

FIGURE 7: HOW DO YOU ENVISAGE THE IMPACT OF "EDGE" ON THE DATA CENTER NETWORK? MAY 2019 (N=24)

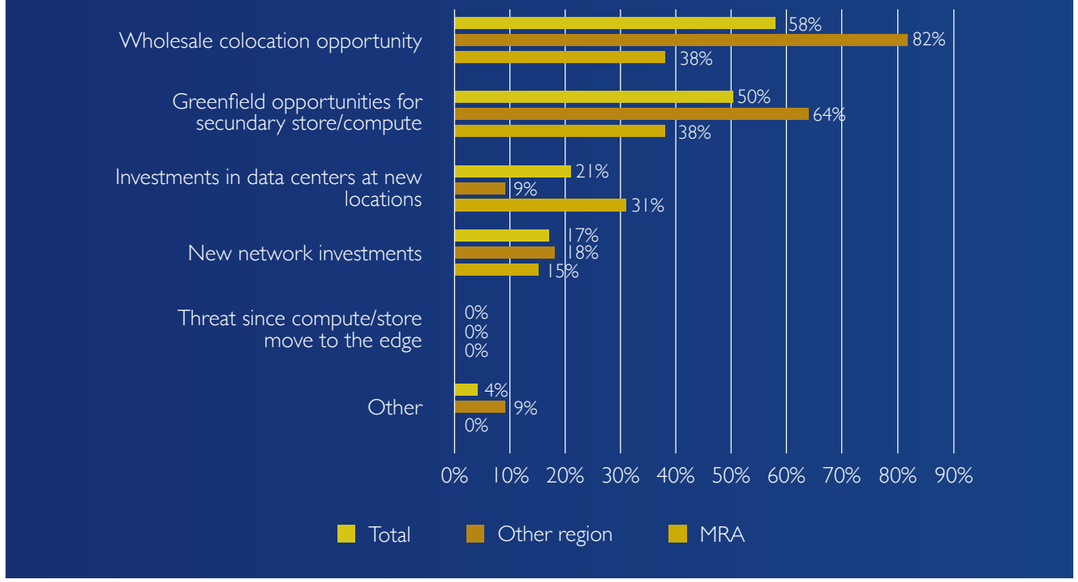



**Source:** Pb7 Research, May 2019



STATE OF THE DUTCH DATA CENTERS

FIGURE 8: WHAT IS THE IMPACT OF THE RISE OF EDGE COMPUTING TO DATA CENTERS SUCH AS YOURS? MAY 2019 (N=24)




**Source:** Pb7 Research, May 2019

services, such as Infrastructure as a Service or Software as a Service solutions. These SaaS solutions are usually infrastructure focused solutions such as Backup as a Service or anti-DDOS. We also see that office automation is less successful as a match. Some companies that combine colocation services and office automation see growth in this area, but most see a stable or declining business in this area. For the coming years it will be interesting to monitor if regional data centers succeed in growing home-grown IaaS and SaaS revenues or if customers move to public cloud vendors.

### Moving to the edge

With the rise of the Internet of Things we not only see that more and more devices are getting connected, but also that the requirements for computing at the edge are growing. Connected devices at the edge are increasingly intelligent and often require a very low latency. As a result, these capabilities are increasingly embedded into the device itself, or in nearby facilities (sometimes referred to as "nodes"). There is quite a bit of debate of the impact of this on the data center market. The biggest change we are seeing at the moment is that cloud operators and colocation data centers respond by getting closer to the edge. This means that they try to open locations at a large number of metropolitan areas. That means they will be happy with one data center for the Netherlands. So for the short to medium term we can expect more edge-related colocation contracts from US and Asian companies in the Netherlands, but the edge will probably have a bigger impact on the data center landscape in other countries.

Dutch data centers understand quite well that the edge is

"**EDGE IS THE KEY DRIVER** BEHIND CURRENT DEMAND FOR WHOLESALE COLOCATION"

the key driver behind the current demand for wholesale colocation. Interestingly, regional data centers are very hopeful that this creates wholesale opportunities for them. They are also the most positive about greenfield opportunities that are created for store and compute services close to the devices. About one in three MRA data centers thinks they will need to expand to other locations in the Netherlands as well. Some further believe that they will have to invest in new or improved networks to connect the edge to the cloud. But no one really believes that edge poses a threat to existing revenues.
We also wanted to understand how operators believe that the data center network will change as a result of edge computing.

There is a clear difference of opinion between MRA-based data centers and regional data centers. While both groups believe a fine-grained network of small data centers will need to be rolled out, only regional data centers believe that operators will want to have a regional presence. The last statement is certainly debatable. As a result of 5G, the air-born latency that we currently experience will be reduced strongly. The latency benefits from then moving it to a regional data center compared to a metro data center are expected to be quite marginal for a small country like the Netherlands.

### Single tenant data centers

Organizations in the Netherlands continue to focus strongly on digital transformation. While a lot of organizations are focusing on transforming the way they engage with customers, many others are focused on the digitalization of back-office and production processes. In order to go through this process, organizations are developing or adopting new applications and find they need to deal with legacy software at the same time. For both efforts, organizations are adopting cloud solutions. Since most organizations have adopted cloud solutions on a proof-of-concept basis, many have ended up with multiple clouds.

But the time that digital transformation was based on trial and error at the edge of the organization is coming to an end. We see that the volume of operations in the cloud is reaching critical mass. Before moving even further into the cloud, organizations are looking to get better control over the multi-cloud situation that they often have stumbled in. Being out of control leads to higher costs, quality issues, and security risks. Add to that the GDPR, and we have a recipe for rethinking how an organization stores and manages its data. As a result, organizations are turning their eyes to hybrid cloud solutions (integrated private and public cloud), supported by the advancements in hybrid cloud management solutions.

What this means for single tenant data centers is, first of all, that it has become very unlikely that they will disappear altogether. They have a clear role to play since a complete move to the public cloud will be out of the question for most organizations, even though public cloud usage will continue to grow strongly. At the same time, the increased attention for security and regulatory requirements for adequate data backups is likely to tempt many organizations when they are placed for a make-or-buy decision in terms of housing to select a professional third-party data center for colocation as opposed to building on premises server rooms.

Finally, we have seen this year that consolidation in the single tenant data center world is speeding up. Server rooms at locations are consolidated in central locations and partially moved to colocation facilities. While cloud is the key long term driver behind the single tenant data center consolidation trend, economic uncertainty now also has a serious impact as organizations start focusing more on cost.

"**DATA CENTER HYPERSCALE HOTBEDS** ARE EMERGING IN GRONINGEN AND THE NORTH AMSTERDAM CAMPUS"



STATE OF THE DUTCH DATA CENTERS

### Hyperscalers

For now, on-premises data centers are here to stay for the foreseeable future. And if we look at the segment of global digital leaders, we are actually looking at rapid growth. This segment consists of a small group of leaders in the digital world, such as Google, Microsoft, and Bol.com who have the scale to cost-effectively design, build, and manage tailored data centers. The enormous scale of Microsoft's and Google's data centers places them in a special category of the single tenant data center market known as hyperscalers or hyperscale data centers.
Interestingly, hyperscale data centers are not necessarily attracted to metropolitan areas such as Amsterdam. They require excellent connectivity (for example where an ocean cable comes ashore) access to large quantities of green power and affordable locations. As a result, new data center one-vendor hotbeds are emerging in Groningen and the north of North Holland.

### Sustainability

All combined, data centers in the Netherlands have a total capacity of more than 1300 megawatts. This was evenly spread across single and multi-tenant data centers last year, but the scales have tipped towards multi-tenant data centers this year that now hold 58% of the total capacity.
The enormous power consumption of data centers has been widely discussed over recent years. However, it must be said that data centers have reacted by investing in durable energy solutions: not only have multi-tenant data centers been reducing the amount of power they require to house and cool computer equipment, they have also started to embrace green power consumption, as we found in our survey among DDA members. For large multi-tenant data centers (and also for hyperscale data centers), green energy has become the standard, and most medium sized data centers are following their lead. Many small data centers (below 400 m2) have not yet fully up to speed with this trend. We have not seen a change in that this year, as the results are comparable to last year's data.

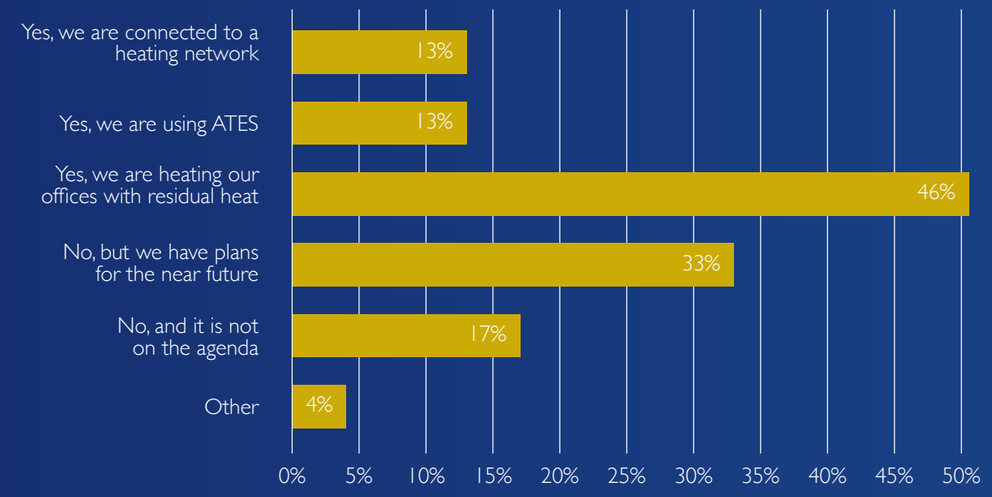
Similarly to the group of small multi-tenant data centers, many single tenant data centers show limited concerns about their carbon footprint. This is especially true for organizations that have smaller server rooms and do not have separate

FIGURE 6: ARE YOU USING GREEN ENERGY? MAY 2019 (N=24)


**Source:** Pb7 Research, May 2019

"**80% OF THE ENERGY** USED BY DDA DATA CENTER PARTICIPANTS IS **GREEN**"

FIGURE 7: IS RESIDUAL HEAT USAGE A THEME YOU ARE WORKING ON? (N=24)




**Source:** Pb7 Research, May 2019

contracts for data center power. Since these types of data centers often have relatively high PUEs, the consolidation trend that drives organizations to colocation facilities has a positive impact on the overall energy usage.
Another theme in terms of sustainability is reusing the residual heat from data centers. There is a surprisingly large part of the DDA-members that is actively using residual heat. The most commonly used application is office heating.

A significant proportion of the members is also using Aquifer Thermal Energy Storage (ATES), even though more members said they were using it last year. The number of data centers that is actively using it for a heating network is still quite limited. We expect that to change as the discussions between data centers and cities seem to be making progress.

"79% OF DDA-DATA CENTER PARTICIPANTS **ARE RE-USING RESIDUAL HEAT** OR HAVE PLANS FOR IT IN THE NEAR FUTURE"



STATE OF THE DUTCH DATA CENTERS

**Summary**
Data centers are the physical manifestation of a rapidly expanding digital world. And that manifestation is very prominent in the Netherlands. The Netherlands is host to one of the top multi-tenant data center locations in the world, home to major hyperscale data centers, and uniquely provides high quality multi-tenant data center facilities to more than 95% of all Dutch businesses within a 30-minute driving distance.
The multi-tenant growth has speeded up to 20% compared to last year's report, a growth percentage that may well be repeated over the next twelve months. The announced expansions and construction plans for the near future show that there is a lot of growth ahead, especially for wholesale colocation in the Metro Region Amsterdam. For single-tenant data centers there is strong growth for hyperscale facilities, but outside of that segment the single tenant footprint is shrinking.

With growth comes responsibilities. There are responsibilities to customers: making sure that computer equipment is professionally housed in a safe, always-on, connected environment with room for growth. And with the scale of power usage comes a societal responsibility. As Pb7 Research sees it in its data center surveys, most data centers are dealing with this responsibility by using green power and they are actively, individually and as a sector, looking at ways to use residual heat.
With growth also comes challenges. While regional data centers are trying to enhance their business model to add more value for their customers, data centers in the MRA region struggle with getting access to energy to support their growing needs. Energy companies are not able to keep up with the rapidly growing demand of new data centers that are getting bigger and bigger. But the biggest challenge of 2019 is getting access to technical staff. While we see a lot of initiatives to deal with energy challenges, we see that the industry has started new initiatives to address this challenge.

Looking forward to the future Dutch Data Center landscape, we anticipate a number of changes. As we have seen over the past two years, data centers are getting bigger and bigger and are increasingly taking to the sky. The new and bigger data center is built on a modular basis. As a result, it has more flexibility in terms of growth and in meeting specific customer demands along the way without planning for it beforehand.

The focus on sustainability will only get stronger as data centers will find new ways to use residual heat and start to look for decreased water usage. The rise of wholesale colocation will grow the market further but will also put pressure on profit margins (bigger contracts with lower margins).
As a result, data centers will focus increasingly on automation, what will also help in dealing with the skills shortage. And finally, we continue to see new MRA-satellites emerge in regions that are not that far from the AMS-IX but can provide more access to power.

"ANNOUNCED EXPANSIONS & CONSTRUCTION PLANS SHOW THERE IS **A LOT OF GROWTH AHEAD IN THE NEAR FUTURE**"

## "3 MULTI-TENANT DATA CENTER PROVIDERS WITH >20.000 M2 DATAFLOOR"

### TABLE 2: TOTAL AMOUNT OF DUTCH DATA CENTERS

| NATIONWIDE | | | | | | |
|---|---|---|---|---|---|---|
| **Owners** | | | | | | |
| | Multi-tenant | | Single tenant | | Total | |
| Datafloor (m2) | Companies (#) | % | Companies (#) | % | Companies (#) | % |
| 10-100 | 45 | 41% | 5.511 | 94% | 5.556 | 93% |
| 100-399 | 14 | 13% | 232 | 4% | 246 | 4% |
| 400-9.999 | 40 | 36% | 101 | 2% | 141 | 2% |
| 10K-19K | 9 | 8% | 3 | 0% | 12 | 0% |
| 20K or more | 3 | 3% | 3 | 0% | 6 | 0% |
| **Total** | **111** | **100%** | **5.850** | **100%** | **5961** | **100%** |

| AMSTERDAM METROPOLITAN AREA (MRA) | | | | | | |
|---|---|---|---|---|---|---|
| | Multi-tenant | | Single tenant | | Total | |
| Datafloor (m2) | Companies (#) | Facilities (#) | Companies (#) | Facilities (#) | Companies (#) | Facilities (#) |
| >100 | 28 | 48 | 44 | 53 | 72 | 101 |

| HYPERSCALERS | | |
|---|---|---|
| | Single tenant | |
| Datafloor (m2) | Companies (#) | Facilities (#) |
| >100m2 | 2 | 2 |

**Source:** Pb7 Research, May 2019

## "194 MULTI-TENANT DATA CENTER PROVIDERS IN THE NETHERLANDS"





### TABLE 3: TOTAL DUTCH DATA CENTER DATAFLOOR SURFACE

| NATIONWIDE | | | | | | |
|---|---|---|---|---|---|---|
| | Multi-tenant | | Single tenant | | Total | |
| Datafloor (m2) | Agg. Total (m2) | % | Agg. Total (m2) | % | Agg. Total (m2) | % |
| 10-100 | 11.710 | 3% | 80.461 | 23% | 92.171 | 13% |
| 100-399 | 2.623 | 1% | 46.755 | 13% | 49.378 | 7% |
| 400-9.999 | 87.933 | 24% | 115.951 | 33% | 203.884 | 28% |
| 10K-19K | 122.299 | 33% | 37.500 | 16% | 159.799 | 25% |
| 20K or more | 144.161 | 39% | 97.520 | 15% | 241.681 | 27% |
| **Total** | **368.726** | **100%** | **378.187** | **100%** | **746.913** | **100%** |

| AMSTERDAM METROPOLITAN AREA (MRA) | | |
|---|---|---|
| | Multi-tenant | |
| Datafloor (m2) | Agg. Total (m2) | % of total NL |
| Metro Region Amsterdam (MRA) | 258.463 | 70% |

| HYPERSCALERS | | |
|---|---|---|
| | Single tenant | |
| Datafloor (m2) | Agg. Total (m2) | % of total NL |
| Hyperscalers | 11.5520 | 31% |

**Source:** Pb7 Research, May 2019

### TABLE 4: TOTAL DUTCH DATA CENTER POWER

| NATIONWIDE | | | |
|---|---|---|---|
| | Multi-tenant | Single tenant | Total |
| **MW power** | 771 | 732 | 1.503 |

**Source:** Pb7 Research, May 2019

## "258.000 M2 MULTI-TENANT DATA FLOOR SURFACE IN THE AMSTERDAM REGION"

# ECONOMIC IMPACT OF THE DUTCH DATA CENTERS

Data centers are the physical manifestation of the digital world. Data centers are the locations that hold and guard the compute power and data storage that is required to run all the digital services that people consume on a daily basis and run the digitized processes that companies are moving to. When we want to assess the impact of the Dutch data center market, we will need to look at more than a general economic impact assessment. We need to better understand the role of the data center in digital ecosystem, the effect of a data center concentration on the Dutch digital sector, and the benefits of digitization on the Dutch economy. In this chapter we start at the beginning, the economic impact assessment, and then work our way up.

## Economic impact of the Dutch Data Centers

There is a growing number of studies that have tried to quantify the direct and indirect effects of data centers on national or local economies:

**I.** In 2014, CBRE conducted an economic and fiscal impact study in a US$ 1 billion data center development in the US. Over a 10 year period, that included the construction period, a $1 billion data center development, which might provide 30 to 50 jobs, would contribute about $200 million in taxes over a 10 year period. This would compare to the fiscal contribution of a corporate headquarters with 1.700 jobs and a capital investment of $40 million.

**II.** Also in 2014, the Boston Consulting Group calculated the impact of a major Facebook data center in Northern Sweden. Next to a direct contribution to the Swedish GDP, BCG also identified multiplier effects: the indirect contribution (spending in the supply chain) was 70%, or a multiplier effect of 1.7, while the induced contribution (spending from employees) added another 60%, or a total multiplier effect of 2.3.

**III.** In 2017, Pb7 Research calculated for the DDA that multi-tenant data centers in the Netherlands contributed directly EUR 585 million to the GDP in 2015, plus EUR 64 million in tax and social contributions. Indirecty the GDP contribution was estimated at EUR 293 million. Finally, Pb7 calculated an additional induced effect of EUR 67 million, leading to a total economic impact of EUR 941 million.

**IV.** Google commissioned Copenhagen Economics to publish a series of reports on the economic impact of Google's European data centers, including the one in Eemshaven, Groningen. The Eemshaven has contributed EUR 800 million in the 2014 – 2017 period.

**V.** In 2019, Pb7 Research calculated the economic impact of three scenarios for the (hyperscale) data center campus in Middenmeer, North of Amsterdam. This was before the announcements of the Google and CyrusOne plans for this campus. The average total annual economic impact of the most optimistic scenario (which would now be the realistic scenario) was calculated at close to EUR 1 billion for the coming ten years.

All of these studies share the same methodology. They calculate direct effects on GDP and/or employment based on the data center's income and payroll. For the indirect effects (or: supply chain impact) on employment and GDP - construction companies, installation and maintenance of equipment for power and cooling, energy, water, and so on - input/output tables are used as measured by e.g. the Dutch Central Bureau of Statistics (CBS). Finally, an induced effect is taken into account, by calculating the spending of employees (also in the supply chain) on the local or national economy. This can be anything from groceries to housing.

"WE NEED A **BETTER UNDERSTANDING** OF THE ROLE OF DATA CENTERS IN THE DIGITAL ECONOMY"



ECONOMIC IMPACT OF THE DUTCH DATA CENTERS

For the purpose of this chapter, Pb7 Research has updated the economic impact analysis for multi-tenant data centers, specifically for GDP contribution and employment.

## Direct economic impact

Looking at the direct contribution, multi-tenant data centers in the Netherlands contributed directly EUR 784 million to the GDP in 2018, according to our calculations. The main part is colocation, but data centers may have other revenue streams such as networking and hosting. For telecommunications companies, we have only looked at the core data center operation. The same is true for IT services companies with colocation facilities.

If we look at the other key aspect of economic impact, employment, we find that the direct contribution is limited. Data centers are capital intensive, but labor extensive. The Dutch multi-tenant data centers provide employment to 1.600 people. This number is lower compared to our estimates in 2017, following an in-depth study on the Dutch data center labor market that was published by the DDA in collaboration with Pb7 Research earlier this year.

## Indirect economic impact

The indirect economic contribution of data centers is especially present during construction phases. Since there are a lot of construction developments in the market going on, we have used a higher multiplier effect than we would expect from "regular" calculations. In the current multi-tenant market, with growth of close to 20% on an annual basis, the indirect effect will be close to 60%. In the Dutch hyperscale market, which is NOT part of the multi-tenant market, it is currently even well above 100%. Based on an indirect effect of 60%, the indirect GDP contribution is estimate at EUR 471 million for 2018. In terms of indirect employment, we are looking at 990 jobs in the supply chain.

## Induced

To complete the economic impact, we look at the induced impact. This is the impact that is made from employees spending money into the economy, anything from house rent or mortgage to daily groceries. Assuming the average employee in the data center and its supply chain earns EUR 3.150 per month, which is slightly above average, plus a holiday allowance, the total induced spending will amount to EUR 256 million. This will also have an induced effect on the employment of about 750.

## Total economic impact

If we take the multiplier effects into account for the GDP contributions, and employment, the Dutch multi-tenant data center market adds up to the following numbers:
In terms of GDP, the indirect multiplier in terms of GDP is 1,6 and with the induced effect we see a multiplier of 1,9. The multiplier effect in terms of employment are, respectively, 1,6 and 2,1.

TABLE 5: ECONOMIC IMPACT (GDP CONTRIBUTION, EMPLOYMENT) MULTI-TENANT DATA CENTERS IN THE NETHERLANDS

| | Direct | Indirect | Induced | **Total** |
|---|---|---|---|---|
| GDP contribution | EUR 784 mln | EUR 471 mln | EUR 256 mln | EUR 1511 mln |
| Employment | 1600 FTEs | 990 FTEs | 750 FTEs | 3330 FTEs |

**Source:** Pb7 Research, May 2019

"MULTI-TENANT DATA CENTERS CONTRIBUTE **€784 MILLION DIRECTLY TO DUTCH GDP** IN 2018"

### Single tenant and hyperscale data centers

When we also include other types of data centers to the data center market, we see that the total impact of data centers on the Dutch economy is quite a bit larger. The data presented in Table 6 is an update of the DDA labor market study "Datacenters & Werkgelegenheid 2019", mildly adjusted to reflect the situation of May 2019. In this study, we specifically looked at employment. We found that single tenant data centers are more labor intensive compared to multi-tenant data centers: they need more staff to run the same amount of data center space. In total, more than 2.500 people are employed to operate single tenant data centers. When we add to that the 550 that are active for hyperscale data centers, we see that data centers overall employ close to 5000 people today. And this number is growing rapidly. We may see a decline in people working for single tenant data centers, but with the strong growth in both the multi-tenant market and the hyperscale market, we found that over the next five years more than 1300 jobs will be created in data centers. Another 1600 will be created in the supply chain, and close to 1000 will be induced.

### Impact of the digital economy

But back to the multi-tenant data center market. The total GDP impact of the multi-tenant data center market was just over EUR 1,5 Billion in 2018 and will continue to grow significantly at a rate well above the GDP average. But we would like to argue that valuing the multi-tenant data center market at about EUR 1,5 billion per year does not do the sector justice. Data centers are the robust heart of an economy that is increasingly digital. If data is the new gold, data centers are the new vaults.

So, what is the value in having a big, professional data center sector? In Western Europe, data center concentrations started to emerge two decades ago around the biggest Internet Exchanges. The Internet Exchanges in Frankfurt, London, and Paris emerged to support the financial services sector. In the nineties, Amsterdam was a challenger in the financial services industry, and in some niches Amsterdam still plays an important international role. Being in the middle of Paris, London and Frankfurt and less expensive, the MRA was and is an attractive location.

TABLE 6: ECONOMIC IMPACT (EMPLOYMENT ONLY) DATA CENTERS IN THE NETHERLANDS, MAY 2019

| | Multi-tenant | Single tenant | Hyperscale | **Total** |
|---|---|---|---|---|
| Direct | 1.599 | 2.659 | 550 | 4.808 |
| Indirect | 990 | 1.359 | 2.699* | 5.047 |
| Induced | 745 | 1.239 | 1.001 | 2.985 |
| **Total** | 3.334 | 5.256 | 4.250 | 12.840 |

**Source:** Pb7 Research, May 2018

**When we look at the indirect effect, we see that there is a very big indirect effect occurring with hyperscale data centers. This is the result of the major construction projects that are in progress: there are high numbers of builders on site, while the size of the operational staff is not yet at full strength.*

"IN THE NEXT 5 YEARS, **1.300 JOBS WILL BE CREATED** IN DATA CENTERS - ANOTHER 1.600 JOBS WILL BE CREATED IN THE SUPPLY CHAIN"





Two decades later, the financial industry is no longer driving the data center industry. Cloud companies have taken over as the big driving force, and they are attracted by the same "old" major Internet Exchanges. The colocation market is very important to cloud providers, but it's not enough for the biggest ones that are expanding with major hyperscale investments. Hyperscale data centers do not need Internet Exchanges, but are attracted to intercontinental sea cables in a combination with affordable green energy resources, preferably in a moderate or cold climate to reduce cooling costs.
What we need to understand about the Dutch data center market, and specifically the MRA data center market, is that it is a mainport market, a key digital distribution hub. More than anything, it opens up the digital European market to international companies. We estimate that 56% of all colocation revenue in the Netherlands is international.

Hyperscalers are even more focused on non-domestic markets. When we look at the impact of this concentration, we will see most of all indirect effects in the supply chain and induced effects to local economies. The impact is going to be more subtle on the national or local digital ecosystem. For example, the Netherlands does not have an exceptionally large IT sector. In relative size it is quite similar to the ones in the UK, France, and Germany who also do not stand out when we look at the EU as a whole. In terms of start-ups - most of them have at least one foot in technology - the Netherlands is doing quite well. The biggest concentration of start-ups in the Netherlands is found in Amsterdam, but still we see that the start-up scenes of London and Berlin (not Frankfurt!) are about 10 times bigger and the one in Paris is about three times bigger compared to Amsterdam.

When we say that the impact of the sector on the digital economy is more subtle, we mean that the data center hub adds to a competitive package that makes the Netherlands attractive for technology investments and creativity. Data centers only create value in an environment where high quality networks are ubiquitous and other conditions are met that make a technology hotspot, such as a skilled workforce, fair costs of living and of doing business, regulations and tax climate, access to markets, and so on. As a result, we may not be able to calculate the exact effect, but we can identify the types of companies and activities that benefit from the mature data center market and quantify the markets that depend on it:

**A robust data center market is part of the strong package that the Netherlands has to attract investments from foreign technology companies.**
In recent years, Amsterdam has landed European headquarters from technology giants such as Uber, Netflix, and Tesla. They select Amsterdam for a combination of an excellent digital infrastructure (this is where data centers come in), access to a highly skilled multiple language labor force, and a fair cost of living and doing business.

**A strong data center market is also part of the package that makes it attractive for domestic technology startups, including internet commerce, a market representing a GDP of more than €100 billion.**
Amsterdam is the home to technology (once) startups such as Booking.com, Adyen, Picnic and Takeaway.com. According to Dealroom.co, there are 1661 technology startups in Amsterdam (1346 domestic, 315 foreign), who create 69.000 jobs, or 13% of all jobs in Amsterdam.*

**We have combinated this data with other inputs, taking into account the differences between Amsterdam and other regions, to model the GDP for tech start-ups, scale-ups, and "born in the cloud" grown-ups. The total GDP is estimated at EUR 22 billion.*

**A strong data center market supports the national IT industry.**
Colocation is being used by ISV's who are shifting to the SaaS-model, hosting companies that offer anything from web hosting to cloud services , and IT service providers that offer managed services and outsourcing. Using a professional colocation facility allows them to focus on their core activities, without having to worry about specialized and secure facilities or about having to invest in twin facilities.

**A strong data center market helps to keep data safe and adds to the continuity of digitized processes.**
Both businesses and the public sector are quickly becoming very dependent on technology. Processes are being made more efficient in time and cost, and new online products and services are leading to new business models. It helps organizations scaling up and down in terms of high-quality facilities on an as-needed basis.

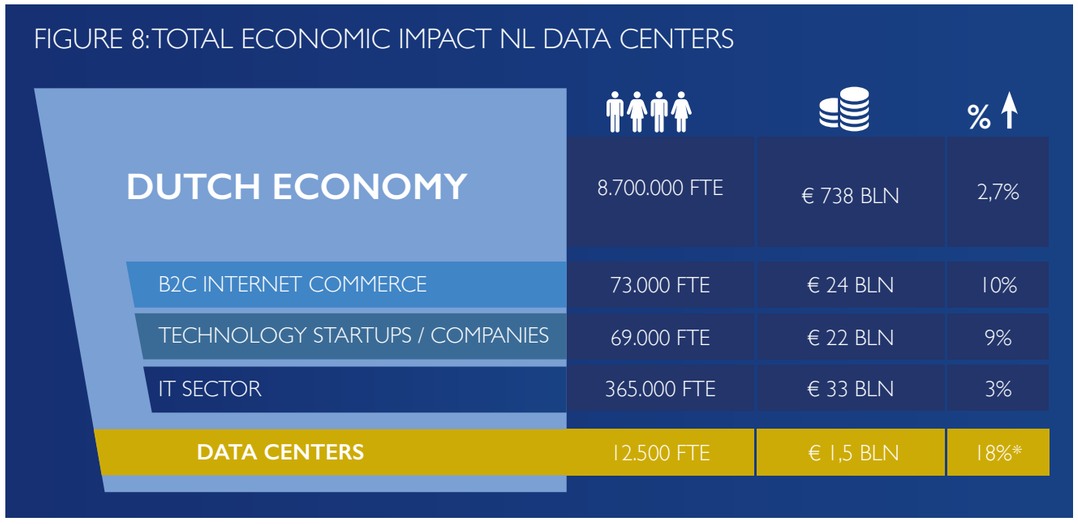
### The value of data and the digitized economy

The importance of a strong digital infrastructure with strong data centers is growing rapidly. Everybody understands that data is becoming more valuable. It has become easier to create, use and analyze data. As a result, the amount of data is growing exponentially. It is hard to put a precise valuation on data. If we look at it from a business perspective, we see that calculation models have been around for quite a while. There are estimates that information has a value of 20 to 60% of the total value of a company, depending on the level of digitization. If you believe that is too high, consider what would happen to a company that lost all of its data. Most companies would have to file for bankruptcy. The cost of building up new databases from scratch would be huge. Even more importantly, without data, most operations would come to a screeching halt or its processes would at least become extremely inefficient. As a result, transactions come to a standstill, customers walk away, and you will have to answer to authorities (tax, privacy, etc.) that may impose hefty fines or even worse.

Some business data may be stored in personal devices, but more than 90% is stored in data centers. That could be a tiny server room, a corporate data center, a colocation facility, or a hyperscale data center from your cloud provider. Even if you are only using cloud services, your service provider(s) will store it in data centers. This data needs to be protected. Part of the protection is done at the software level: security software should prevent cybercriminals from accessing and or corrupting data; and back-up and continuity solutions try to minimize the impact of unintended data loss. Data centers take care of the physical protection against power failures, temperature, humidity, fire, lightning, and of course intruders.

Over the last couple of years there have been some attempts to quantify the GDP that should be attributed to "digital" across industries. The METISfiles used as a basis the amount of employees who depend on ICT for ore than 50%, assuming that they create "digital value" as a result . Using this analysis, they believe the total Digital GDP was 29%, or EUR 182 billion in 2016 for the Netherlands. Using a different methodology, IDC predicts that by 2022, over 60% of global GDP will be digitized "with growth in every industry driven by digitally-enhanced offerings, operations, and relationships" . It is not entirely clear how IDC measures this. But since they forecasted 50% for 2021, we can assume they believe it would be at about 35% today, or EUR 271 billion. When we extrapolate the data from The METISfiles, we arrive at a similar percentage. The current volume of about 35% is impressive, but the forecasted growth is even more impressive.

FIGURE 8: TOTAL ECONOMIC IMPACT NL DATA CENTERS




**Source:** Worldbank, CPB, CBS, UWV, Thuiswinkel, Dealroom, Pb7, Dutch Data Center Association

**Growth percentage of Dutch multi-tenant data center power last year.*



ECONOMIC IMPACT OF THE DUTCH DATA CENTERS

**Summary**

The Netherlands is home to one of the strongest data center hubs in Europe. Using the most common method to calculate the economic impact shows that the contribution in terms of GDP and employment is growing rapidly. But the GDP contribution of EUR 1,5 billion does not reflect the importance of the sector. In an economy where businesses and the public sector are rapidly becoming dependent on digital processes and data represent a major and rapidly growing part of the value of a company, multi-tenant data centers play a very important role. They make sure that digital businesses can focus on their core business. Without data centers, there would not be a EUR 271 billion digitized economy.

## "WITHOUT DATA CENTERS, THERE WOULD NOT BE A €271 BILLION DIGITIZED ECONOMY"

**Resources Economic Impact**

Digital Infrastructure and Economic Development. An Impact Assessment of Facebook's Data Center in Northern Sweden
*The Boston Consulting Group, Commissioned by Facebook, June 2014*

Economic impact Dutch Data Centers Rapport
*Pb7 Research, commissioned by Dutch Data Center Association, 2017*

European data centres. How Google's digital infrastructure investment is supporting sustainable growth in Europe. Country case: The Netherlands
*Copenhagen Economics, Commissioned by Google, March 2018*

North Amsterdam Data Center Campus: Economic Impact
*Digital Gateway to Europe in collaboration with Pb7 Research, 2018*

Datacenters & Werkgelegenheid
*Dutch Data Center Association in collaboration with Pb7 Research, 2019*

ICT, Kennis en Economie
*CBS, 2018*

European Startup Report 2017
*Joblift, 2017*

Employment in Amsterdam's Tech Ecosystem
*Dealroom.co commissioned by Startup Amsterdam, 2019*

De Digitale Economie van Nederland
*The METISfiles commissioned by Nederland ICT, 2017*

IDC FutureScape: Worldwide IT Industry 2019 Predictions
*IDC, 2018*

# AMSTERDAM: KEY DATA CENTER MARKET

For the FLAP-markets in Europe (Frankfurt, London, Amsterdam and Paris), 2018 overall was an extraordinary year. The year ended on 194 MW of take-up, In Amsterdam, one single transaction was responsbile for 50% of the entire take-up in the market during 2018.

TABLE 9: AMSTERDAM MARKET TAKE-UP (MW)

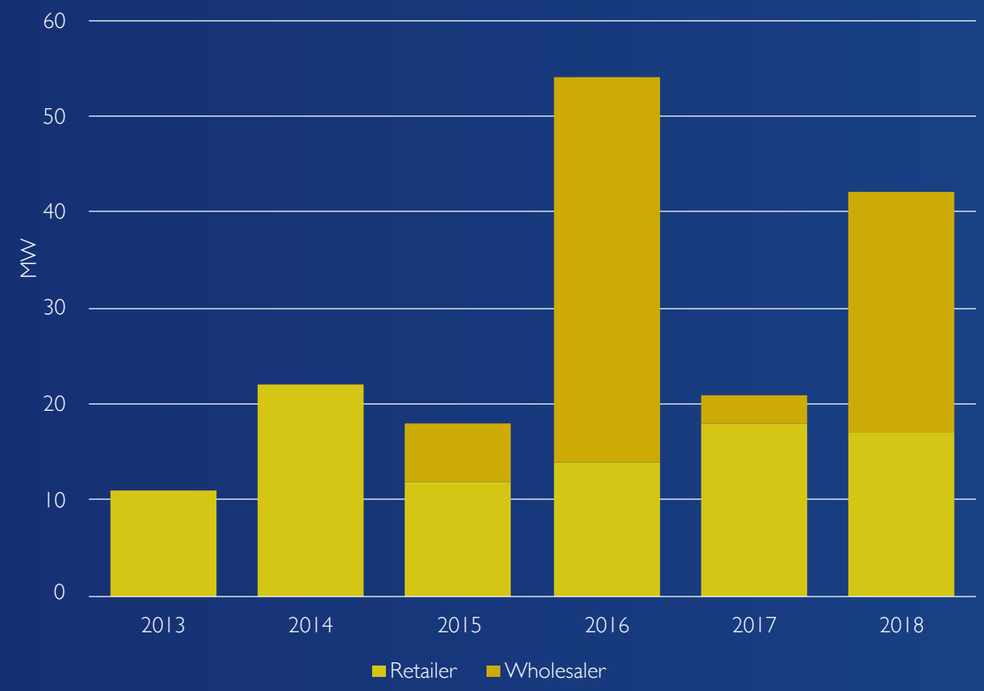



TABLE 10: AMSTERDAM MARKET TAKE-UP (MW)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Retailer | 11 | 22 | 12 | 14 | 18 | 17 |
| Wholesaler | - | - | 6 | 40 | 3 | 25 |
| Total | 11 | 22 | 18 | 54 | 21 | 42 |

**Source:** CBRE 2019



# AMSTERDAM: KEY DATA CENTER MARKET

Amsterdam ended 2018 with its highest vacancy rate since 2014, at 19%. Amsterdam has traditionally been a retailer-dominated market which typically results in lower vacancy rates, given the phasing of buildings. However, the recent development of larger-scale wholesale facilities in the market has led to an increase in the amount of capacity immediately available in the market.

TABLE 11: AMSTERDAM MARKET AVAILABILITY (MW)

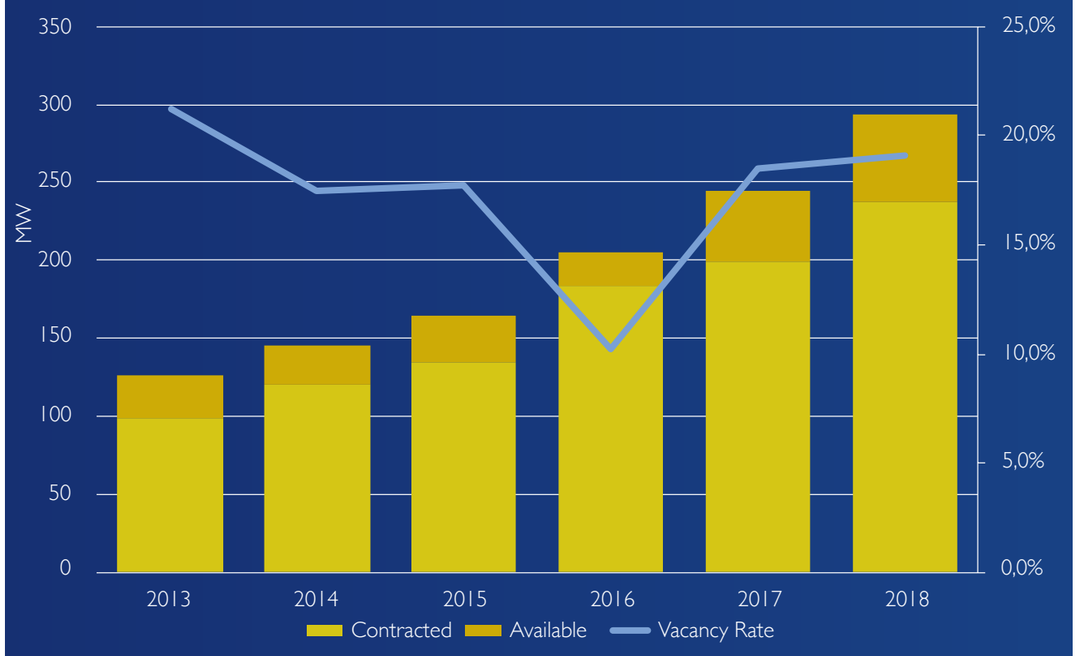



TABLE 12: AMSTERDAM MARKET AVAILABILITY (MW)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Contracted | 99 | 120 | 135 | 184 | 199 | 238 |
| Available | 27 | 26 | 29 | 21 | 45 | 56 |
| Vacancy Rate | 21,2% | 17,5% | 17,8% | 10,2% | 18,5% | 19,1% |

**Source:** CBRE 2019

**Increasing demand for wholesale services**

Although Amsterdam is more a retail data center market than a wholesale data center market, we see the wholesale segment growing rapidly, by 30% in comparison to 2017. In total, Amsterdam market size has grown by 20%, in terms of MW.

TABLE 13: AMSTERDAM MARKET SIZE (MW)

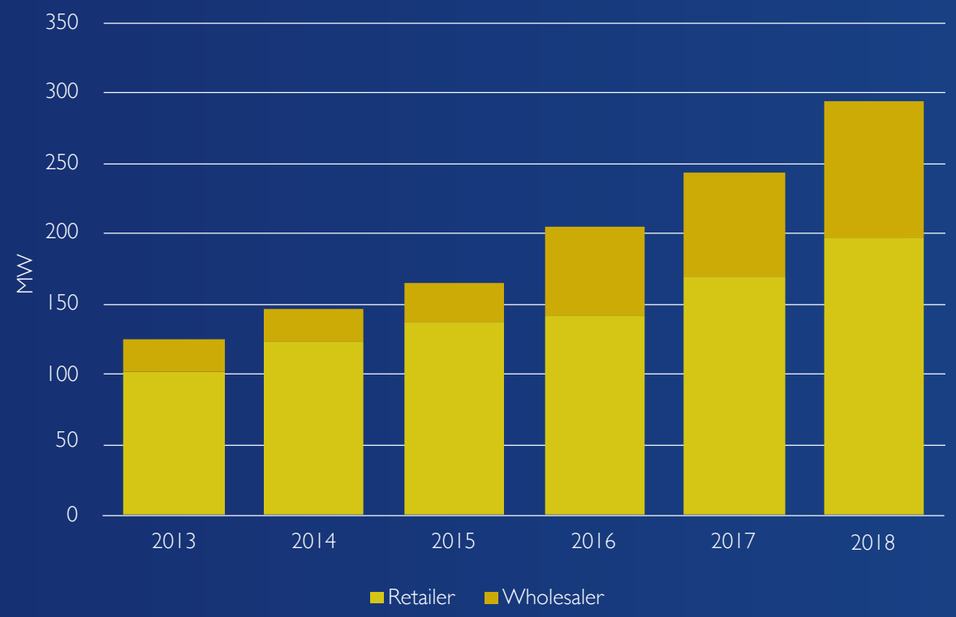



TABLE 14: AMSTERDAM MARKET SIZE (MW)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Retailer | 102 | 123 | 137 | 142 | 169 | 198 |
| Wholesaler | 23 | 23 | 28 | 63 | 75 | 97 |
| Total | 125 | 146 | 165 | 205 | 244 | 295 |

**Source:** CBRE 2019

"THE AMSTERDAM COLOCATION MARKET HAS GROWN **20% IN TERMS OF MW"**



AMSTERDAM: KEY DATA CENTER MARKET

**Unprecedented growth for FLAP markets**

CBRE's figures show there was a total of 194MW of take-up recorded across the FLAP (Frankfurt, London, Amsterdam and Paris) markets in 2018, up from 119MW in 2017. This makes 2018 the third consecutive year with over 100MW of take-up, which means that there has been nearly 469 MW of take-up in the past three years. And there are no signs of slowing down.

TABLE 16: FLAP MARKET TAKE-UP (MW)

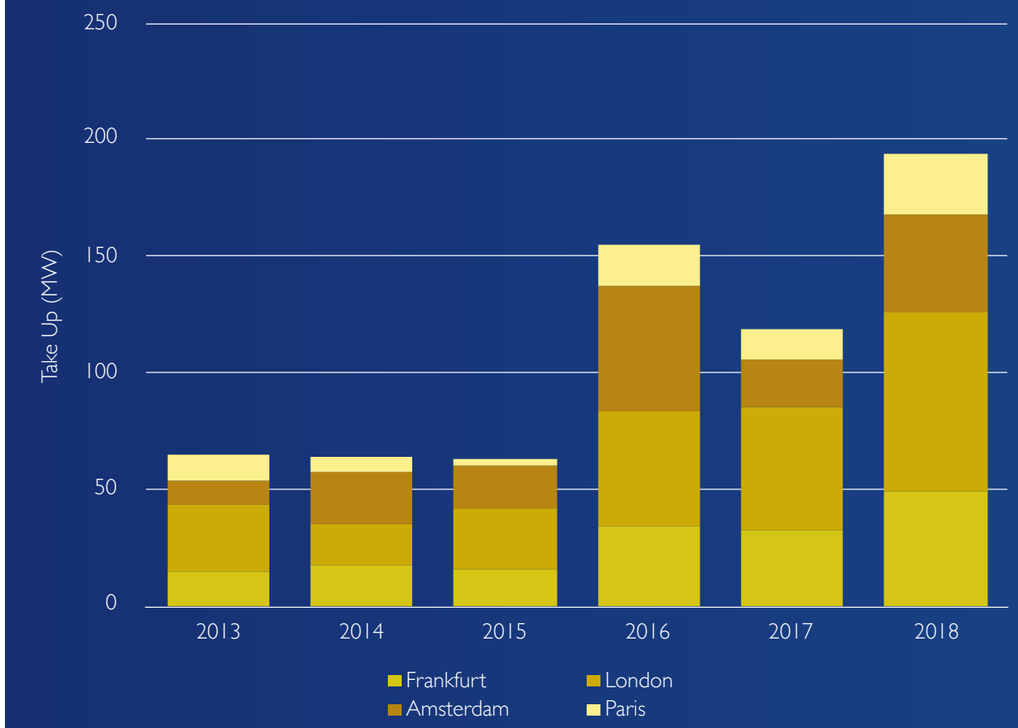



TABLE 17 FLAP MARKET TAKE-UP (MW)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Frankfurt | 15 | 17 | 16 | 34 | 32 | 49 |
| London | 28 | 18 | 26 | 49 | 53 | 77 |
| Amsterdam | 11 | 22 | 18 | 54 | 21 | 42 |
| Paris | 11 | 7 | 3 | 18 | 13 | 26 |

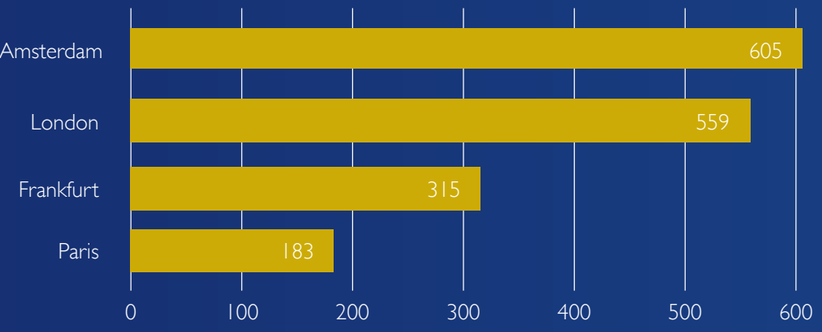
**Source:** CBRE 2019

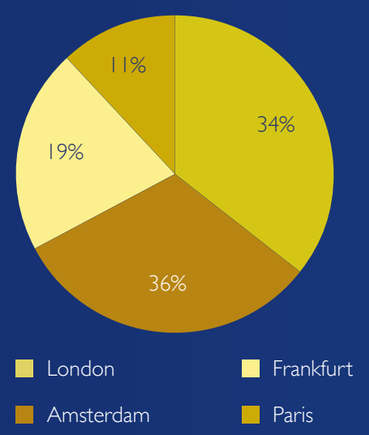
# AMSTERDAM: #1 DATA CENTER HUB IN EUROPE

The Amsterdam metro market (50km or 31 miles radius) is unique as it is the only FLAP-market that combines a well-developed colocation data hub with a large hyperscale North Amsterdam campus at 40 km (25 miles) distance. Based on CBRE's numbers combined with data from Pb7 and the DDA, Amsterdam is now taking the lead in Europe as largest data center hub.

As many companies are choosing a 'cloud first' strategy this is benefiting the hyperscale public cloud. Their growth is currently outpacing the commercial colocation growth in Europe, and with the recent announcements of new hyperscale developments in the North Amsterdam data center campus, the Amsterdam metro market has become the largest FLAP market in size.

TOTAL MARKET SIZE (MW)




TOTAL SUPPLY (MW)

| | 2019 | % |
|---|---|---|
| Amsterdam | 605 | 36% |
| London | 559 | 34% |
| Frankfurt | 315 | 19% |
| Paris | 183 | 11% |
| **Total** | **1662** | **100%** |

**Source:** CBRE, Pb7 Research & Dutch Data Center Association, 2019

"IN 2018, AMSTERDAM MARKETSIZE REACHED A TOTAL **MARKET SIZE OF 600+ MW**"



# AMSTERDAM: #1 DATA CENTER HUB IN EUROPE

TABLE 18 FLAP MARKET TAKE-UP (MW)

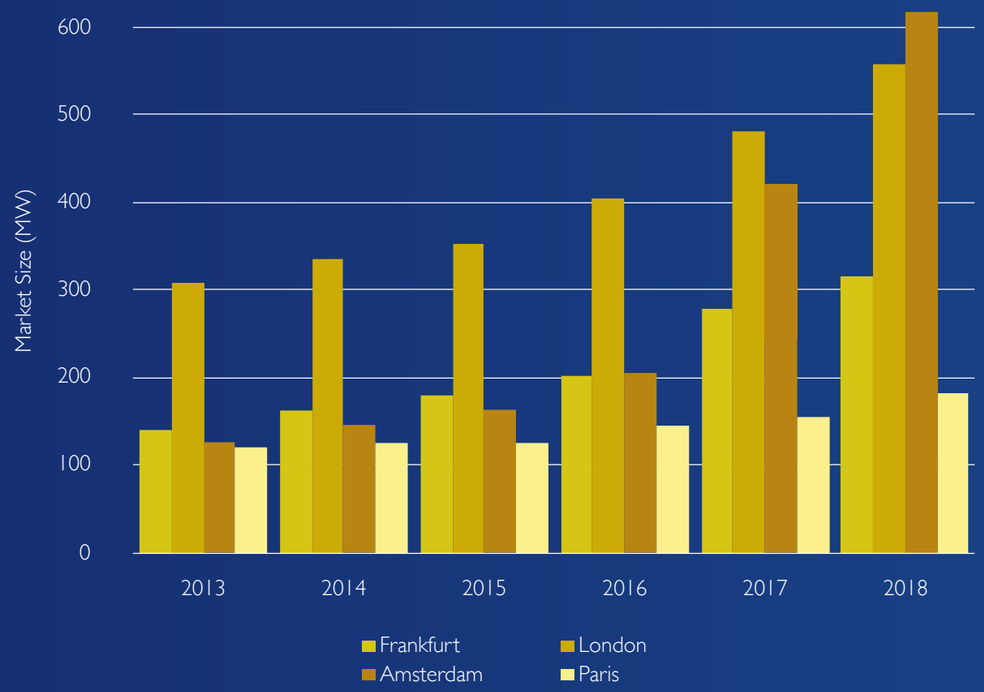



TABLE 19 FLAP MARKET TAKE-UP (MW)

| | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|---|
| Frankfurt | 141 | 164 | 181 | 203 | 279 | 315 |
| London | 309 | 337 | 354 | 404 | 482 | 559 |
| Amsterdam | 125 | 146 | 164 | 204 | 424 | 605 |
| Paris | 121 | 125 | 127 | 146 | 156 | 183 |

**Source:** CBRE, Pb7 Research & Dutch Data Center Association, 2019

"AMSTERDAM IS THE CONNECTIVITY CAPITAL AND EUROPE'S **NUMBER 1 DATA CENTER HUB**"

# DUTCH DATA CENTERS

## NATIONAL DATA CENTER STRATEGY

This year, the first National Data Center Strategy was published, as a result of the industry working together with national and regional Dutch governments in the REOS-coalition. The project aimed to take control of the spatial development of data centers in the Netherlands, in agreement with the national government and the provinces North-Holland, South-Holland, Utrecht, Flevoland and North-Brabant. The roadmap is a targeted approach to steer the growth of data centers, which are expected to keep on growing with around 15% each year for the coming years, and to sustainably strengthen the economy.

Most data centers are located in the Amsterdam region and they are growing fast. So fast, that this has a great impact on available space and energy distribution. Which is why the national government, the largest Dutch cities - Amsterdam, Rotterdam, The Hague, Utrecht - and the Brainport in Eindhoven have joined forces and agreed to a roadmap of data centers to achieve balanced growth.

### Route map shows data centers the way

By clustering around Amsterdam, the Flevopolder and a new cluster in South Holland, they expect to be able to take the pressure off the boiler. The Amsterdam region remains the data hub of the Netherlands and must continue to grow in a sustainable way. By using heat from data centers for heating homes and offices, the data center sector makes a serious contribution to the energy transition.

### DDA and REOS

The Dutch Data Center Assocation has been an important collaboration partner in these talks with the national and regional governments and has actively participated in the data center roadmap. With the upcoming challenges and expected growth rates, it is very important for both the DDA and the Dutch governments to steer the growth into the right direction, so the industry can keep on growing.

### Resillience strategy

For data centers, both fysical and digital security is crucial. Clustering of data centers could therefore potentially be vunarable. This is the main reason - next to the expected rise of edge computing, and many companies preferring to have their cricial data close to them, which both mean a rise of regional data centers as well - the REOS report talks about resilience, and developing fall-back or backup locations in the Netherlands. Locations that have been positioned in the roadmap are South-Holland (The Hague-Rotterdam), Flevoland (Almere), Utrecht and hyperscale locations North Amsterdam (Middenmeer) and Groningen (Eemhshaven). In all these roadmaps, the Amsterdam region is and will continue to be seen as the foundation of the Dutch data center market as worldwide important hub.

### Roadmap to 2030 and beyond:

**Source:** REOS Ruimtelijke Strategie Datacenters, 2019

"FOCUS ON A **LONG TERM** DUTCH DATA CENTER STRATEGY TO ACHIEVE **BALANCED GROWTH**"

# NATIONWIDE

## DDA Data Centers

**DDA MEMBERS**

*Atom86*
*BIT*
*Bytesnet BV*
*Cellnex*
*Colt B.V.*
*Datacenter Fryslân*
*Datacenter Groningen*
*Datacenter Nedzone*
*Dataplace B.V.*
*Digital Realty*
*EdgeConneX*
*ENGIE Services*
*E-Shelter*
*Equinix*
*EvoSwitch*
*Global-e Datacenter*
*Global Switch*
*Google*
*Interconnect*
*Interxion*
*ITB2 Datacenters*
*Keppel Data Centres*
*Maincubes*
*Nikhef Housing*
*NLDC*
*Previder*
*Serverius*
*SmartDC*
*Switch Datacenters*
*Systemec*
*The Data Center Group*
*QTS*

## Hyperscale Campuses


**HYPERSCALE CAMPUSES**

1. **Groningen**
   *Dataport Groningen, Eemshaven*

2. **North Amsterdam**
   *Agriport A7, Wieringermeer*

All data centers can be found online. Visit the Dutch Data Center Map: **www.dutchdatacenters.nl/map**



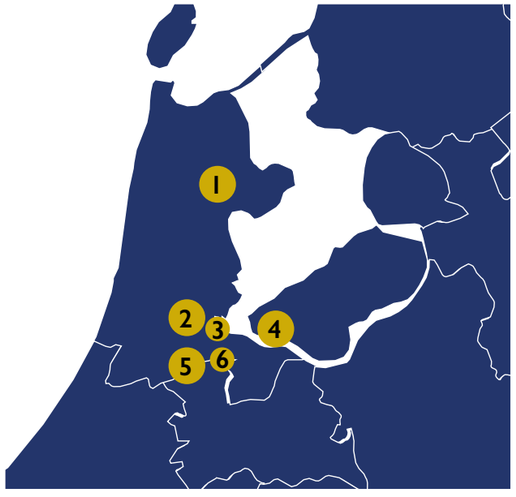
# COLOCATION HUBS

## Colocation Hubs


**COLOCATION HUBS**

1. **Groningen**
2. **Amsterdam**
3. **Rotterdam**
4. **Eindhoven**

## Amsterdam Hubs




**AMSTERDAM CAMPUSES**

1. **North**
2. **West**
3. **Science Park**
4. **Almere**
5. **Schiphol**
6. **South-East**

All data centers can be found online. Visit the Dutch Data Center Map: **www.dutchdatacenters.nl/map**

# REGIONAL DATA CENTERS

## Alternative Netherlands


**A - Rotterdam**

The Data Center Group
NLDC
SmartDC
Bytesnet
Dataplace
Nedzone
Colt
Cellnex

**B – South region**

Interconnect
NLDC
Global-e
Dataplace
Cellnex
Systemec
Engie

**C – East region**

Previder
Equinix
Cellnex
Dataplace
BIT
Serverius
ITB2 Datacenters

**D – North region**

QTS
Bytesnet
Cellnex
Datacenter Groningen
Datacenter Fryslân

## Data Centers Near The Border


1. QTS
2. Datacenter Groningen
3. Previder
4. Equinix
5. Dataplace
6. Cellnex
7. Systemec
8. Cellnex
9. Engie
10. Cellnex
11. NLDC
12. Interconnect
13. Cellnex
14. Global-e
15. Roosendaal
16. Nedzone
17. Cellnex
18. NLDC
19. Bytesnet
20. SmartDC
21. Iron Mountain
22. Cellnex
23. Datacenter Fryslân

All data centers can be found online. Visit the Dutch Data Center Map: **www.dutchdatacenters.nl/map**



# AMSTERDAM AREA

## Amsterdam Area - International Operators


1. Interxion
2. Global Switch
3. Equinix
4. E-Shelter
5. Iron Mountain
6. Colt
7. Digital Realty
8. EdgeConnex
9. Keppel

## Amsterdam Area - Alternative Operators


**Within 30 km radius (+/- 20 miles)**

1. NLDC
2. Cellnex
3. MainCubes
4. The Data Center Group
5. Atom86
6. Switch Datacenters
7. Dataplace

**Within 65 km radius (+/- 40 miles)**

8. Serverius
9. SmartDC
10. Bytesnet
11. BIT
12. ITB2 Datacenters

All data centers can be found online. Visit the Dutch Data Center Map: **www.dutchdatacenters.nl/map**

# DATA CENTER MYTHS

**1**

**MYTH**: Data centers don't employ anybody

**FACT**: Data centers generate jobs directly, in construction and operation, and indirectly in their supply and customer communities. Their most important economic effect, however, is the way they enable their customers, whose productivity and competitiveness are stimulated by world class digital infrastructure.

**2**

**MYTH**: Data centers are just big sheds full of servers

**FACT**: While some data centers win architecture awards, more commonly they indeed resemble boring industrial buildings. But appearances can be misleading: nondescript exteriors house a whole array of state-of-the-art technologies; from sophisticated cooling and ventilation to emergency generators.

**3**

**MYTH**: Data center power use is increasing exponentially

**FACT:** The amount of data that we generate is increasing faster than ever before. But this data explosion is only driving an incremental increase in energy use. Overall, data center energy efficiency is improving. For example, virtualisation and cloud computing increase computing capacity whilst reducing energy consumption.

**4**

**MYTH**: Data centers can be built anywhere

**FACT:** Data centers need "Position, Power and Ping". Position is a location near to customers. Power is electricity, lots of it, and 24/7. The greener and cheaper the better. Ping is connectivity – the number of telecoms networks they can access and how much available capacity there is.

**5**

**MYTH**: Data centers are bad for the environment

**FACT:** Data centers do consume a lot of power. Because of this, most data centers strive to procure renewable energy. Data centers are also focussing on the use of data center residual heat and they ensure that the disposal supply chain for waste electricals is as closed as it can be.



# DATA CENTER MYTHS

**6**

**MYTH**: Data centers are all in the Arctic (or should be)

**FACT:** Data centers are all over the world, and the choice of location is dependent on the business model and the three P's (see above). While high-latitude locations excel in terms of availability and reliability of renewable energy, "metro markets" from London or Amsterdam to Singapore are preferred by operators requiring close proximity to a specific internet exchange or strategic positioning.

**7**

**MYTH**: Data centers have nothing to do with me

**FACT:** Data centers have everything to do with us. We rely on data centers for everyday activities such as booking a ticket, receiving a text, shopping online, paying tax, visiting the doctor, socialising on social media and paying the electricity bill. We depend on data centers in the same way that we depend on electricity.

**8**

**MYTH**: Data centers all do the same thing

**FACT:** Data centers do lots of different things. Some specialize in high performance computing, where vast datasets are crunched for genetic research or weather forecasting; others are run by hyperscale operators offering transactional services like Amazon or social media like Facebook and some provide technical space for customer servers.

**9**

**MYTH**: Data centers are becoming obsolete thanks to the cloud

**FACT:** "The cloud" actually resides in physical servers located in data centers on the ground. Cloud computing is the result of changes in technology and business models over the last decade, changes that enable more optimal use of ICT infrastructure.

**10**

**MYTH**: Data centers waste energy

**FACT:** Data centers are built for efficiency. Additionally, the more effcient data centers are, the less energy they use, the lower their costs, the better it is for their competitive advantage. So why waste energy? A no-brainer!

These data center myths where a result of a coorporation between several data center associations in the EU

# POSITIONS

## OUR POSITIONS

With growth comes opportunites, however also challenges. As our young industry is professionalizing and as we are still seeing double digits growth rates, we need to make sure that we lead this growth in the right direction. To make sure the Dutch data center market can continue to florish, focus is key.
Based on market observations and valuable input of our participants and partners, the DD addresses three themes to foster further growth of the Dutch data center sector and the digital economy as a whole.

The first key topic is education & employment. Our recent survey concluded that the number 1 challenge for data centers is to find enough skilled staff. The exponential growth we see in the sector also means that the employment needs cannot be met. The Dutch education system does not provide sufficient digitally and technically trained candidates to meet the demand of the data center industry. To enable further grow of the data center industry, DDA actively collaborates with industry, educational organisations and governments to enthuse, inform, educate and retrain technical and digital talent.

Secondly, we focus on energy & sustainability. In an industry that is in a high demand of power, it is a necessity to prioritize sustainability. We work hard on regulating the power demand and the objective to utilize 100% green energy. The industry does this by rethinking the way we gain and use energy, by generating more green energy in the Netherlands, by investing in new methods to gain and rewin energy and by reusing residual data center heat.

Lastly, we focus on the digital economy & the Netherlands as Digital Gateway to Europe. The digital transformation can be seen in every industry. From agriculture to health care to business services, all are more or less dependent on digital services. Data centers facilitate those services and therefore are the foundation of our digital society. We will continue to promote the Netherlands as digital mainport.

The mainport is growing rapidly; Amsterdam specifically, has one of the world's biggest international data center hubs, providing an attractive digital ecosystem for multinationals and tech companies.

Education & Employment

Energy & Sustainability

Digital Economy & Data Hub

"AS OUR YOUNG INDUSTRY IS GROWING, WE NEED TO MAKE SURE THAT WE LEAD THIS GROWTH **IN THE RIGHT DIRECTION**."

# EDUCATION & EMPLOYMENT

**12.800**

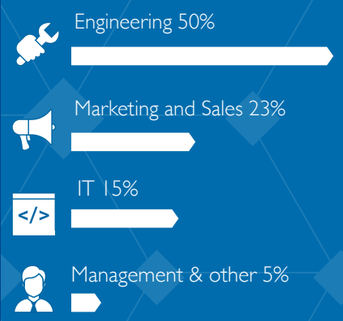
jobs have been created by data centers

**#1**

biggest challenge for data centers is finding technically trained staff

**> 500**

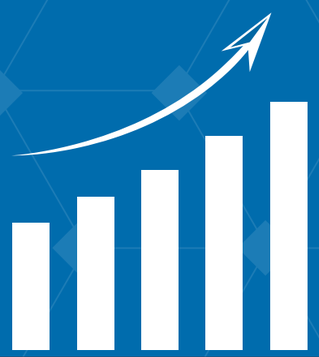
OPEN VACANCIES




**EMPLOYMENT INCREASE**

in multi-tenant data centers in the next 5 years:

**56%**



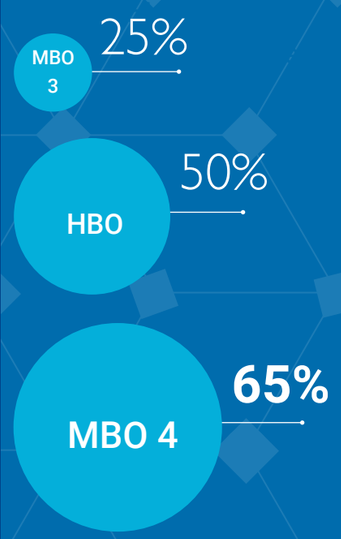
**CLOSE TO**

**10.000**

FTE's working in and around the Dutch data centers

**Opportunities for mbo and hbo students**

in the field of technology and it there is an increasing need for:




**750**

data center security officers ensure the physical security of the internet

**HIGH GROWTH POTENTIAL FOR WOMEN**

**7,1%**



# EDUCATION & EMPLOYMENT

**The data center industry is a relatively new employer on the labor market, that grows rapidly. To illustrate: the Dutch data center hub has seen an annual growth of 18.5% over the last 8 years Due to this growth, the industry is in need for technical and digital talent. To facilitate further growth of the digital industry, and to safeguard our position as Digital Gateway to Europe, we must take action right now.**

As of now, the Dutch education system does not provide sufficient digitally and technically savvy candidates to meet the demands of the data center industry as there are no suitable curricula on any level. UWV reported an enormous amount of unfilled vacancies in Q4 of 2017. Estimations come down to 13.300 for IT-related jobs and 60.800 for technical jobs, and this shortage is increasing every day.

Choosing for a career in the data center industry means a career with great prospects and plenty of learning and development opportunities. To enable further grow of the data center industry and therefore the digital economy of the Netherlands, DDA actively collaborates with industry, educational organisations and governments to enthuse, inform, educate and retrain technical and digital talent..

### Make digital and tech core subjects in education

To provide the labor market with sufficient digital and technical talent, we need to make digital and technical subjects more prevalent in the curricula of all educational stages. This is essential to decrease the gap between supply and demand, but also do educate young talent for jobs that do not exist yet.

### Encourage public and private collaborations

Collaborating can arise in many forms. Over the years the gap between supply and demand on the IT and technical labor market has grown significantly. To bridge the gap between education and job demand, industry, governments and educational institutions must work together to increase the flow of digital and tech talent.

### Promote a career in the data center sector, a career with golden prospects!

The DDA proactively enthuses students to choose a career in the data center, by showing that working in the data center sector ensures you of a life long career. We focus on women in particular, since they are hugely unrepresented. A missed opportunity, as diversity in the working space leads to innovation, creativity and productivity.

### Foster free flow of people in the EU

There are many unfilled vacancies and the shortage keeps growing. Companies therefore search beyond borders to attract skilled employees. It is important for our industry to have an open market and position the Netherlands as attractive country for digital and technical talents to work and reside.

"PROMOTE THE DATA CENTER SECTOR;
**A CAREER WITH GOLDEN PROSPECTS!"**

# EDUCATION & EMPLOYMENT: OUR REPORTS


**Publication "Data centers en Werkgelegenheid" March 2019**

As society is increasingly online, the data center sector also continues to grow bigger and is therefore a growing source of employment, according to research conducted by the Dutch Data Center Association in collaboration with colocation provider Interxion and security company Workrate. Data centers with multiple locations, so called multi-tenant data centers expect to have 56% more employees in five years time.

The 12,800 jobs that the sector is currently creating is estimated to grow towards 16,300 in the next five years. The actual realization of this growth however, strongly depends on the availability of sufficient technically qualified personnel. The research concludes that finding qualified personnel appears to be the biggest challenge for the data center industry.

**The publication "Datacenters en Werkgelegenheid" (in Dutch) is freely accessible via www.dutchdatacenters.nl/publicaties**


**Publication "North Amsterdam Data Center Campus: Economic Impact Study" October 2018**

The data center industry in Amsterdam has grown on average by 18% per year in recent years, so that the industry is constantly looking beyond the city limits. The Noord-Holland North region has also been discovered: at the Agriport A7 site in Middenmeer, just a 30-minute drive from Amsterdam, Google has now purchased a plot next to Microsoft. Commissioned by the region,

Digital Gateway to Europe calculated the impact of this North Amsterdam data center campus on the Dutch economy. And this impact is great; the total investment is already estimated at € 2 billion. The direct, indirect and induced economic effects of the data center campus were calculated on the basis of 3 different growth scenarios.

**The publication "North Amsterdam Data Center campus: Economic Impact Study" is freely accessible via www.dutchdatacenters.nl/publicaties**

**Interested in learning more about our actions regarding Employment and Education? Or would you like to collaborate with us by setting up a project?**

Contact Eline Stuivenwold
Policy Officer on Data Center Employment and Education

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031203037860

"MULT-TENANT DATA CENTERS EXPECT **56%** **EMPLOYMENT INCREASE** OVER THE NEXT 5 YEARS"



# EDUCATION & EMPLOYMENT: OUR EVENTS

**Working in the data center sector will ensure you of a life long career of learning and development. Therefore, the DDA actively promotes the industry to students, job seekers and other stakeholders, and activily works on collaborating with vocational schools to bring the data center industry into the classroom. Promotion and education on the career prospects can further lead young people into the digital career path, showing them the role they could play in the digital economy of the future. The DDA has a specific focus on promoting the industry among woman, since they are barely represented: around 7% of data center staff is female and for the technical staff this percentage is even lower.**

**Data Center Tech College & Career Floor**



**Girlsday 2018**

"WE AIM TO BRING THE DATA CENTER INDUSTRY **INTO THE CLASSROOM**"

**80%**

of Dutch data centers use green energy

**1 MILLION**

potential households that can be heated by residual data center heat

All Dutch data centers together (multi- & single tenant) use

**1503 MW**

**0%**

Data centers run fully electric and do not emit CO2 directly

**600**

KILOTON CO2 can be saved by reusing data center residual heat

**90%**

of this power converts to reusable heat

**Since 2018**

Data center residual heat is classified as neweable energy

**18%**

Dutch multi-tenant data center growth in MW in 2018 to a total of

**771 MW**

**79%**

of DDA members re-use waste heat or has plans for the near future

By doing so, data centers are becoming in-between stations of energy instead of end stations



ENERGY & SUSTAINABILITY

**The times in which data centers obtained their power from the grid, and in which residual heat ironically went to waste, are over. Both the global Paris Agreement (2015) and our own Climate Agreement (2018) enforce us to act smarter and more responsible with regard to the environment. Hereby, the data center industry aims to contribute proactively.**

The entire industry is fully electric and runs on green energy. Power efficiency has become the industry's second nature due to both sustainability and cost efficiency purposes. Several residual heat projects have launched and residual heat of data centers has been classified as 'renewable energy', which means this heat can make a significant contribution  Despite the industry's efforts to operate as efficiently as possible, additional support is needed.

Everyone uses a data center daily, and all those data centers need electricity. The larger the data center, the more efficiently it is: data centers use to the latest technologies and innovations to reduce their energy bill.  However, power networks and substations have never been designed for such huge concentrations of energy. To keep our digital economy going, we must continue to provide our data centers with electricity.

### Use the residual heat of data centers for the built environment

Using residual heat has great potential. If we start using the data center residual heat for households, offices and pools, we can achieve a CO2-emission reduction with estimations of 600 kiloton. This means we can accellerate the energy transition. These projects require strong private-public coorporation.

### Increase the generation of green power in the Netherlands

"Real" green energy should be available as soon as possible, and the usage of it should be encouraged. Almost all Dutch data centers aim to fully run on green energy, such as energy from windmills, solar parks, hydropower and hydrogen. It is likely that it will take years before the supply of genuine green energy is available

### Power infrastructure development should match the pace of the digitalization and energy transition

The growth of data center clusters were never planned for, and have a big impact on power networks and substations. Whereas data centers are growing in a high pace, regulations are not. To further develop our digital economy and to maintain our leading position as Digital Gateway to Europe, it is essential to supply data centers with sufficient energy.

### Adjust energy related legislations to create more space in the distribution network

Power distribution in the Netherlands is heavily regulated, which has led us to have among the best networks in the world. Now, the journey towards a digital and circular economy requires flexibility in legislations to look ahead and create several scenarios when it comes to the demand for distribution networks and substations.

"WE MUST ENSURE TO PROVIDE DATA CENTERS WITH **SUFFICIENT GREEN ENERGY**"

# ENERGY & SUSTAINABILITY: OUR REPORTS


**Factsheet "Subsidivise 2019"**
**February 2019**

Are you planning to invest in the field of data center innovation or sustainability? There are again plenty of subsidy opportunities! Subsidies not only make your investments profitable, they above all support you in realizing your innovative ambitions.

To show which arrangements are available for the data center sector, the DDA publishes the third edition of this factsheet, in collaboration with subsidy consultancy Hezelburcht. In the factsheet, the subsidies that are available are explained.

> Questions? Please consult the DDA & Hezelburcht Subsidy Helpdesk for DDA-participants and partners via the DDA-portal.

**The factsheet "Subsidievisie 2019" (in Dutch) is available for download via www.dutchdatacenters.nl/publicaties**


**Publication "Datacenter Restwarme & Innovatie"**
**November 2018**

Following the second Residual Heat Congress on 10 October 2018, the DDA published the Residual Heat & Innovation 2018 Data Center report. To succesfully start up sustainability and energy efficiency projects, knowledge sharing is key. Best practices regarding residual heat, with concrete examples, where shared at our event.

The publication is entirely based on concrete and practical cases, some of which were explained during the congress. The most crucial learning experiences are discussed extensively in the report. These best practices will help future data center residual heat projects.

**The publication "Datacenter Restwarmte & Innovatie 2019" (in Dutch) is freely accessible via www.dutchdatacenters.nl/publicaties**

**Interested in learning more about our actions regarding Residual Heat and/or Energy?**

Contact Erik Barentsen
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"**KNOWLEDGE SHARING IS KEY** TO SUCCESFULLY START SUSTAINABILITY PROJECTS"



# ENERGY & SUSTAINABILITY: OUR EVENTS

**By working together with and bringing together governmental parties, industry and operators to foster conversation, the DDA improves the knowledge and works together to create solutions. Key events include organizing the national congress on residual heat reuse: the Data Center Residual Heat & Innovation 2019 congress on October 10. The DDA also partipates in many talks and round tables with industry experts, power distributers and -operators, and policy makers, with regards to energy distribution, sufficient green power and energy regulations.**

**Data Center Residual Heat & Innovation Conference, 2018**


**Q4 Power Session 2018**

"WE AIM TO CREATE **SOLUTIONS FOR THE ENERGY GRID** TOGETHER"

# DIGITAL ECONOMY & DATA HUB

The Dutch IT sector employs

**200.000 people**

with a revenue of

**€90,3 billion**

**#1 + #6**

AMS-IX is Europe's #1 Internet Exchange and NL-ix is number 6 in Europe

In 2017, Dutch mobile Internet use grew to

**87%**

**98%**

of Dutch households have Internet access, making The Netherlands

**#1**

In Europe

The total impact of the Dutch multi-tenant data center market on Dutch GDP is

**1.5 BILLION**

**€**

**20 years**

is the average life span of

**SUBMARINE INTERNET CABLES**

which means **NOW is the time for replacement**

to ensure that The Netherlands stays the

**DIGITAL GATEWAY TO EUROPE**

**20%**

of all Foreign Direct Investments (FDI) into the Netherlands is related to

Data centers & Cloud

Dutch Public cloud adoption increased to

**92%**

from 89% in 2017



# DIGITAL ECONOMY & DATA HUB

The Dutch digital hub (or "mainport" in Dutch) is very important for the economy. The digital hub has grown fast in the last years and that has resulted in a bigger economic impact than Schiphol or the Rotterdam harbor: 20% of all foreign direct investments is cloud- and data center related. However, to stay ahead as digital frontrunner worldwide and keep international competition at bay, we have to keep investing and innovating. The DDA is committed to our digital infrastructure. This way, the Netherlands will continue to be one of the most important data hubs in the world

Although the Netherlands has excellent infrastructure, we are in fierce competition with other data hubs. Maintaining our position requires structural attention, investments and innovation. Better representation is crucial for attracting foreign investments.

Our digital mainport is promoted under the banner of 'Digital Gateway to Europe': the best global digital infrastructure and leading ecosystem. That way we can continue to compete with other countries.

**Promote the Netherlands as Digital Gateway to Europe**

Allocate structural funding and continous attention to digital connectivity in a broad sense; including fiber optics, sea cables, data centers, Internet Exchanges, security, cloud and hosting operators, innovation and education.

**Ensure a business-friendly climate for digital and tech companies**

Ensure that the Netherlands stays competitive regarding digital infrastructure legislation and operation costs such as energy prices and taxes. A good investment climate requires a well-considered, balanced and government-wide policy. Invest in technical & digital education and stimulate R&D and free movement of people.

**Acknowledge the importance of the industry**

The Dutch digital infrastructure plays a crucial role in the economy, but is largely out of sight of the government and the public. Support the industry by mapping the economic impact and importance of digital infrastructure for the Dutch economy. Integrate data centers and other digital infrastructure elements such as fiber fully into planning and zoning plans.

**Strengthen the digital ecosystem of the Netherlands**

The synergy of the strong digital ecosystem has a strong effect on the rest of our economy. Strengthen private-public cooperation to make sure that the digital infrastructure sector and its surrounding ecosystem optimally connect to each other and to societal demands.

"PROMOTE THE NETHERLANDS AS **DIGITAL GATEWAY TO EUROPE**"

# DIGITAL ECONOMY & DATA HUB: OUR REPORTS


**Publication "2019 Outlook Report"**

**January 2019**

This 2019 Outlook report was published at the Strategy and Networking Summit KickStart Europe 2019 on trends and investments in connectivity, cloud & data center, held on January 14-15 in Amsterdam.

The report provides an overview of the latest insights and trends regarding connectivity, cloud and data center. The report dives into key indicators and outlooks regarding the latest IT, business and infrastructure trends that are expected to have a strong impact in 2019 and beyond.

Theis annual report was initiated by Digital Gateway to Europe and co-produced by research partners Pb7 and CBRE.

**The publication "2019 Outlook Report" is freely accessible via www.dutchdatacenters.nl/publicaties**


**Publication "State of the Dutch Data Hub 2018"**
**December 2018**

The Dutch digital infrastructure plays a crucial role in the economy, but is largely out of sight of the government and the public. By mapping the direct, indirect and induced economic impact for the Dutch economy and its worldwide position as hub, the DDA aims to show the importance of allocation structural attention and funding to this crucial digital infrastructure.

In a continously changing world with Brexit, growing protectionism & data demand, the Netherlands' position as an European data processing and distribution country is stronger than ever:. Every year, we publish a report with the current state of the Dutch Data Hub. To show how the Netherlands is performing on certain key characteristics as digital mainport in this global -and compatitive! - world..

**The "State of the Dutch Data Hub 2018" is available for download via www.dutchdatacenters.nl/publicaties**

**Interested in learning more about our actions regarding Digital Economy & Data Hub?**

Contact Judith de Lange
Policy Officer on Digital Economy & Hub
Digital Gateway to Europe

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"DIGITAL INFRASTRUCTURE IS CRUCIAL FOR THE ECONOMY, BUT IS LARGELY **OUT OF SIGHT**"



# DIGITAL ECONOMY & DATA HUB: OUR KEY EVENT

The KickStart Europe Conference, focused on Infrastructure Investment, Strategy & Networking, will be held on January 27 & 28, 2020 in the RAI Amsterdam. The Summit focuses on the Data Center, Cloud, Connectivity ànd Edge ecosystems. The KickStart Europe conference right at the start of the year provides the latest trends and connections to the right investments in the European digital infrastructure. The summit gives the expected 1.000 attendees a great KickStart of 2020.

**KickStart Europe 2019**



"THE KICKSTART EUROPE SUMMIT HELPS TO STAY AHEAD **IN THE NEW YEAR**"

*"The world's top tech companies choose the Netherlands as the place to conquer Europe. They have very good reasons."*


# DIGITAL GATEWAY TO EUROPE

Digital Gateway to Europe

It is very hard to comprehend that the data hub did not exist 30 years ago. Since then, this industry grew with unprecedented pace. The recent announcements of large data center investments by Cyrus One and Google show the continuous growth of the industry and the positive environment the Netherlands is for such investments. Are we only getting started? The Digital economy is growing fast, IDC expects that in 2021 over 50% of the worlds GDP origins from the digital economy; more growth is coming!

**The Netherlands is connectivity capital**

In 30 years we now have a total of around 200 large data centers, 2 top 10 internet exchanges with AMS-IX and NL-IX, 71% of all Dutch data centers that are in the greater Amsterdam area, divided into 6 campuses - with many international focused regional data centers spread around. The center of gravity of data centers in the Netherlands has seen 18% average growth in the last 7 years. Next to that the Netherlands has 2 hyperscale campuses, Green Data Ports in Eemshaven in the North of the Netherlands and the North Amsterdam campus at Middenmeer. Impressive numbers for a country that is less than a third in size of New York State.

The Netherlands has a unique proposition being a large colocation hub and a hyperscale hub at the same time. For business-to-business-hyperscalers, this is the place to be. One of the reason why Microsoft has built its largest data center outside the US on the North Amsterdam campus. And why Google has been constantly building out their data center facility in Eemshaven. With the growth of Cloud, AI and Machine Learning, we will see more hyperscale growth combined with colocation growth around the Amsterdam hub, are both data center types are connected.

**Digital infrastructure**

The digital infrastructure is the combined fixed and mobile access networks, data centers, cloud & hosting providers, domain name registrars, internet exchanges, content delivery networks, etc.

Part of the digital infrastructure are international digital hubs, these are only present in a few countries around the world. These digital hubs are international intersections of connectivity and are the key commercial multi-tenant data center markets.

**'The third mainport'**

At the end of 2015 the Dutch parliament recognized the Digital Gateway as the third mainport of the Netherlands. 'Mainport' is a Dutch word meaning an intersection of major transport routes. 'Hub' is the English best equivalent. The motion submitted by member of parliament Kees Verhoeven (D66) stated that the Dutch government should develop an economic vision with the relevant stakeholders and implement this vision to strengthen the position of the digital hub. The adoption of the motion was an important milestone and great support for the Digital Gateway to Europe.

"THE NETHERLANDS HAS THE **LOWEST** AVERAGE **LATENCY** FOR DATA DISTRIBUTION **THROUGHOUT EUROPE**"

# DIGITAL INFRASTRUCTURE ASSOCIATION NL (DINL)

**The Netherlands is well-known for its outstanding digital infrastructure. To secure and improve this position, the Dutch Digital Infrastructure association (DINL) was founded in 2015. It acts as an umbrella organization of industry associations and organizations that belong to the core of the Dutch digital infrastructure.**

**The Netherlands is a digital gateway to Europe**
Only a few places in the world have the right mix of preconditions and ingredients to be successful as digital hub. The Netherlands is one of those: it has an extensive and flourishing digital ecosystem based on a strong and safe digital infrastructure. Add to this a workforce with a commercial spirit and international orientation, good physical accessibility, a stable political climate and access to capital for business, and all preconditions have been met for a thriving digital hub.

Our excellent connectivity with the rest of the world attracted a still rapidly growing data center industry, which facilitates a diverse and extensive hosting and cloud industry. Major brands such as Google, Microsoft and others built data centers here to serve the rest of Europe. In 2018, Google announced a major expansion, and other hyperscales are also in the process of expanding to the Netherlands.

**Maintain our position as a digital frontrunner**
DINL aims to foster public-private collaboration on issues concerning legislation and regulation, to decrease the gap between education and the job market for IT-professionals, and promote the Netherlands as a digital gateway to Europe.

There is still a lot of work to be done on the current issues on the digital infrastructure. The Dutch government could show more decisiveness when it comes to developing talent, securing growth opportunities for data centers and other infrastructure, and stimulating other preconditions that boost the digital hub. DINL aims for these preconditions to be safeguarded. Our positive digital ecosystem won't last without effort. All the conditions for our strong position need continuous reinforcement. By working together with the core of the Dutch digital infrastructure, DINL has a strong voice in the public debate. This way the whole sector is involved in maintaining and increasing our position as a digital frontrunner.

Stichting Digitale Infrastructuur Nederland

**The Dutch Digital Infrastructure Association** is committed to a solid development of the Netherlands as a junction in the international digital infrastructure. We are at the forefront of our digital economy and the sector has a great potential. The online sector is the Dutch digital mainport and thus creates hundreds of thousands of jobs and has a substantial share in our GDP.P.

DINL represents the parties that provide the facilities for the digital economy: data centers, hosting and cloud parties, Internet Service Providers, AMS-IX and SURF. DINL places the Netherlands on the map as an international digital node, guides governments, companies and citizens in the digital economy and shows the opportunities to strengthen the position of the digital mainport..

The DDA is a member of DINL and takes part in both the board and the executive team.

**Find more information on www.dinl.nl**

"ONLY A FEW PLACES IN THE WORLD HAVE THE RIGHT MIX OF PRECONDITIONS AND INGREDIENTS TO BE SUCCESSFUL AS DIGITAL HUB. **THE NETHERLANDS IS ONE OF THOSE**"



# ABOUT DIGITAL GATEWAY TO EUROPE

Digital Gateway to Europe

The Netherlands is the 'Digital Gateway to Europe'; it provides a springboard into the European (Digital) Single Market for digital and tech companies. The Dutch are innovative and multi-lingual and therefore serve as a great testmarket for new products. Digital Gateway to Europe is the organization promoting the Dutch Digital Data Hub, and that supports foreign companies to prepare launch or expansion in the Netherlands.

## By the industry, for the industry
We organize events such as trade missions, events, launchpads and other meet-ups to share information about the Dutch data hub. Scale-ups, start-ups and enterprises who would like more in-depth information regarding the Dutch digital economy can consult our Digital Gateway to Europe knowledge database.

## Knowledge database
Digital Gateway to Europe focuses on data hubs and the development of hyperscale and data center campuses. We regularly initiate research and write reports about data hubs. Find out more about the accessibility of large-scale Internet capacity, excellent business climate, privacy laws, net neutrality and many more reasons which make the Netherlands the preferred location for digital services and to distribute data.

## KickStart Europe
Digital Gateway to Europe organizes the Annual Strategy & Networking conference KickStart Europe, focused on bringing the digital infrastructure industry together to discuss trends in technology and investments.

## Stay up to date
Visit **www.digitalgateway.eu** for on our events, publications and upcoming missions. Stay up to date by subscribing to our newsletter online.


## Why the world's top tech companies choose the Netherlands

"IF IT'S A SUCCESS IN THE NETHERLANDS, IT'S A SUCCESS IN EUROPE"

# REGIONAL DEVELOPMENT PARTIES

The Netherlands is part of the European Single Market and complies to all uniform rules, which makes the country ideal for distribution of data and digital services to other countries. The Dutch have a pragmatic, long term orientation with the ability to adapt to changes. Forbes ranked the Netherlands #3 globally, below the UK and New-Zealand, as best country to do business when looking at taxes, investor protection and bureaucracy. There are many regional development agencies located in the Netherlands, that roll out the orange carpet for data centers and other digital and tech companies.

www.innovationquarter.nl

**INNOVATION QUARTER**
**Rotterdam & The Hague as Twin location for Amsterdam**

InnovationQuarter is the regional economic development agency for West Holland. Our mission is to strengthen the regional economy in West Holland by stimulating the innovation potential of this region. In close co-operation with major local corporations, educational and research institutions – like the Erasmus MC in Rotterdam, the Delft University of Technology and Leiden University – as well as government organizations, InnovationQuarter supports technological developments with social impact, encourages entrepreneurship and invests in fast-growing companies.

www.sadc.nl

**SCHIPHOL AREA DEVELOPMENT CORPORATION - SADC**
**Development of data center locations around the Schiphol Airport area**

SADC (Schiphol Area Development Company N.V.) develops high quality, accessible, (inter) nationally competitive business locations on the WESTAS logistics corridor in Amsterdam. SADC is undertaking action on three important course changers. The transition from a linear to a circular economy, the steadily increasing digitisation and its impact on how we work and live and the way businesses attempt to remain innovative and competitive. This is apparent from how businesses today are collaborating: increasingly across sectors and through business ecosystems.

investinholland.com

**NETHERLANDS FOREIGN INVESTMENT AGENCY**
**Rolls out the orange carpet for digital and tech companies investing in the Netherlands**

The NFIA is your One-Stop Shop for Success in the Netherlands. Whether you're considering locating in the Netherlands or have existing operations here, the Netherlands Foreign Investment Agency (NFIA) is prepared to assist your company at every stage of establishing or expanding operations here.



# REGIONAL DEVELOPMENT PARTIES

www.groningen-seaports.com

**DATA PORTS GRONINGEN**
**Groningen Eemshaven Data Port**

Dataport Eemshaven has all facilities needed to support a reliable data center operation. Dataport Eemshaven is located at Groningen. The energy abundance in Eemshaven is second to none in Europe: over 8,000 MW in a broad power mix is available at close range of the dedicated data center business park. The Eemshaven offers room to grow and the region has excellent connections with internet hubs in Amsterdam, Hamburg and the Danish region.

investinnhn.com

**DEVELOPMENT AGENCY NOORD-HOLLAND NOORD & AGRIPORT A7**
**Amsterdam North Data Center Campus - Agriport A7, Middenmeer**

NHN focuses on the economical structure of the north of North-Holland by acquiring companies and stimulating employment. A large influencer on the economic of the north of North-Holland is Agriport. Agriport is a logistical meeting point for agriculture and datacenters. Europe's largest high tech greenhouses are based at Agriport. In large scale greenhouses, like in datacenters, management of energy costs is the key to success. The first hyperscale datacenter is operational at Agriport since 2015. Two more plots of 70 hectares and 55 hectares are now available for datacenters in the Agriport area.


**For more insights into the North Amsterdam Data Center Campus, read our publication on the economic impact of the developments in Middenmeer in our report.**

Download the publication on www.digitalgateway.eu

"20% OF FOREIGN DIRECT INVESTMENTS IN THE NETHERLANDS ARE **CLOUD AND DATA CENTER RELATED**"

# THE NETHERLANDS: A LEADING DIGITAL COUNTRY

## MOST CONNECTED COUNTRY

The Netherlands is the most connected country in terms of cross-border flows of trade, capital, information and people.
***(Source: DHL Global Connectedness Index, 2019)***

## BEST COUNTRY FOR BUSINESS

Forbes ranked the Netherlands #3 globally, below the UK & New-Zealand as best country to do business. Focused on taxes, investor protection and red tape/bureaucracy.
***(Source: Forbes, 2018)***

## HIGHEST ENGLISH PROFICIENCY #2 IN THE WORLD

The Netherlands has the second rank on the new EF English Proficiency Index (EF EPI), when it comes to global workspace English skills.
***(Source: EF EPI, 2018)***

## BEST DIGITAL PERFORMANCE: #4 IN EUROPE

The Netherlands is ranked fourth on the Digital Economy and Society Index (DESI), that summarizes relevant indicators and tracks the evolution in digital competitiveness.
***(Source: European Commission 2017)***

## HIGHEST RATE OF HOUSEHOLD INTERNET ACCESS IN EUROPE

#1 in Europe with 98% of households having Internet Access The European average is 87%. Also in terms of high-speed broadband connectivity ranks the Netherlands at the top.
***(Source: Eurostat, 2017)***

## TOP 4 MOST COMPETITIVE COUNTRY

#4 in the world in competitivenes regarding infrastructure, health, education, goods market efficiency, technological readiness, buiness sophistication and innovation.
***(Source: World Economic Forum, 2018)***

## AMSTERDAM: BEST CITY TO WORK IN TECH

High salaries, a high standard of living, and a high chance of success help make Amsterdam the best city to work in tech in Europe.
***(Source: Hubspot, 2018)***

## FOREIGN INVESTMENTS ATTRACTIVENESS

The Netherlands ranks fifth in EY's Foreign Direct Investment (FDI) attractiveness, which shows the growth potential of a country.
***(Source: EY Attractiveness survey, 2017)***



# A GREAT COUNTRY FOR DATA CENTERS

## PERFECT CONNECTIVITY

The Netherlands has multiple submarine cable connections, extensive fiber infrastructure and Europe's lowest average latency

## PART OF EU SINGLE MARKET

Part of uniform EU-regulations such as GDPR; which makes the Netherlands ideal for distribution of data & digital service to other countries

## FAVORABLE CLIMATE

With ideal conditions (no hurricane or earthquake threats) and an average temperature of 50 °F (10 °C), the Dutch climate is ideal for data centers

## INTERNATIONAL MINDSET

Worldwide #1 in English Proficiency Index and home to 60% of IT companies of Forbes Global 2000, including Uber, Tesla, Elastic, Oracle and Netflix

## RELIABLE & AMPLE ENERGY

One of Europe's most reliable and stable power supply; with low industrial energy prices when compared to other tier-1 data center locations

## STABLE & LONG-TERM POLITICS

The Dutch have a pragmatic, long term orientation and are flexible to changes. The coalition system results in stable, predictable and moderate politics

## EXCELLENT ECOSYSTEM

Builders, suppliers, designers; we are home to all major names in the industry, such as Unica, ICTroom, Deerns, Stulz, Huawei, Socomec & Minkels

## SUPPORTED BY NETWORK

An active network of regional development agencies and the Netherlands Foreign Investment Agency results in rapid permit procedures and quick construction

# ABOUT

# DUTCH DATA CENTER ASSOCIATION

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

The DDA expresses industry views on regulatory and policy issues. It demonstrates leadership by facilitating and encouraging members to implement operational improvements in the form of best practices. The DDA promotes education and contributes to technical standards, which enables the data center industry in the Netherlands and abroad to further distinguish itself.

The DDA is one of the founders of the umbrella foundation Digitale Infrastructuur Nederland (DINL). DINL unites organizations that facilitate the digital infrastructure within the Netherlands. The DDA closely collaborates with Digital Gateway to Europe, which promotes the Netherlands as international data hub. The DDA also actively collaborates with market operators, the government and other interested parties.

**Board of Directors**

**Michiel Eielts**
Chairman
(Equinix)

**Eric Boonstra**
Secretary
(Iron Mountain)

**Michael van den Assem**
Treasurer (Interxion)

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**Eline Stuivenwold**
Policy Officer
Education &
Employment

**Judith de Lange**
Policy Officer
Digtal Economy &
Data Hub

**Erik Barentsen**
Sr. Policy Officer
Energy &
Sustainability

**Zoë Derksen**
Jr. Marketing &
Communication

**Nadja Sauer**
Intern

DUTCH DATA CENTER ASSOCIATION

**Dutch Data Center Association**
**Tel.:** +31 20 3037860
**Email:** info@dutchdatacenters.nl
**Website:** www.dutchdatacenters.nl

# DDA PARTICIPANTS

Schiphol-Rijk

www.atom86.net

Ede

www.bit.nl

Rotterdam & Groningen

www.bytesnet.nl

The Netherlands

www.cellnextelecom.nl

Amsterdam & Roosendaal

www.coltdatacentres.net/

Leeuwarden

www.dcf.frl

Zuidbroek

www.datacentergroningen.nl

Arnhem, Brabant, Rotterdam, Utrecht & Amsterdam

www.dataplace.eu

Amsterdam, Groningen, Hoofddorp & Schiphol

www.digitalrealty.com

Schiphol-Rijk

www.e-shelter.nl

Amsterdam

www.edgeconnex.com

Maastricht

www.engie-services.nl

Amsterdam, Enschede & Zwolle

www.equinix.nl

Gilze & Rijen

www.global-datacenter.nl

Amsterdam

www.globalswitch.nl

Eemshaven, Groningen

www.google.com/about/datacenters



# DDA PARTICIPANTS

Eindhoven & 's Hertogenbosch

www.interconnect.nl

Amsterdam & Schiphol-Rijk

www.interxion.com

Haarlem

www.ironmountain.com/digital-transformation

Apeldoorn & Deventer

www.itb2.nl

Almere

www.keppeldatacentres.com

Schiphol-Rijk

www.maincubes.com

Steenbergen

www.nedzone.nl

Amsterdam

www.nikhef.nl/housing

Aalsmeer, Almere, Eindhoven, Groningen, Rotterdam & Schiphol-Rijk

www.nl-dc.com

Hengelo

www.previder.com

Dronten & Meppel

www.serverius.net

Heerlen & Rotterdam

www.smartdc.net

Woerden

www.switchdatacenters.com

Venlo

systemec-datacenters.com

Amsterdam, Utrecht & Delft

www.thedatacentergroup.nl

Eemshaven & Groningen

www.qtsdatacenters.com

To become a member contact us at **info@dutchdatacenters.nl**

# DDA LEAD PARTNERS

www.socomec.nl

Founded in 1922, Socomec is an industrial group with a workforce of 3100 people. Our core business – the availability, control and safety of low voltage electrical networks with increased focus on our customers' power performance.

The Socomec Group's independence ensures control over its own decision making, respecting the values advocated by its own family shareholders and shared by its employees. With around 30 subsidiaries located on all five continents, Socomec pursues international development by targeting industrial and service applications where the quality of its expertise makes all the difference.

www.stulz-benelux.com

Customer focus, entrepreneurial spirit, and technological expertise – these have formed the basis for the successful growth of the STULZ Group for almost 70 years.

The amount of data in the world doubles approximately every 2 years. Therefore more data center are needed which must be air-conditioned. An efficient use of resources is required . Innovations from STULZ help to reduce the power consumption of data centers and other mission-critical applications.



# DDA LEAD PARTNERS

www.minkels.com/nl

Minkels is a knowledge-driven producer and worldwide supplier of high-quality solutions for data center infrastructure. The Minkels brand is part of the product portfolio of Legrand, a publicly traded company with worldwide sales in the low voltage installation, data network and data center markets. Legrand operates in more than 180 countries and achieved worldwide revenues of 5 billion euros in 2016.

Minkels products stand out for their innovativeness and flexibility. Customers can always be assured that they will get the very latest data center technology: modular solutions that respond to evolving, customer-specific business requirements.

www.eversheds-sutherland.com

Eversheds Sutherland (Netherlands) BV is a firm of legal advisors with offices in Amsterdam and Rotterdam. It is part of Eversheds Sutherland, an organization with 66 offices spread over 32 countries and more than 2.000 expert legal professionals.

The legal challenges facing data centers are unique, requiring a distinct blend of specialist legal advice and industry knowledge. For decades, Eversheds Sutherland has advised data center developers, owners, operators, funders, and enterprises. Its team of advisors is fully immersed in the sector, providing swift, commercial and cost-effective advice.

For more information, please visit **www.dutchdatacenters.nl/partners**

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# PB7 RESEARCH

Pb7 Research is an independent ICT research firm. We provide independent research and advice, aimed at the successful deployment of new technology in the European market, with a key focus on the Dutch market. Pb7 supports technology marketers and strategists by identifying and analyzing market and competitive opportunities and challenges, technology buyers in making well-informed decisions and we help policy makers with key statistics and market insights. Pb7 Research is a specialist in IT security, IT professional services, data center infrastructure and services, cloud, and other emerging technologies.

## Research methodology

The research is based on desk research and two short anonymous surveys among data center decision makers among the members of the Dutch Data Center Association. The DDA has 30 members who represent 84% of the Dutch multi-tenant data center market in terms of square meters data floor. 24 of the members completed the survey about growth, sustainability, and the impact of "edge". Earlier this year, we (Pb7 Research and the DDA) also completed a survey on labor market challenges. Some of the outcomes are used as well. The desk research has focused on mapping individual multitenant and single tenant data centers. For this purpose, Pb7 Research used publicly available sources and online searches.

After identifying the multi-tenant data centers, we check the current status via every individual website and do a double check based on addresses. We remove data centers that went out of business, have changed owner, other double counts, or no longer offer colocation (from a proprietary data center) and add data center locations that were not listed in other sources. For a limited number of data centers we had to estimate the net floor space as there was only information about the number of racks (1 per 2 m2) or the gross surface.

While the overview of data center space per location was complete, we had information about the power capacity (MW) and the PUE for about 40% of the multi-tenant data centers and a small group of single tenant data centers. By calculating the averages per m2, we quantified the total capacity for multi-tenant data centers. The total capacity for single tenant data centers required more modelling and estimates for especially small data centers.


### Pb7 Research

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**Tel.:** +31 657 585 156
**E-mail:** peter@Pb7.nl
**Website:** www.Pb7.nl




# CBRE DATA CENTER SOLUTIONS

CBRE formed a special Data Center team in 1994 to address the specialized technical real estate needs of high-tech firms such as telecommunications companies, data center operators and corporates.

**Core technical real estate services provided by the CBRE Data Center Solutions team include:**

- Acquisition – One-off assignments, worldwide network rollouts
- Disposal – One-off assignments, multi-site marketing campaigns
- Investment
- Consultancy – Consolidation strategies, mergers & acquisitions
- Asset valuation – Bank, corporate
- Project management, development monitoring, due diligence, building and M&E surveys
- Research – Market reports, statistics, take-up forecasting

## Data center research

CBRE quarterly Europe Data Centers Marketview identifies data center supply, take up, demand and availability and forecasts the next quarter's outlook. It provides an industry-leading analysis of the data center colocation in Europe.

The research relates only to the four largest European carrier neutral colocation markets of London, Frankfurt, Amsterdam and Paris. Accurately capturing the dynamics of all the categories of the data center market is very difficult, especially when attempting to analyse vacancy within standalone carrier, web-hosting and IT outsource data center facilities. The carrier neutral market caters for the full range of user/operator requirements so it is the best indicator of the underlying conditions in the data center market.

## Disclaimer




### CBRE Data Center solutions

**Contact:** Mitul Patel, Associate Director
**Tel.:** +44 20 3257 6669
**E-mail:** mitul.patel@cbre.com
**Website:** www.cbre.com

# OUR EVENTS

After successful previous editions, the Dutch Data Center Association organizes the third edition of the Residual Heat & Innovation Data Center on October 10, 2019, previously known as Sustainability Day. It is thé knowledge platform for industry, government and operators focused on the effective use of residual heat from data centers to promote the energy transition.

**Data Center Residual Heat & Innovation Congress**
The congress brings visitors from various backgrounds together, including data centers, policy makers, real estate professionals, heat and energy companies, engineers, suppliers and financiers. The first edition in 2017 led to the launch of various residual heat projects and the 2018 congress also led to great initiatives, including the submission of the motion to classify residual heat data center as "renewable energy". This has ensured that an important threshold has been removed to reuse the heat and is an additional trigger to invest in new infrastructure.

**Meet other experts**
For this residual heat and innovation conference, we are again trying to further accelerate efforts and introduce new innovations to the market. Therefore we work together with all experts on data center energy & sustainability and bring them all to the conference, so knowledge can be shared. The 2019-edition promises to be very busy, with around 300 attendees with a wide variety of expertise. More information will be shared soon via our website.

"THE DATA CENTER RESIDUAL HEAT & INNOVATION SUMMIT BRINGS ALL **EXPERTS ON DATA CENTER ENERGY & SUSTAINABILITY** TOGETHER"


**Data center Residual Heat Awards 2018**

DDA organized a contest that focuses on students in engineering and sustainability. The assignment was to come up with an idea to reuse data center residual heat in a smart way. Another way to enthuse Dutch students to consider the data center industry as an innovative career path.

Hugo Kooymans (Best Practice) & Tim Ruijs (Most innovative idea) where the winners. The jury consisted of the DDA, Heijmans, GreenVis, NLDC Data centers and the Hogeschool van Amsterdam.

**Read more about the Data Center Residual Heat Awards via www.dutchdatacenters.nl/studenten-denken-mee-groene-stroom-en-hergebruik-restwarmte-datacenters**

For more information, please visit **www.dutchdatacenters.nl/event/datacenter-restwarmte-innovatie-2019**



# OUR EVENTS

On January 27 and 28, 2020, Digital Gateway to Europe will organise the annual KickStart Europe Conference 2020 on trends & investments in connectivity, data center and cloud. Developers, financiers, designers, constructors, investors and the European digital industry meet each other in Amsterdam for a great start of 2020

**KickStart Europe 2020 Amsterdam Conference on January 27 & 28, 2019**

KickStart Europe 2020 is about the latest trends and investments in technology and digital infrastructure. Keynote speakers will kick-off the event in the morning, and share their vision on strategies, trends and latest developments in the digital infrastructure industry of cloud, connectivity and data centers.

The event further focuses on the latest updates and expectations in the connectivity, cloud and data center market. Leading analysts will talk about tech and digital infrastructure investments and trends.

**Meet the industry**
During this event, there is ample opportunity to meet, speak and get introduced to key players in the European digital industry. Meet new potential business partners and catch up with existing contacts during the event and at the network drinks afterwards.
The KickStart Europe 2020 event offers great opportunities to set up meetings with potential business partners, experts and relevant operators and investors.

"KICKSTART EUROPE PROVIDES A VENUE FOR **THOUGHT LEADERS FROM THE DIGITAL INFRASTRUCTURE** INDUSTRY"

**KickStart Europe 2020 Partner Program**

Interested in becoming a partner for KickStart Europe 2020?

As partner, you receive prominent visibility to the 1.000 C-level attendees with a focus on European data center, cloud & connectivity

As partner, you are provided with excellent network opportunities at the conference via your own branded private meeting lounge

**For more details, reach out to Judith de Lange via info@kickstartconf.eu or call us directly at 0031203037860**

For more information, please visit **www.kickstartconf.eu**

# OUR LATEST PUBLICATIONS


### 2019 Data Center Guide (in Dutch)

A full overview of all the DDA data center participants with a full descriptions of their services, location and size.
Download via **www.dutchdatacenters.nl/publicaties/datacenter-gids-2019**


### 2019 Data Centers & Employment (in Dutch)

This report shows research on the data center employment and maps the development and career opportunities within the industry..
Download via **www.dutchdatacenters.nl/publicaties/datacenters-werkgelegenheid-2019**


### 2019 Outlook report

This report was published and handed out at the KickStart Europe Conference 2019 and provides an overview of the latest insights and trends regarding connectivity, cloud and data center.
Download via **www.dutchdatacenters.nl/publicaties/outlook-rapport-2019**


### 2018 State of the Dutch Data Hub

To show how the Netherlands is performing on certain key characteristics as digital mainport in this global -and compatitive! - world., this annual report shows the current state of the Dutch Data Hub.
Download via **www.dutchdatacenters.nl/publicaties/state-dutch-data-hub-2018**


### 2018 Data Center Residual Heat & Innovation (in Dutch)

Following the Residual Heat Congress of 2018, we published this report, based entirely on concrete practical cases, some of which were explained during the congress
Download via **www.dutchdatacenters.nl/publicaties/datacenter-restwarmte-innovatie-2018**


### 2018 North Amsterdam Data Center Campus: Economic Impact Study

Commissioned by the Noord-Hollland North region, we calculated the impact of the North Amsterdam data center campus (known as Middenmeer) on the Dutch economy.
Download via **www.dutchdatacenters.nl/publicaties/north-amsterdam-dc-campus**

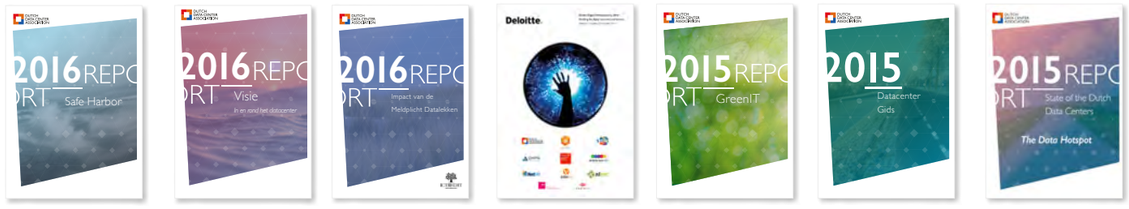
Download the free reports at **www.dutchdatacenters.nl/publicaties**



# OUR OTHER PUBLICATIONS








Download the free reports at **www.dutchdatacenters.nl/publicaties**

# OTHER PUBLICATIONS

## Digital Gateway reports

Download via **www.digitalgateway.eu/knowledge-db**


## KickStart Europe Outlook reports

Download via **www.kickstartconf.eu**


Download the free reports at **www.digitalgateway.eu/knowledge-db**

More information:
www.dutchdatacenters.nl

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