Google + Deloitte.

Data Centres Impact Report

THE NETHERLANDS

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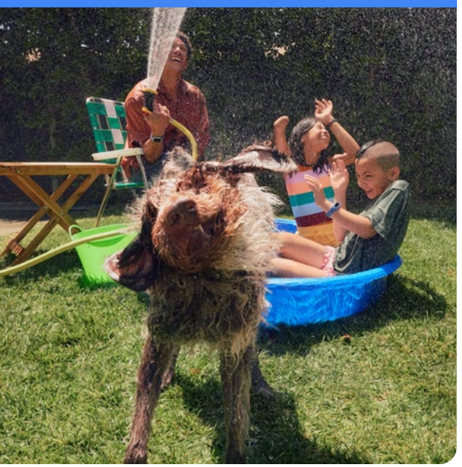
Executive summary

Data centres are at the core of the transformation to a digital economy. They enable a growing number of industries to make quick, information-driven decisions and provide products and services to their stakeholders securely and reliably. Google's data centres are part of this ecosystem, with an owned and operated network of over 25 data centre locations around the world. Each location has been strategically chosen based on considerations such as: land availability, infrastructure, talent, and the opportunity for impact to meet the requirements of the world's increasing digital needs.

As Google seeks to drive positive change in the communities where it operates, learning more about the impacts its data centres have had in the Netherlands became a priority. To do this, Google engaged Deloitte in 2023 to quantify the economic, social, and environmental impacts that Google data centres have had in Middenmeer and Eemshaven. This report presents the impact across those three dimensions for the period of 2017-2022. The objective of this report is to be as transparent as possible about the data centre impacts. In cases where some data was not included, it is due to regulatory, competitive, or data quality considerations. As the ability to do so changes, future impact assessments will reflect Google's capability to share additional information.

Economic impact

From 2017-2022, annually, Google added ~€1.7 billion to the Gross Domestic Product (GDP) of the Netherlands through direct, indirect, and induced contributions and ~€345 million in direct, indirect and induced contributions to labour income. During the same time period, Google's operations in the Netherlands supported ~7,250 direct, indirect and induced jobs.



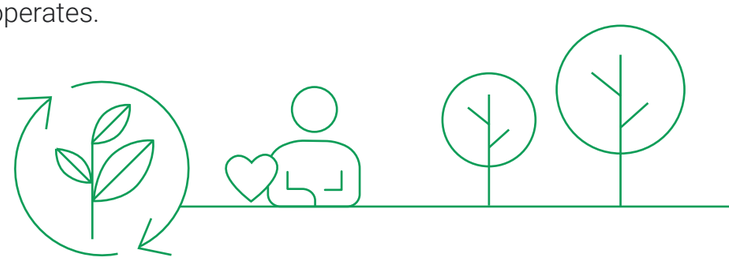
Social advancement

Google aims to improve the lives of as many people as possible – including people working at Google through employee well-being measures and for people around Google, through supporting local education and other programs. Between 2017 and 2022, Google.org awarded €6.1 million in grants to Dutch communities to help strengthen STEM ("Science, Technology, Engineering, Mathematics") education and vocational programs, provide employment training for refugees, and offer COVID-19 support to small businesses.

Environmental sustainability

At its data centres, Google is working to maximize energy efficiency and reduce the use of water. Google acknowledges the potential impact it has on its surrounding environment—namely through energy usage, greenhouse gas emissions, water, waste, land, and biodiversity — and works to mitigate this impact. To this end, Google is an offtaker of several carbon-free energy projects in the Netherlands through power purchase agreements (PPAs), enabling the delivery of over 125 MW (megawatts) of carbon-free capacity from 2017-2022. It has set a target that by 2030, Google data centres globally aim to run on 24/7 carbon-free energy. Additionally, Google invested €45 million in Eemshaven to develop a new industrial water pipeline in partnership with North Water to eliminate the use of groundwater for cooling and aims to replenish 120% of freshwater volume it consumes on average by 2030 each year.

Through this report, Google has a more comprehensive understanding of the economic, social, and environmental impact it has had in the Netherlands, including the matters most important to its stakeholders. Moving forward, Google will take these learnings to continue finding ways to channel its economic impact locally, minimizing its environmental impact through optimizing water and energy, and engaging with local stakeholders - all in support of continuing to make an impact on the communities in which it operates.



Google data centres:
Keeping the internet secure & sustainable

By driving local economic development, fostering thriving communities, and spurring environmental stewardship.
In the Netherlands, from 2017-2022, Google data centres (DCs) impacted the community through:

Economic impacts

Support economic wellbeing through jobs, GDP, labor income and productivity.

+€1.7B Generated per year in direct, indirect, induced impacts as measured **by GDP**

€345M added to labor income**

Google's operations supported **7250 jobs†**

Social advancement

Create strong relationships in communities where it operates and contribute to a higher quality of life for those residents.

Between 2017-22 the following was given **€6.1M** in grants to Netherland communities for:

STEM education

Employment training within the community

COVID-19 support to small businesses

Environmental sustainability

Reduce the demand for finite resources and serve as a catalyst for the transition to sustainable business growth.

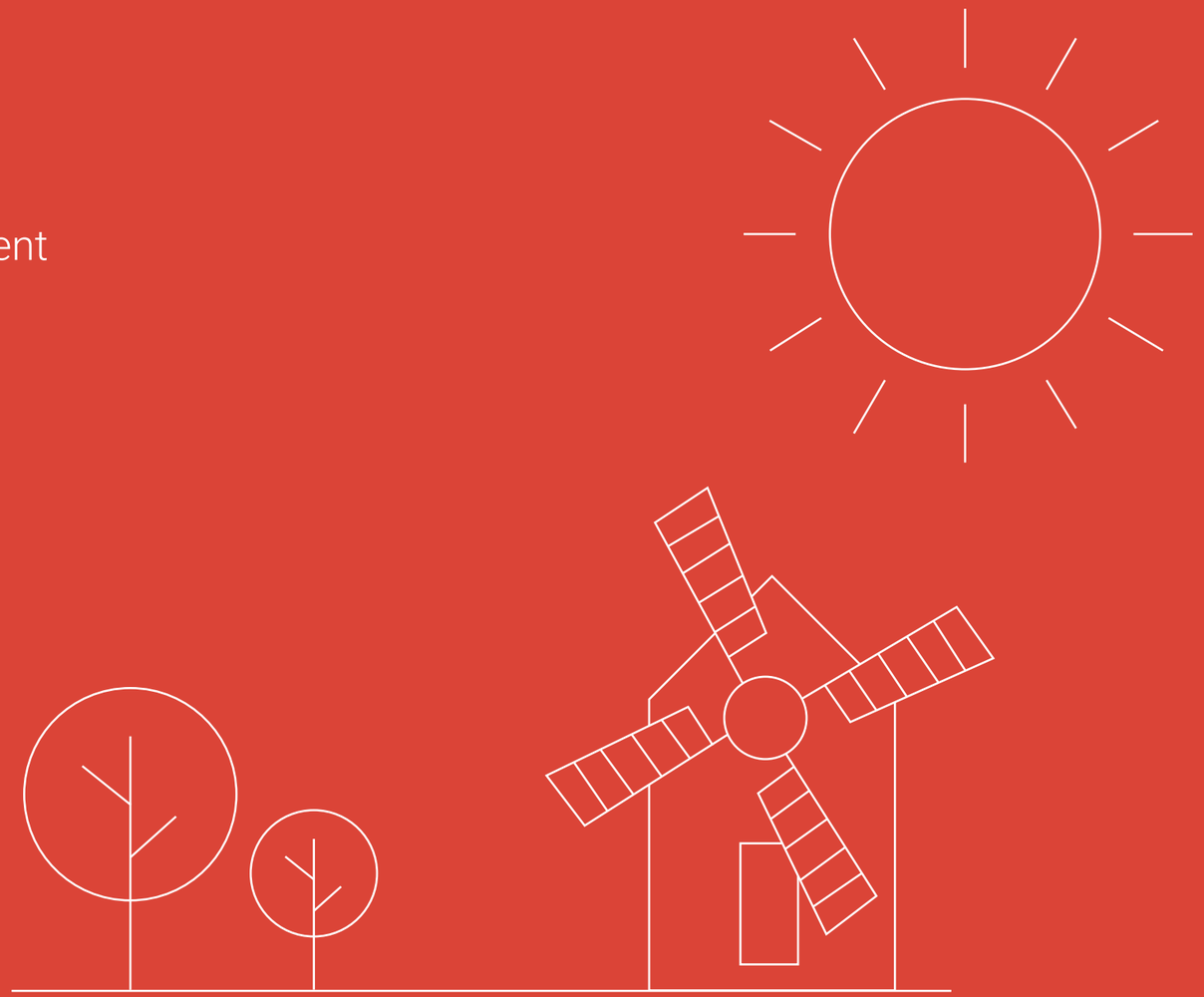
Energy Google data centres are 1.5x more energy efficient and deliver 3x more computing power per unit of electrical power*

100% zero-carbon **By 2030,** data centres will run on 24/7 carbon-free energy

By 2030, Google has pledged to replenish 120% of freshwater used annually, on average, across all offices and data centres globally

FOOTNOTE:
*As of 2022, Google's data centres globally are, on average, 1.5 times as energy efficient as a typical enterprise data centre and compared to five years ago, they now deliver approximately three times as much computing power per unit of electrical power. ** Includes direct, indirect and induced labor income. † Includes, direct, indirect and induced jobs.

Introduction



INTRODUCTION

An introduction to data centres

Where does the internet live?

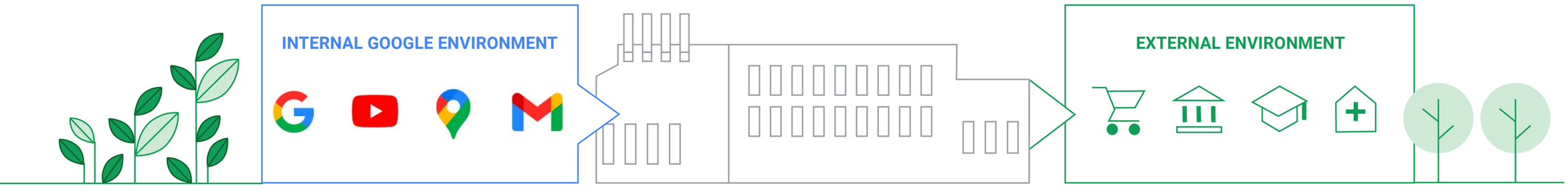
We use data every day when we do things like pull up a map to a new restaurant, attend online classes, stream favourite TV shows, or subscribe for online services. The demand for internet-based services just keeps growing – and as it grows, so does the need to store and safeguard enormous quantities of digital information.

Data centres (DCs) are the global hubs of the internet's connectivity, digital activity, and secure storage. They are where the internet lives. Google's global network of data centres is designed to do this work. Google distributes all the data under its care – including its own – across many computers in different locations. This helps Google keep data safe, and makes it possible to deliver information to users in a fraction of a second, using fiber and internet connections.

Artificial Intelligence (AI) and Machine Learning (ML) contribute to the reliability of Google's data infrastructure and its ongoing innovation.

Google's Netherlands data centres securely store data from Cloud customers, ensuring the safety and performance of their web applications. These data centres also play a role in serving everyday user needs, like running Google search and streaming YouTube videos.

In other words: Google's network of data centres is the heart of Google's services – services that are used every day by people all over the world.



What is a data centre?

A data centre is a facility with many computers that store and process large amounts of information. Whenever a person accesses Gmail, edits a document, or searches for information on Google, they are using Google's data centres and have the power of a supercomputer at their fingertips. Data centres require different types of supporting infrastructure – including power systems, backup generators, water cooling systems, security facilities, warehouse buildings and office space – that work together to achieve a common goal.

Data centre buildings can be as large as dozens of football fields put together. They host servers that are stacked in racks up to the ceiling. These servers are what make the data centre go, and Google employs the highest security standards (see footnote) for protecting these machines and the sensitive data they hold.

Google's network of enterprise data centres benefit from economies of scale, enabling a favourable ratio of data storage capabilities per kilowatt hour of energy and litres of water that outperforms industry averages. According to the Dutch Data Center Association, "Hyperscalers are gigantic single-tenant data centres, built by and for globally operating internet companies". Enterprise data centres also make sure that computations and data processing are evenly distributed across the data centre network, which allows them to scale computing power and adapt to client needs more quickly.

FOOTNOTE: Google Cloud remains compliant with EU privacy legislation, offering Model Contract Clauses (MCCs) in alignment with The European Commission's MCCs. Google continues to hold certification against internationally-recognised privacy standards including ISO 27018 and ISO 27701. (read more).

Google data centres have impacts beyond the efficient delivery of data security, adaptability, and connectivity. The internet lives in the physical infrastructure of data centre campuses – and these campuses live within local communities. This report covers the ways Google's data centres in the Netherlands impact the environment and the people who live in it, and marks a step towards Google's ongoing practice of accountability and transparency.

Google data centres
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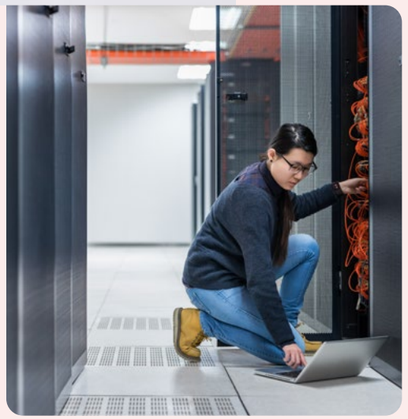


INTRODUCTION

Google in the Netherlands

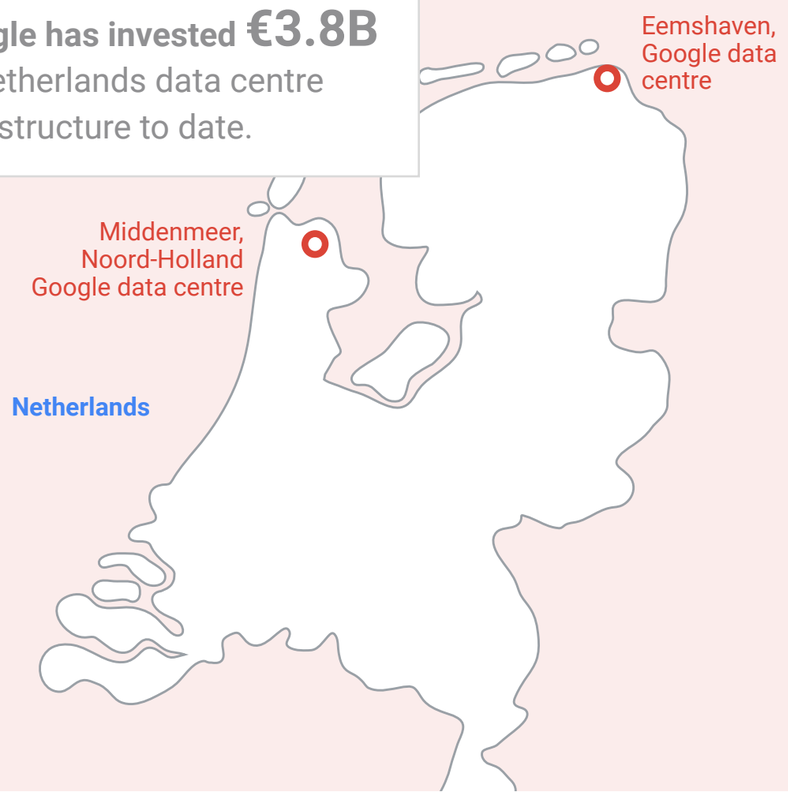
Google opened its first office in the Netherlands (NL) in 2002. Since then, Google has expanded its footprint, including developing two data centre locations – a facility in Eemshaven, Groningen and one in Middenmeer, Noord-Holland.

Google has invested €3.8 billion in Netherlands data centre infrastructure to date. The investment over a number of years includes the initial €600 million investment to open the Eemshaven data centre in 2016, two subsequent expansions in 2018 and 2019, and a €500 million investment to open the Middenmeer data centre in 2020, showing a commitment to investment in the Netherlands.

Eemshaven and Middenmeer are strategic investment locations for Google because of their energy infrastructure, developable land, and available workforce.

From 2017 to 2022, Google has significantly increased its activity in building and operating digital infrastructure in the Netherlands. The Dutch Digitalization Strategy (2021) specifies AI, data-use and sharing, digital skills and inclusion, connectivity, and resilience as key focus areas. Moreover, Google is also an offtaker of clean energy. Renewable energy procurement contributes towards two national environmental commitments including the 2019 government goal to be completely gas-free by 2050 and the 2022 commitment to reduce carbon emissions by 55% (from 1990) by 2030.

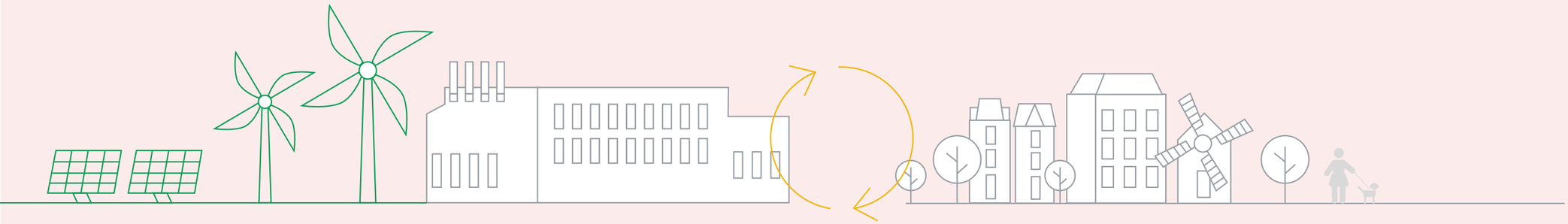
Google has invested €3.8B in Netherlands data centre infrastructure to date.

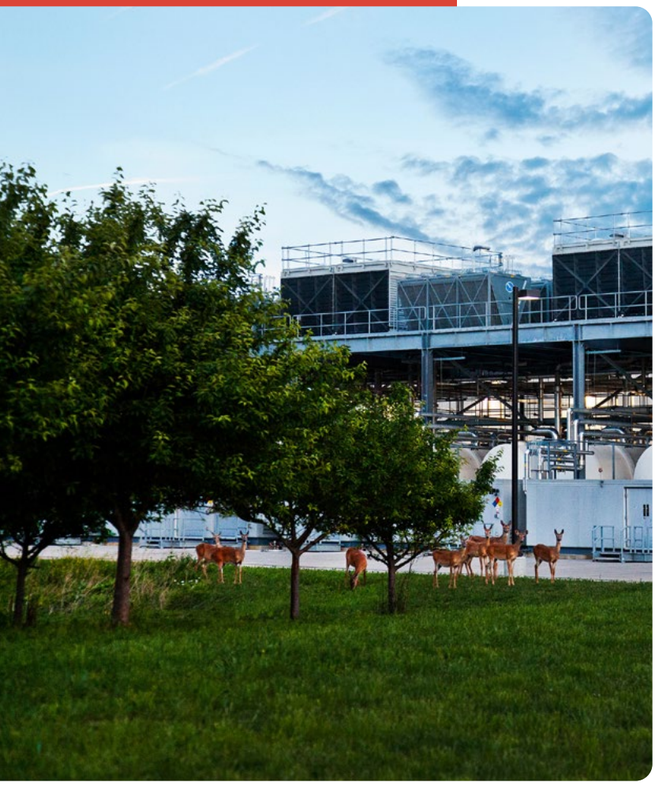


The key activities include:

- Investment in technical infrastructure: Google has made investments in construction, leasehold improvements, electrical equipment, servers and land. These investments are aimed at supporting the expansion of data centres to meet the fast-growing demand for reliable, efficient and sovereign cloud and advanced computing.
- Employment of personnel: Google has hired employees in the Netherlands to manage and operate the technical infrastructure. This includes network, electrical, hardware and software engineers, as well as supply chain managers and administrators.
- Expenditures on vendors and subcontractors: Apart from wages, Google has hired vendors and subcontractors who assist in constructing and operating the technical infrastructure.
- Renewable energy purchase: Google has procured renewable energy from projects including those developed by Kronos Solar EDPR and Eneco in the Netherlands for its operations, thereby contributing to a more sustainable energy footprint.
- Community grants: Google has provided community grants to support initiatives such as upskilling the the Netherlands workforce and promoting education.

These activities reflect Google's commitment to expanding both digital and physical infra–structure in the Netherlands while considering sustainability, workforce development, education and community support.



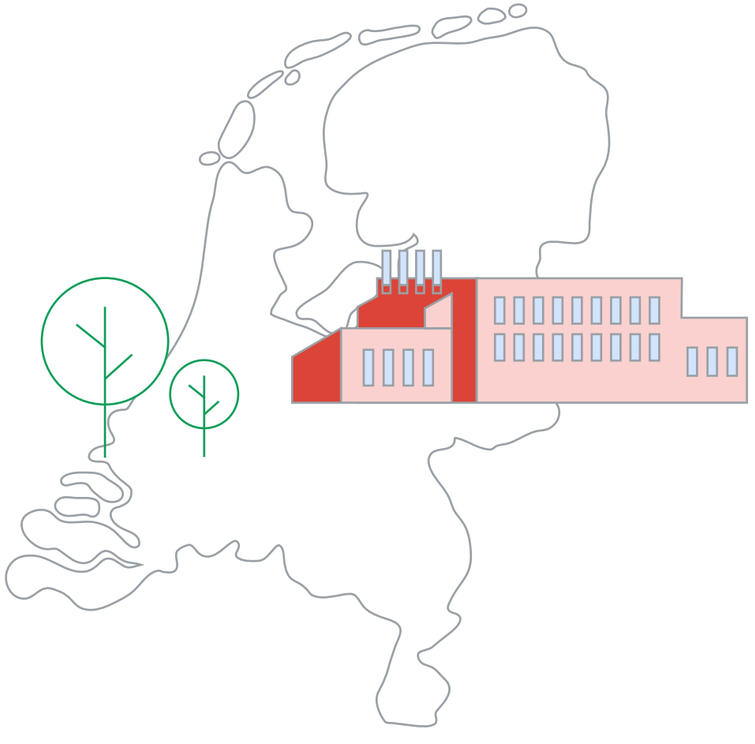


INTRODUCTION

External business environment

One of the top trading nations, the Netherlands uses its advanced infrastructure to move goods, people, and data around the world through Europe's largest port and fourth-largest cargo airport, Rotterdam and Schiphol. In addition, it is one of Europe's primary internet hubs with highly connected network infrastructure. It is home to one of the largest Internet Exchanges (a centralized hub for internet traffic for a geographic region) known in the world as the Amsterdam Internet Exchange (AMS-IX). It is highly connected by fiber optic networks and undersea cables that reach the eastern seaboard of the United States, London, and other major cities across the Atlantic. The Netherlands also has a thriving digital economy, which requires data centres. In 2017, the digital economy amounted to 29% of the Dutch GDP. Moreover, the Netherlands has a high internet literacy rate of >90%, with 9/10 Dutch people ages 16-75 using the internet daily, and >80% of Dutch companies with >250 employees using cloud services. There are 299 data centres and 1020 service providers in the Netherlands, the majority of which are colocation facilities located in and around Amsterdam.

In light of the rapid expansion of data centres, the government of the Netherlands has adopted general policies to ensure that data centres are limited to specific locations. Locations on the coast like Eemshaven and Middenmeer are positioned to meet these requirements. At these locations, energy demands can be met sustainably, residual heating can be supplied to district heating, land is not scarce relative to other locations, and the data centres meet the market requirement for digital connectivity.



Google's theory of change

GOOGLE DATA CENTRE THEORY OF CHANGE

Google's data centre guiding principle

Keep digital infrastructure secure and sustainable while driving local economic development, fostering thriving communities, and spurring environmental stewardship

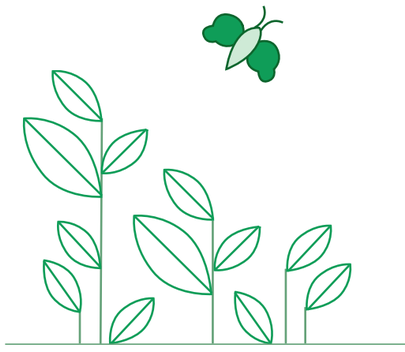
Data centres play an important role in Google's corporate mission to organise the world's information and make it universally accessible and useful. To achieve its mission, Google takes a three-part approach to driving positive change in the communities where its data centres operate.

Economic development: Google seeks to make positive contributions to the communities that host its DCs by working to improve the economic conditions of its employees and suppliers, offering grants, and making investments in local businesses and infrastructure.

Social advancement: Google aims to support higher quality of life in the communities near its DCs by providing high-paying jobs, grants, and educational programming to community members.

Environmental sustainability: Google works to maximize its energy efficiency and reduce water use by investing in energy efficient operations, clean power, and site selection.

These three areas of community development work are interconnected, and the impacts made across each towards community wellbeing must be driven by a cascaded approach from action (e.g., digital upskilling programs), to output (e.g., increased technical abilities in the workforce), to outcome (e.g., increased employability in the workforce).



GOOGLE DATA CENTRE THEORY OF CHANGE

Prioritized topics from stakeholder interviews

This report delves into economic, social, and environmental topics of high importance to stakeholders in the Netherlands. By identifying areas of focus according to the values expressed by stakeholders, Google will be able to identify which topics are most important to those stakeholders and reflect unique needs and concerns of individual data centre communities.

During 10 semi-guided interviews, participants were asked to assess 13 topics that were deemed relevant to Google's business activities and indicate which they considered most important for Google to consider. Interviewees included trade associations, municipality and state development authorities, universities, public policy makers, educators, and NGOs. Internal stakeholders from teams within Google – such as Energy, Operations, Sustainability, Site Selection, and Public Policy – were also interviewed.

In the course of these stakeholder interviews, the following topics emerged as areas of interest for this report:

Economic: Stakeholders prioritized the impact of data centres on local business as the most important topic, followed by the data centres' impact on employment. Tax contribution by data centres was a lower priority compared to the other two topics mentioned. This could be driven by the fact that while communities are able to observe the effect on jobs and businesses first-hand, benefits from tax contributions take a while to trickle down to the community and are not immediately visible.

Social: Stakeholders prioritized data privacy and cybersecurity as the most important impact of data centres. They also prioritized diversity and inclusion, health and wellbeing and education. This report extensively covers Google's impact across all these social topics.

Environmental: Stakeholders prioritized greenhouse gas emissions as the most important environmental topic for DCs, followed closely by the impact of energy and water use. Stakeholders also expressed concerns around data centres and windmills being visually unappealing in the midst of farmlands.

Due to the anonymized nature of these interviews, the directional information about which topics are important to stakeholders reflect broad views on data centres and the data centre industry in general, while some are specific to Google as a data centre owner and operator.

Keep digital infrastructure secure and sustainable

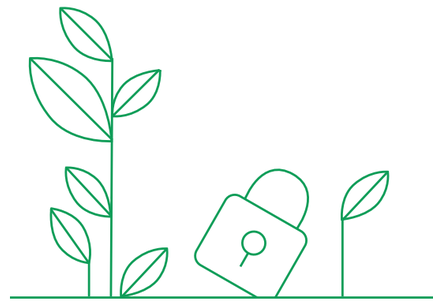
KEEP DIGITAL INFRASTRUCTURE SECURE AND SUSTAINABLE

Google's economic, social, and environmental data centre impacts to the Netherlands

This report provides an overview of how Google's actions are aligned with its work addressing the economic, social, and environmental concerns and priorities for DCs. The first section offers an overview of Google's contributions to the economy in the Netherlands. The second section outlines how Google is prioritizing its people, both internally and externally. The third section examines Google's relationship to the environment, including energy use, emissions and water.

Google's contributions to the local economy

The Netherlands has been referred to as the "Digital Gateway to Europe" because of its robust digital infrastructure and significant usage of fiber optics, sea cables, and online services. Despite the data centre and cloud industry being the fastest growing sector in the Netherlands, as an industry it is still not recognised by traditional economic measurements. For example, the Dutch Central Bureau of Statistics does not map data centres as a unique sector due to lack of correct SBI (standard business) sector codes.



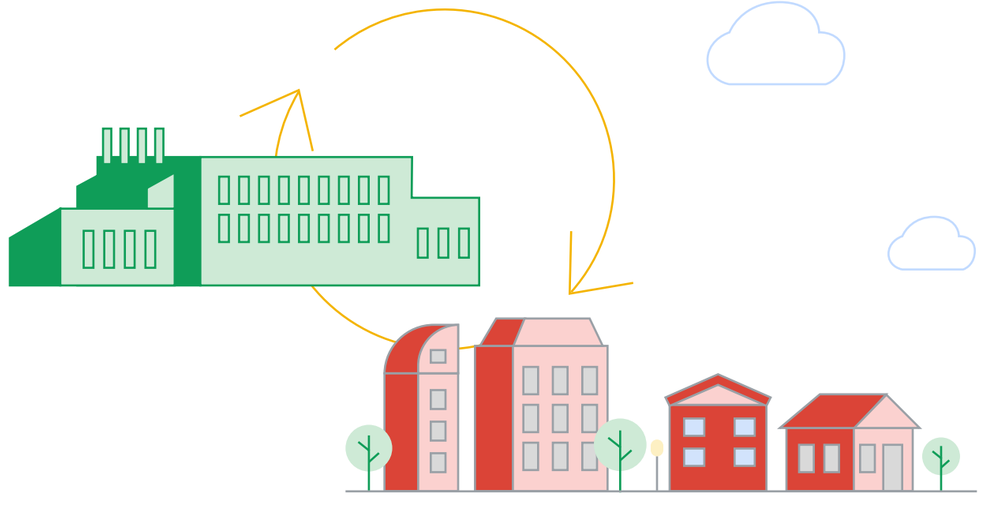
The Netherlands' digital competitiveness is a significant factor in the country's overall economic competitiveness. Sectors like agriculture and chemicals processing depend on digital capabilities to evolve to meet the rising standards of productivity and efficiency. These sectors, among many others, have traditionally operated manually but are increasingly relying on data and data centres to power their operations and growth through technologies like automation. Through increased economic activity, holistic impacts on employment, contributions to the public budget, and the support of local businesses, Google has continued to collaborate with the Netherlands to enable its digital transformation.

Google creates economic opportunity throughout the Netherlands, not only through its contributions to the technology sector and the indirect ripple effects of this work on the local economy. For example, Google supports technology advancements by housing them in its data centres, and by patronizing businesses in other sectors, such as construction, manufacturing, or IT equipment resale – all of which contributes to the local economy.

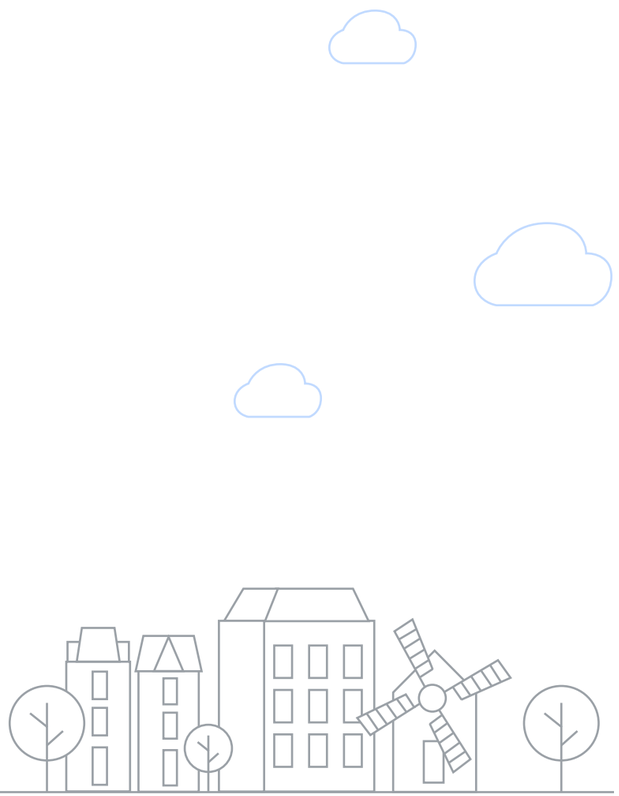
In the Netherlands, Google also operates warehouses in three cities that employ over 700 vendors and contractors and add to its position as a hub for trade and inventory management. Overall, Google's data centres in the Netherlands positively impact the economic wellbeing of the country.

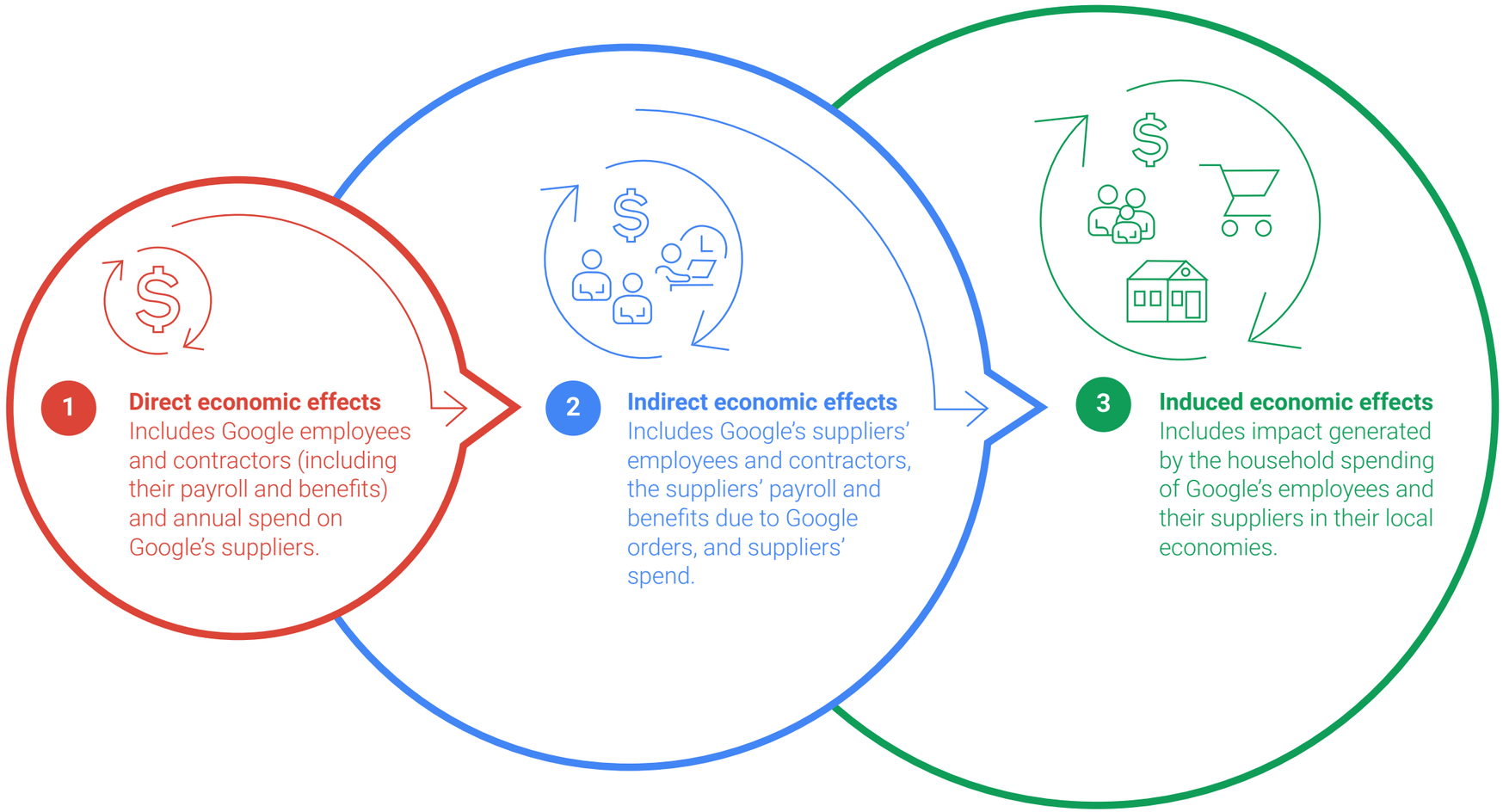
Contribution to the Netherlands' GDP: direct, indirect, and induced impact

Data centres necessitate the use of land, highly specialized equipment, servers, and buildings; not to mention the ongoing expenditures that



must be made on maintenance and repair, staffing, equipment upgrades, energy, and retaining highly qualified employees. Since the local market offers a limited range of electrical equipment needed for data centre operations, this equipment has primarily been purchased outside of the Netherlands. As a result, part of the impacts on GDP and employment are to be attributed to other countries responsible for the production of this equipment.





1 **Direct economic effects**
Includes Google employees and contractors (including their payroll and benefits) and annual spend on Google's suppliers.

2 **Indirect economic effects**
Includes Google's suppliers' employees and contractors, the suppliers' payroll and benefits due to Google orders, and suppliers' spend.

3 **Induced economic effects**
Includes impact generated by the household spending of Google's employees and their suppliers in their local economies.

> "The Eemshaven has been of serious economic value to the Netherlands and the region over the last fifteen years, with one success after another. The highlight was the construction of the Google data centre."
>
> - Anne M. Kress, *Director of Groningen Seaports from 2001-2017*

Between 2017 and 2022, Google's data centre investments in the Netherlands generated an average of ~€840 million per year in direct, ~€700 million in indirect, and ~€200 million in induced economic impacts, as measured by GDP— ~€1.7 billion on average in total per year and ~€2.6 billion in total in the most recent year of study, 2022. The direct economic impacts of these investments measure the contributions to the Dutch economy – in terms of GDP contribution – caused by Google's total investment in data centres in the Netherlands. Indirect economic impact includes spending by Google's suppliers and contractors, and their employees, as the result of Google's construction and operation of data centres. For example, a construction company contracted by Google for a building upgrade will generate, in addition to a direct effect, an indirect economic impact. Induced effects are generated by the household spending of Google's employees and their suppliers in their local economies. Overall, Google's DC construction and operations had the highest economic impact on the construction sector, followed by the electricity, gas, steam and air conditioning supply sectors.

Direct and indirect impact on employment

Between 2017 and 2022, Google's investments and ongoing operations in the Netherlands supported a yearly average of ~410 direct jobs – which includes Google data centre employees, temporary workers, full-time vendors and contractors, ~5,800 indirect jobs – jobs created by Google's suppliers and contractors, and ~1,020 induced jobs – jobs created through household spending of direct and indirect employees. Yearly values vary based on construction and other large capital projects and includes ~670 direct jobs supported in the most recent year of study, 2022. Additionally, associated employee compensation amounted to a yearly total average of a ~€345 million impact on labor income (~€30 million direct, ~€275 million indirect and ~€40 million induced).

FOOTNOTE: The GDP contributions above are represented in terms of nominal values, and no adjustments for inflation have been made.

During the pandemic, beauty salon owner Yvonne Last used Groei mit Google's online workshops to help promote her online visibility. "I started making product videos for social media, which led to more orders. But I had no idea about the possibilities that Google offers to improve the performance of your website." Google paired Yvonne with a personal coach, Lisa, to showcase the salon's full range of treatment and products and move the business higher in online local search results.

Impact on taxes and public budget

Income from taxes provides the Dutch government with funds to provide essential services – such as education, healthcare, capital improvements, public safety, parks, and recreation and culture – to its citizens. From 2017-2022, Google contributed a yearly average of ~€360 million in direct, indirect and induced tax contributions.

Small business spotlight

Small businesses have benefited from the increased business activity around Google's data centre sites and infrastructure development (which host over 500 local vendors) and from Google's online resources.

More broadly, Google is working to increase access to high-earning career opportunities by democratizing digital skills in the Netherlands. According to the European Commission, in 2022 only 54% of Europe's workforce had basic digital abilities. To help bridge the digital skills gap, Google offers 22 online courses in the Netherlands for individuals to build fundamental skills in digital functions like AI and Cloud computing. It also created the

Google provided a €4.5M grant to Youth Business International's COVID-19 Rapid Response and Recovery Program. This initiative backs young (18-35 years old), underserved small business owners across 32 countries. Of the 3,497 businesses that received loans and trainings for sustaining and scaling their business during COVID in the Netherlands, 62% survived the pandemic's disruption to business, resulting in 2,163 retained jobs.

Grow with Google program which provides local businesses with online marketing tools and training for leveraging Google products such as Google Ads, Analytics, and the Google Marketing Platform. From 2017-2022, Grow with Google trained 189,000 people across the Netherlands, helping them to modernize their thinking around advanced analytics and operations to expand their organizations.

KEEP DIGITAL INFRASTRUCTURE SECURE AND SUSTAINABLE

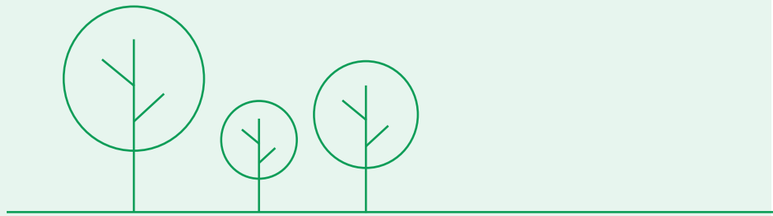
Google's commitment to people

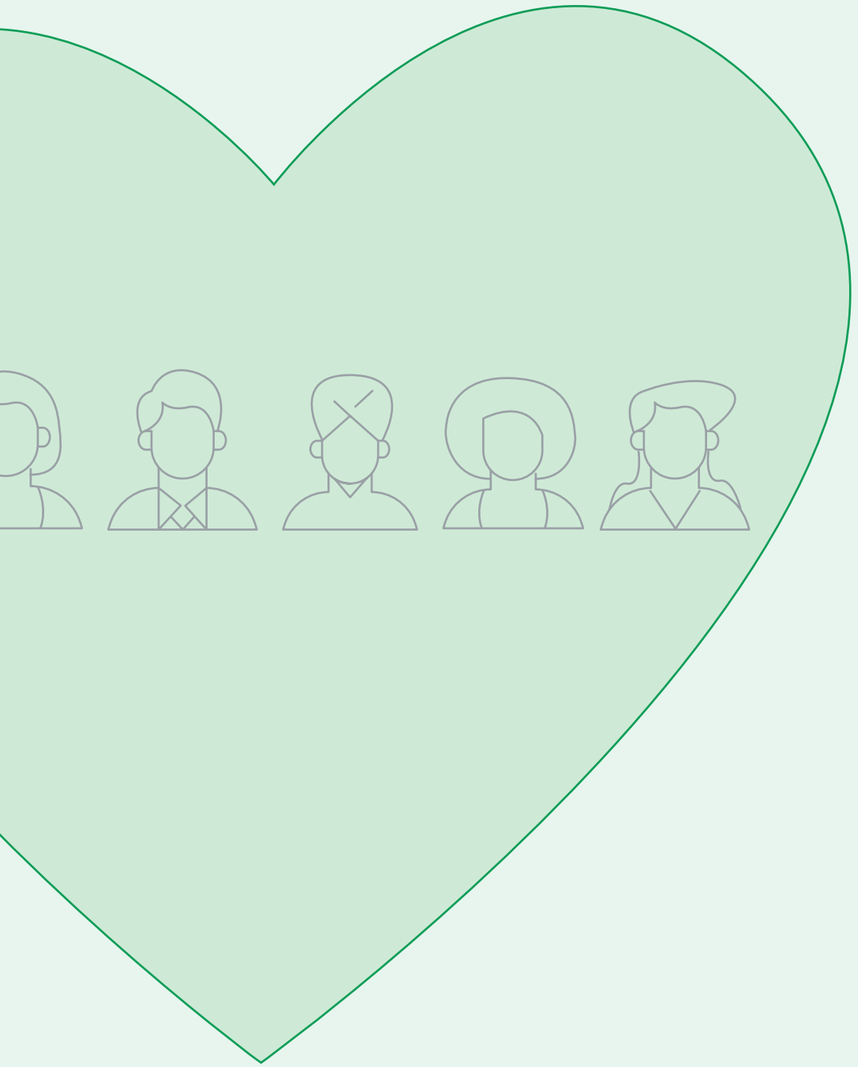
Google is committed to improving the lives of as many people as possible — both internally, for its employees and contractors, and externally, by supporting initiatives that benefit local communities. Its goal is to create strong relationships with stakeholders in the communities in which it operates and contribute positively to a higher quality of life for residents.

Between 2017 – 2022, Google has invested €6.1 millions in the Netherlands on behalf of its Middenmeer and Eemshaven data centres. The majority of these investments have gone towards expanding access to education through technology – both for students from disadvantaged communities and students in Middelbaar Beroepsonderwijs (MBO), secondary vocational education. Google has also made investments to help local communities accomplish specific goals, such as funding technology equipment for seafarers and promoting biodiversity and circularity in the gardens of shared living communities.

Investing in people at Google

Google's international reputation as a desirable employer extends to its data centres. Talented employees from a variety of skillsets and backgrounds are proud to call Google's data centres their place of work. They cite team diversity, culture, and career development opportunities (such as Google's IT Support Professional Certificate) as a few reasons for their job satisfaction.





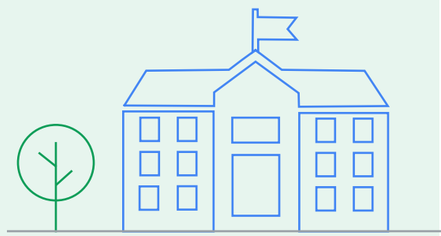
Managers at the Netherlands data centres are committed to refreshing a workforce development plan annually to meet their employees' career development aspirations and training needs. Google requires 100% training completion for employees of all expertise levels to gain exposure to a variety of relevant fields and uphold operational safety. Data centre employees in Middenmeer spend an average of 190 hours per year on training, which are regularly refreshed with the introduction of new equipment.

Investing in people around Google: Supporting local education

Google sees a two-fold opportunity in its Theory of Change for advancing education in the Netherlands. The first opportunity is enriching the Dutch education system by introducing technology skills to young students. The second is providing mentorship to MBO (secondary vocational education) students who can one day seek employment at Google's data centres.

Google believes that connecting students to computer science curricula can show potential future careers and a new way to problem solve. "Google is looking not just for programmers, but also for creative people. This is an area where (the) population is in decline," says Grietha de Boer, Program Manager at the Hanze University of Applied Sciences in Groningen. "So Google wants to show people that they don't have to move away. There are plenty of opportunities close by. My dream for the future is that digital literacy will become an important subject in every school, and that teachers will be able to learn from their students" – Google's EU data centre community: Stories from the Netherlands - YouTube.

Google saw an opportunity to improve digital literacy for Dutch communities when COVID-19 shifted schools to online learning. Google provided Chromebooks with educational applications to 150 children ages 6-18 through Puur for Kids, an organization serving students whose families cannot afford to purchase a personal computer. These Chromebooks allowed children to continue their education amidst the pandemic.



Google has also dedicated a large portion of its Middenmeer investments to the expansion of existing technology education programs. For example, it supported Stichting Junior IOT in growing their walk-in services allowing junior students to practice electronics assembly, programming, and 3D design. Google's funding, education kits, and Chromebooks have enabled these successful programs to access new electronics equipment so students can experiment with technology and engineering applications. Students were also able to use Chromebooks to apply "project-based learning" to relevant industry topics such as healthcare, sustainable energy, cloud technology, and robotics.

Google's data center community grants program extends to creating a continuous learning pipeline for vocational education and careers, connecting MBO (secondary vocational education) and HBO (higher professional education) talent and trade professions in the electrical and mechanical fields. Google has funded programming that provides practical mentorship opportunities to VO (VO stands for secondary education in the Netherlands, which is a collective term for the first year of high school, special secondary education, secondary general education) students with applications centred around cooling systems technology. Google is also expanding its data centre apprenticeship program as a part of the Dutch ICT MBO educational program. Each year, at least 3 young apprentices enrolled in school are selected to spend anywhere between 20 and 34 weeks in a work-and-study program which compensates MBO students as they develop digital skills.

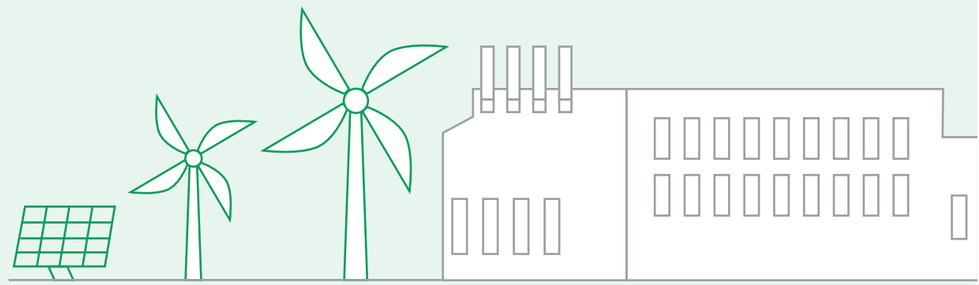
Google

Provided Chromebooks to **150 children ages 6-18** through Puur for Kids, an organization serving students whose families cannot afford to purchase a personal computer.

Supporting local community members

Google believes data centres should not only host data to support businesses and public agencies, but also improve their neighbours' quality of life through direct and indirect community benefits. In 2019, Google selected SkillLab BV – a social enterprise that helps refugees translate their skills to the European labour market – as one of 20 grantees of Google's AI Impact Challenge. Dedicating €958,000, Google helped power SkillLab's AI solution for building skill profiles based on the unique inputs of job seekers, resulting in the completion of 1,011 job training courses. At the close of the AI Impact Challenge, Google tapped SkillLab to become a member of its ongoing program, Startups for Sustainable Development. Now supported by regular contact to Google advisors that support the growing startup through technical and culture decisions, SkillLab continues to drive towards the Sustainable Development Goals (SDGs) of Quality Education, Decent Work and Economic Growth, and Reducing Inequality (SDGs 4, 8, and 10).

Data centres produce both light and noise as byproducts of their operations. With both data centres located away from residential areas (the Eemshaven data centre is rurally based while the Middenmeer data centre is situated in an industrial park), Google strives to keep operational noise levels minimally disruptive in the spirit of preserving a peaceful landscape. Google maintains noise levels at its data centres by conducting noise modeling during both the construction and operation stages. Through measurement, modeling and simulation while preparing to build a DC campus, Google develops a baseline understanding of noise in sensitive locations, frequencies of concern, and times when noise peaks during the 24-hour day. These measurements and baselines help Google determine the best methods and times for attenuating self-generated noise.



During day-to-day data centre operations, the main generators of noise are external cooling plants, on-site substations, and miscellaneous HVAC equipment. To mitigate the impact of this noise, Google adjusts designs for cooling towers closest to residential areas and only conducts unavoidable maintenance of equipment like generators during the day.

Google recognises the importance of minimizing the light pollution of its data centres to avoid obscuring the visually astounding landscape of the Netherlands. To remain compliant with the Netherlands' local light regulations, Google's facilities are regularly monitored to ensure external lighting is no higher than the stipulated threshold for the planning area, which is 0.1 lux (often compared to the level of light from a full moon). As stipulated by the NL regulations, Google's light plan for mitigating light pollution is regularly reviewed for approval by relevant Dutch authorities.

Data centres can impact neighbours' quality of life not only through the light and sound produced, but by how they look. Google works with the Dutch government and regulators to meet more stringent building guidelines on future data centres, which will require co-design and sign-off with a provincial Beautification committee. This requirement, effective as of 2023, will allow local stakeholders to shape the site planning process through review of blueprints and by making specific recommendations, from the height of buildings to the orientation of the fence to the acoustic blocking on site.

It was observed through interviews that light pollution, sound and aesthetics were mentioned as areas in which communication channels with Google were initially limited, but are now improved. One stakeholder gave the example of a data centre neighbour who was concerned with the lights, and after the message was shared with Google the issue was resolved.

KEEP DIGITAL INFRASTRUCTURE SECURE AND SUSTAINABLE

Google's data privacy, resiliency, and digital infrastructure

Google specializes in cybersecurity capabilities and services. As such, it takes serious measures to protect the private data its clients trust it to safeguard. Just as Google follows its mission to advance equity by increasing public access to the internet, it must honor its clients' trust by striving to keep their private information safe.

The organizations that trust Google's data centres to protect their private information include small businesses, public organizations, and large corporations. Google works hard to honor this trust with strong security measures, such as requiring Google employees to complete a series of security checks before they enter the building. Measures like these might earn data centres a reputation for being secretive, but they are in place for user security and to safeguard the information Google houses for its clients.

Maintaining data privacy

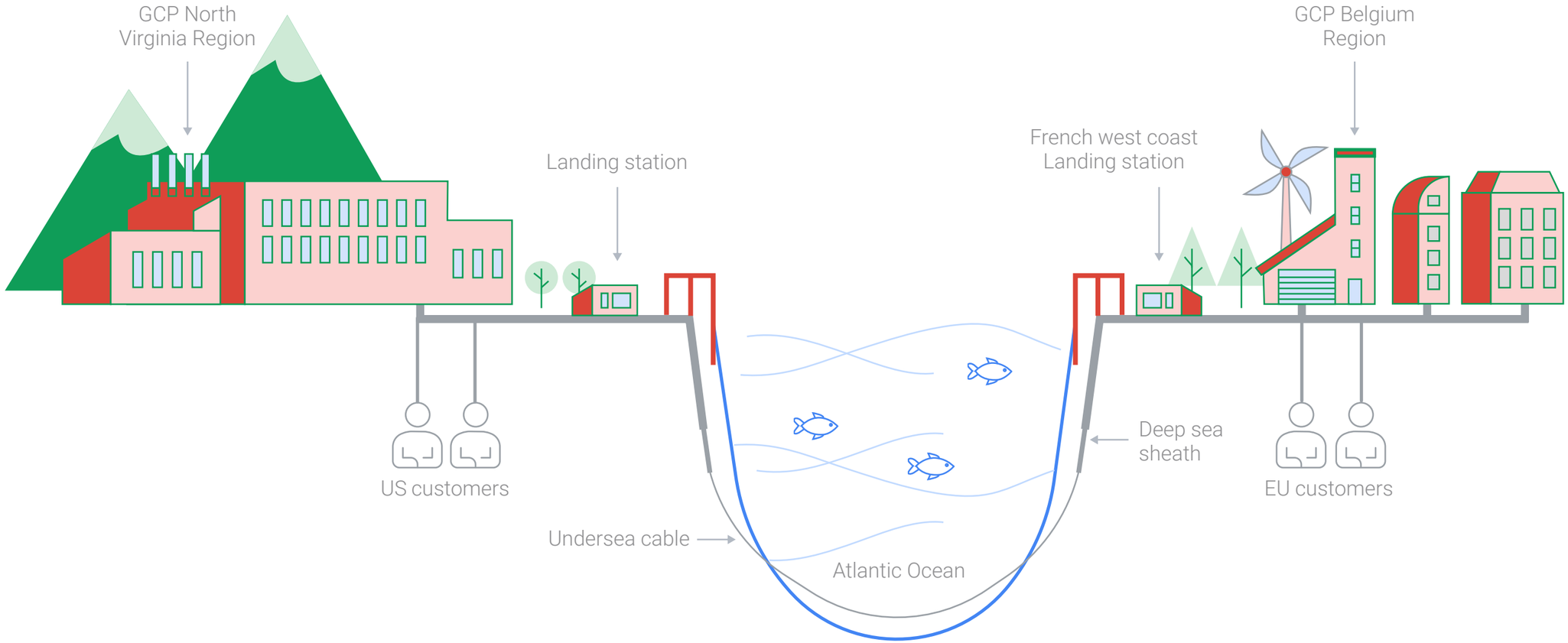
Data centres go to extensive lengths in order to safeguard the information they house for their clients, which include small businesses, public organizations, NGOs, and large corporations.

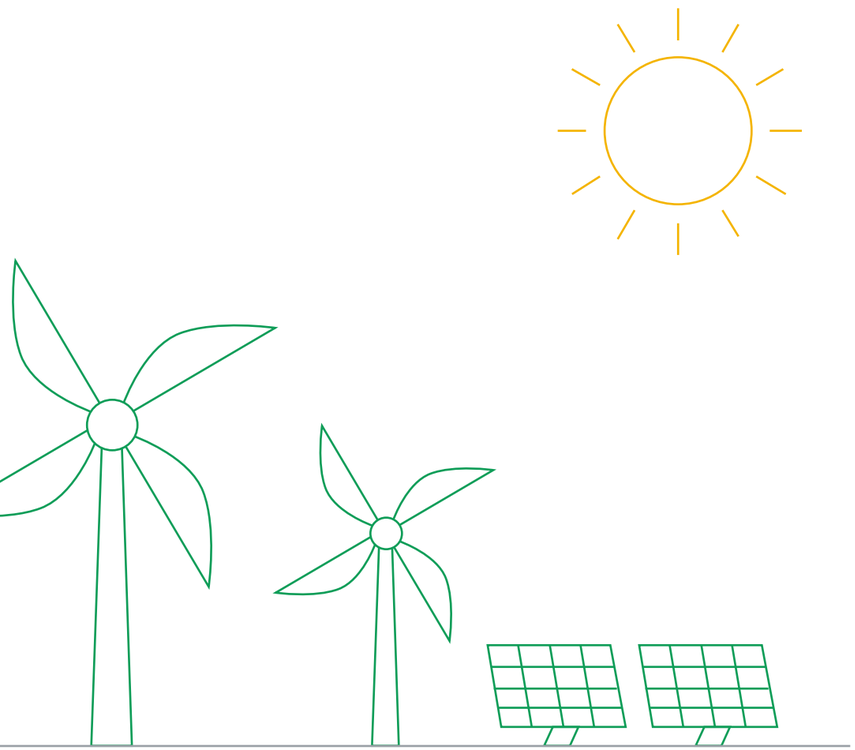
Google's Netherlands data centres serve clients across the world from a variety of highly secure sectors, including financial services, healthcare, and public agencies. Data centre employees focused on security spend an average of 330 hours per year on training at the Middenmeer data centre, with 40 hours of mandatory training required for new security guards. Google deploys monthly security tests to keep protocols top-of-mind for employees. Depending on an individual's performance, extra training may be required.

Improving digital infrastructure

The speed at which Google is able to transport data across great distances to enable business operations to run without interruption is made possible by its digital infrastructure. The Google Cloud network consists of fiber optic cables under land and sea, and cloud regions around the world.

In 2018, owing to major expansions to Google's global cloud infrastructure, Google opened a new cloud region in the Netherlands. In 2020, Google operationalized the Dunant subsea cable, which connects Virginia Beach, VA, with the French Atlantic coast and then to EU customers. It has the capacity to deliver information at 250 terabits per second (Tbps). In other words, it is capable of transmitting a quantity of data equal to the Digital Library of Dutch Literature across the Atlantic hundreds of times over per second.





KEEP DIGITAL INFRASTRUCTURE SECURE AND SUSTAINABLE

Google's impact on the environment

The following section includes the impact of Google data centres on energy use, greenhouse gas emissions and water use. In cases where some data was not included, it is due to regulatory, competitive, or data quality considerations. As the ability to do so changes, future impact assessments will reflect Google's capability to share additional information.

Google is undertaking efforts to minimize the necessary impacts its data centres have on the environment, which are in line with the government's 2022 commitment to a 55% reduction in carbon emissions by 2030 compared to 1990. To minimize its emissions, Google is an offtaker of carbon-free energy via several power purchase agreements (PPAs), totaling more than 125 MW of carbon-free capacity over 2017 – 2022. Google is aiming to run on 24/7 carbon-free energy at all data centres on every grid where it operates. Additionally, Google has pledged to replenish 120% of freshwater consumed, on average, by 2030.

As a collective, these actions aim to reduce the demand on finite resources, improve the health and wellbeing of local community members and can serve as a catalyst for the transition to sustainable business growth.

Why do data centres need energy?

The process of storing data. processing data, and networking can be highly energy intensive. At present, data centres account for about 1–1.5% of global electricity use. A majority of this energy demand comes from a need to source power for data servers. As data servers run they produce heat and need to be cooled, which generates additional energy demand.

The energy market in the Netherlands

The Netherlands is heavily dependent on natural gas, especially for household heating. In 2019 the country decided to go completely gas-free by 2050, and to halt domestic production by 2030. In 2021, the top five energy sources in the Netherlands were natural gas (47%), wind (15%), coal (14%), solar (10%), and biomass (8%). Between 2020 and 2021, fossil fuel production in the Netherlands decreased by 33% and renewable energy production rose by 22%.

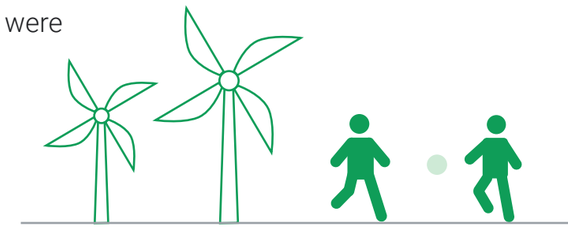
Additionally, in 2022, the government coalition committed to a 55% reduction (compared to 1990) in carbon emissions by 2030. They plan on reaching this goal by constructing offshore wind farms in the North Sea, opening two new nuclear power plants, encouraging large energy users to reduce their consumption, and stimulating additional sustainable energy production (solar, onshore wind, biomass, geothermal heat, and hydropower). Google's dedication to decreasing its energy footprint and adopting renewable sources of energy is in harmony with the Netherlands goals for reducing carbon emissions.

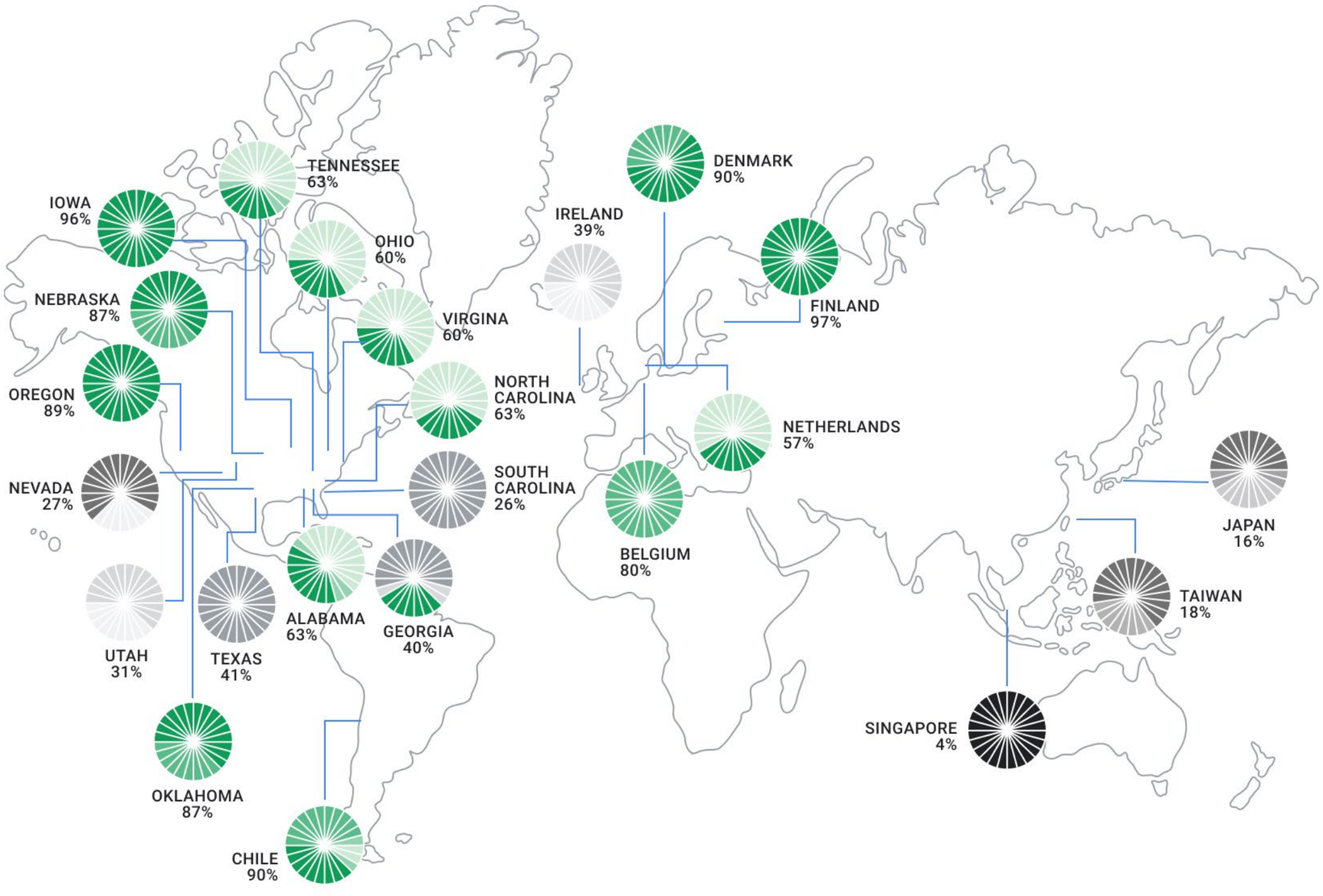
Google's efforts to reduce its energy impact

Globally, Google has matched 100% of its annual electricity consumption with renewable energy purchases since 2017. Google has also undertaken initiatives like energy-efficient data centre design, diversified energy sourcing strategies, and AI-based smart operations. Due to Google's efforts to source carbon-free energy for its data centres and construct energy-efficient physical structures, it was able to operate at an average of 57% carbon-free energy (CFE) in the Netherlands in 2022 as opposed to the national grid average mix of ~42%.

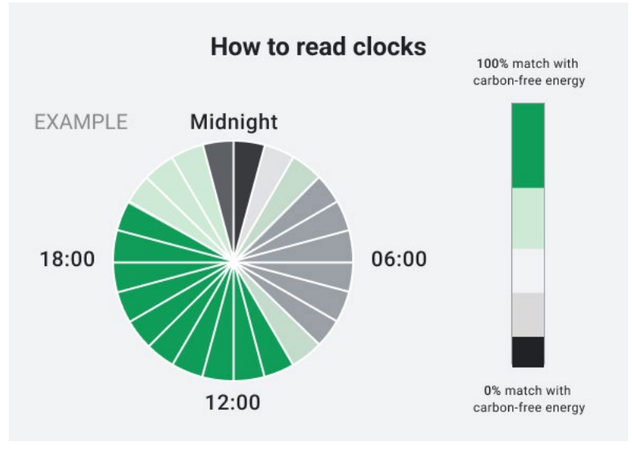
Google's diversified energy sourcing strategy and evolution towards 24/7 CFE

As of the end of 2022, the total clean energy generation capacity supported by Google in the Netherlands adds up to more than 125 MW, including Google-enabled wind and solar projects such as Delfzijl, Wind Farms Krammer and Bouwdokken and Delfzijl Sunport. In 2023, two additional PPAs with Wind Farm Kronningswind and Wind Farm Fryslan were also announced.





In addition, in 2020 Google set a global goal of running on 24/7 carbon-free energy by the year 2030. While Power Purchase Agreements (PPAs) and Renewable Energy Certificates (RECs) are tools that contribute towards developing a greener electricity grid, they do not ensure that the total energy consumed by an organization comes from low-carbon sources. New types of energy contracts and advanced clean energy technologies will also be needed.



FOOTNOTE: Google defines carbon-free energy as any type of electricity generation that doesn't directly emit carbon dioxide, including (but not limited to) solar, wind, geothermal, hydropower, and nuclear. Sustainable biomass and carbon capture and storage (CCS) are special cases considered on a case-by-case basis, but are often also considered carbon-free energy sources.

The current CFE score at the Dutch data center sites in Eemshaven and Middenmeer is 57% and is expected to be 80% carbon-free energy in 2024.

Energy efficient design

As of 2022, Google's data centres globally are 1.5 times more energy efficient than an average data centre, and they deliver three times more computing power per unit of electrical power than was possible just five years ago. In 2022, the Power Use Efficiency (PUE) of Google's ISO 50001 certified data centre in Eemshaven was 1.07, compared with the global industry average of 1.55.

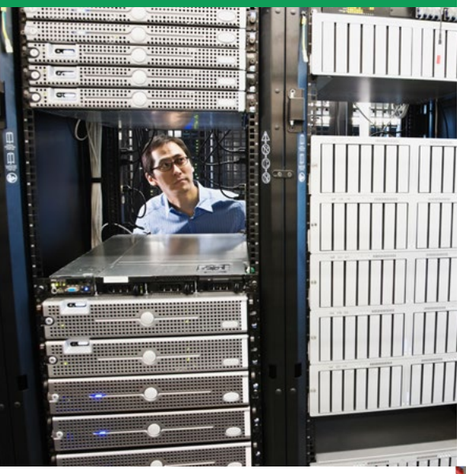
Google uses a carbon-intelligent computing platform, first announced in 2020, to shift cer–tain computing tasks and their associated energy consumption – such as processing a video uploaded to YouTube – to times and places in which carbon-free energy is available on the grid. Google also utilizes a task-shifting capability for demand response to reduce data centre electricity consumption during periods of high stress on the local or regional energy grid, temporarily reducing power consumption to provide valuable flexibility when it is needed, so that local grids continue operating reliably and efficiently.

Moreover, at all data centres, Google has designed and implemented highly efficient Tensor Processing Units and has outfitted its facilities with high-performance servers – including smart temperature, lighting, and cooling controls. These measures have promoted even more efficient energy use at Google's DCs.

FOOTNOTE: PUE is determined by dividing the total amount of power that enters a data centre by the portion of that power used to run the data centre's IT equipment. PUE is expressed as a ratio, with overall efficiency improving as the quotient decreases toward 1.0. Google calculates PUE in line with ISO/IEC 30134-2 Standard for Power Usage Effectiveness.

Greenhouse gas emissions reduction

In 2021, Google set a goal to achieve net-zero emissions across the entirety of its operations and value chain globally by 2030. To accomplish this, Google aims to reduce its combined Scope 1, Scope 2 (market-based), and Scope 3 absolute emissions by 50% against a 2019 baseline before 2030. It also plans to invest in nature- and technology-based



carbon removal solutions that will neutralize its remaining emissions. Google has formally committed to seek out the Science Based Targets initiative's (SBTi) validation of its absolute emissions reduction target.

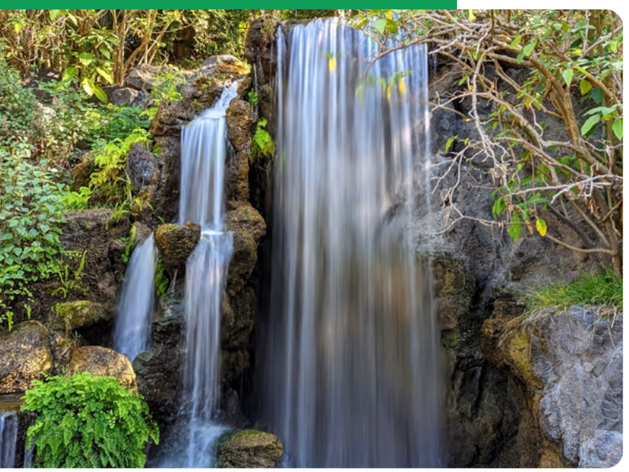
In 2022, Google's total global Scope 1, Scope 2 (market-based), and Scope 3 greenhouse gas emissions were 10.2 million metric tons, and the 24% of that total (2.5 million metric tons) that are Scope 2 emissions are mainly due to the electricity demands of data centres.

FOOTNOTE: Scope 1 emissions are direct emissions from company-owned and controlled resources. Scope 2 emissions are indirect emissions from the generation of purchased energy and cooling, such as from a utility provider. The market-based method of calculating Scope 2 emissions incorporates Google's renewable energy purchases via contractual mechanisms like power purchase agreements (PPAs). Scope 3 emissions are all indirect emissions – not included in Scope 2 – that occur in the value chain of the reporting company.

Water stewardship

Data centres are similar to personal devices like laptops in that as they run, they generate heat – though they do so on a much larger scale. In order to keep the servers and chips from overheating, large industrial cooling systems are used to remove heat from the data centre. At present, the cooling solutions for data centres include air-cooling, water-cooling, or a combination of these technologies. There is no one-size-fits-all approach to cooling a data centre. The best solution for a specific DC depends on local factors like climate, availability of carbon-free energy, and water.

Before selecting a site for a new data centre and identifying the optimal cooling solution, Google assesses the local watershed's depletion and water scarcity risk, incorporating the site's potential impact. Water-cooling is determined to be responsible and resilient at sites that return favorable assessments for both metrics, underscoring the importance of water stewardship and resilience during site



selection and facility design. Once operational, Google continues to monitor these metrics to manage future risks and proactively develop strategies to mitigate them.

Middenmeer

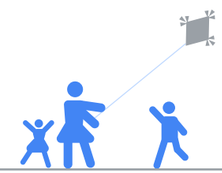
Water-based cooling enables Google to cool its data centres as needed while lowering its impact on the local energy grid. The facility in Middenmeer uses an adiabatic cooling system, which only uses water when a certain temperature is reached. This balances the use of water and energy for cooling rather than relying solely on one or the other.

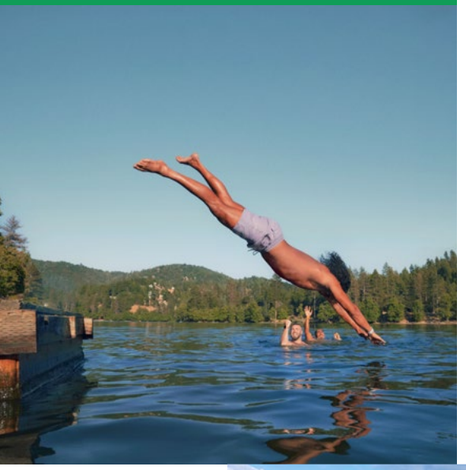
Eemshaven

To limit the impact on the local watershed in Eemshaven, Google invested €45 million to develop a new industrial water source in partnership with North Water, significantly reducing the use of groundwater for cooling. This project involved the development of a withdrawal & treatment facility at Garmerwolde and 30 km of pipeline to convey treated water from the Eemskanaal, an abundant and low-quality water source, to Eemshaven. This new industrial water supply can be used by other industrial consumers in the region for a cost of €1/m^3, promoting economic development while reducing demand for high-quality groundwater. In 2021 Google set a goal to replenish more

In 2022, the Middenmeer & Eemshaven data centres consumed **876,000 cubic meters (231.5 million gallons) of water.***

*Reference article





freshwater than it consumes globally by 2030 and to take action toward further supporting water security in the communities where it operates. Achieving these goals would mean Google replenishes 120% of the freshwater it consumes annually, on average, across all its offices and data centres. In the Netherlands, Google has provided funding for three projects in support of these goals:

- Construction of a double dike in the Province of Groningen to provide improved flood safety and create salt marsh habitat and opportunities for aquaculture and saline agriculture.
- Implementation of a data-driven water control structure in the Negenboerenpolder to route freshwater and reduce withdrawals to prevent salt intrusion.
- Expansion of an Aquifer Storage and Recovery system on the island of Texel to increase the system's volume capacity in support of the agricultural economy.

Conclusion

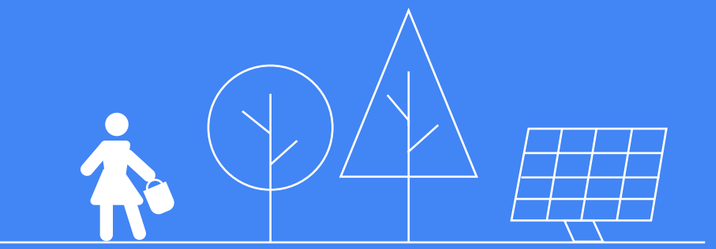
This report provided an overview of the economic, environmental and social impact of Google's data centres in the Netherlands from 2017-2022, and some of the actions it is taking to scale the positive impacts and minimize the negative impacts.

Data centres are essential for the transition to a more digitized economy. From 2017-2022, Google's data centres have had an annual average direct, indirect and induced economic impact of ~€1.7B in contributions to the GDP of the Netherlands. Google.org has awarded €6.1 million in grants to help strengthen STEM education and vocational programs, provide employment training for refugees, and offer COVID-19 support to small businesses from 2019-2022. Google has made investments in environmental sustainability, which can be seen in its Power Usage Effectiveness (PUE) value of 1.07 in Eemshaven.

In alignment with the Theory of Change, Google aims to keep digital infrastructure secure and sustainable while driving local economic development, fostering thriving communities, and spurring environmental stewardship. These three areas (economic, social, and environmental) are interconnected, and collectively impact community wellbeing.

One generally accepted way to measure community wellbeing is through the Organization for Economic Co-operation and Development (OECD) Better Life Index. This index assesses well-being across a range of topics and indicators that the OECD has identified as essential in the areas of material living conditions and overall quality of life. The OECD Better Life Index is a way to frame the overall impact that Google data centres may have on the communities in which it operates.

Of the eleven topics measured and weighted equally by the OECD Better Life Index, Google data centres might influence four. It is important for Google to recognise that over one-third of the wellbeing measure in a community could be driven by its actions. With deliberate action going forward, Google data centres can positively influence the following topics: Income (measured by



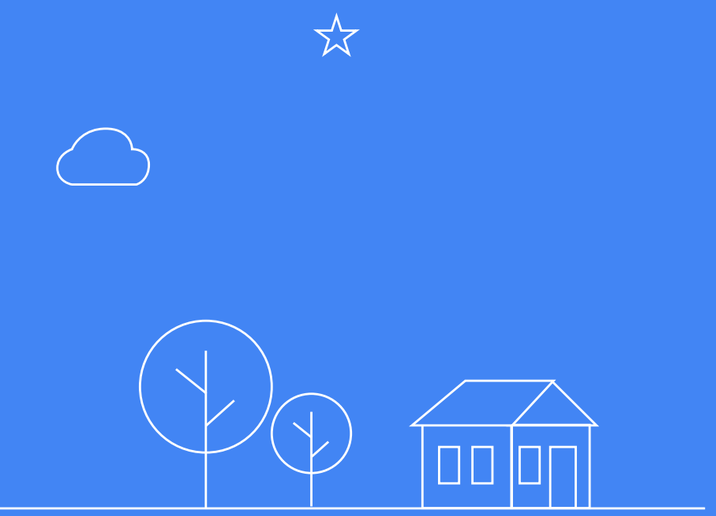
Household net adjusted disposable income and Household net wealth), Jobs (measured by Labour market insecurity, Employment rate, Long-term unemployment rate and Personal earnings), Education (measured by Educational attainment, Student skills, Years in education) and Environment (measured by Air pollution and Water quality).

Although Google has made investments in environmental sustainability, there are still emissions from its data centre operations. Google aims to achieve net-zero emissions across its operations and value chain by 2030. Google is working towards this in the Netherlands by investing in local renewable energy capacity and optimizing the balance between water usage and energy usage.

As the capacity required to meet the needs of a more digital future grows, so will the digital infrastructure needed to enable it. While any expansion will increase GDP and add jobs, Google can channel its impact by using local contractors where possible, formalizing relationships with employment agencies to shape programs that address digital skill talent gaps and continuing to use Grow with Google for career certification and for small businesses.

Google is passionate about being a good neighbour. As such, it is critical for Google to continue addressing local opportunities and challenges, which is dependent on engagement from local stakeholders, investment in collecting and sharing reliable data when possible, and a continued, proactive strategy. Google has already established a precedent of listening to and engaging local stakeholders in Middenmeer and Eemshaven. Google adjusted its plans in response to community concerns around light, noise, and other issues. Continuing to participate in open dialogue will build more trust moving forward. Google will also continue to monitor its economic, social, and environmental impacts at the local level through robust data and consistent adherence to its Theory of Change. Filtering decisions related to data centre investments and operations through this lens will create a secure and sustainable internet.

Appendices



APPENDICES

Glossary

The topics as defined below were used to assess regional priorities in the interviews conducted to inform this study.

Economic topic	Definitions
Employment creation	Number of jobs - direct, indirect or induced - that are created as a result of a data centre operator's employment opportunities and workforce upskilling programs, as well as induced workforce outcomes.
Contribution to local businesses & industry sectors	Contracts with local businesses, adjacent sectors supported, and other positive or negative externalities related to data centre operators' engagements around a point of presence.
Contribution to tax income	National & local taxes on data centre land use, equipment, and other taxed activities paid to governments.

Social topic	Definitions
Education	Local educational programs supported and financed through a data centre operator's investments and partnerships.
Employee health & wellbeing	Physical safety protection and mental support provided to data centre employees and contractors.
Diversity, equity & inclusion	Support, development, and/or empowerment of talent from vulnerable and historically under-represented groups in a way that supports equal access.
Contribution to digital infrastructure & connectivity	Investments in local digital infrastructure, cabling and connectivity.
Contribution to data privacy & cybersecurity	Reinforced data security and reliability as a result of a data centre's adherence to high privacy and cybersecurity standards.

Environmental topic	Definitions
Emissions reduction	Efforts to change energy consumption and other drivers of emissions (i.e., greenhouse gases resulting from data centre operations).
Energy use & impact on grid	Use of non-renewable or renewable energy impacting energy prices, capacity, and regional grid, and efforts to reduce the amount of energy used through operations.
Waste recycling & sustainable materials	Waste produced from data centre equipment and operations as generated, recycled, or reduced through the employment of sustainable materials.
Water usage & treatment	The withdrawal, consumption, and discharge of water in operations, including impacts to local water quality.
Biodiversity & land preservation	The impacts of a data centre's physical presence and operations on natural resources, including deforestation, species impacted, and restoration programs.

Acronyms

AI	artificial intelligence
CDN	content delivery network
CFE	carbon-free energy
CO_2e	carbon dioxide equivalent
CS	computer science
dBA	A-weighted decibel
DC	data centre
DEI	diversity, equity, inclusion
ESG	environmental, social and governance
GCP	Google Cloud Platform
GDP	gross domestic product
GHG	greenhouse gas
HVAC	heating, ventilation, and air conditioning
IT	information technology
ML	machine learning
MW	megawatt
MWh	megawatt-hour
NGO	non-governmental organization
OSHA	Occupational Safety and Health Act
POP	point of presence
PPA	power purchase agreement
PUE	power usage effectiveness
RCM	reliability-centered maintenance
REC	renewable energy certificate / credit
SDM	space division multiplexing
SROI	social return on investment
STEM	science, technology, engineering and mathematics
tCO_2e	metric tons of carbon dioxide equivalent
UX	user experience
WUE	water usage effectiveness

APPENDICES

Methodology

Direct, indirect, induced economic impact calculations – input-output models and assumptions

To calculate economic impacts, this report uses an input-output model developed by IMPLAN. IMPLAN defines input-output analysis as "A means of examining inter-industry relationships within an economy. It captures all monetary market transactions between industries in a given time period. The resulting mathematical formulae allow for examinations of the effects of a change in one or several economic activities on an entire economy (impact analysis)." For more information on IMPLAN, and their assumptions made as part of their input-output analyses, refer to the articles on Input-Output Analysis and Assumptions and Detailed Key Assumptions of IMPLAN & Input-Output Analysis.

Based on IMPLAN's input-output tables, a set of multipliers that reflects the capital investments and operating expenditures from Google's data centres were created to derive GDP, employment and labor income multipliers. For GDP contributions, all Opex categories were included in GDP, Labor Income and Employment calculations. The following Capex categories were included in GDP, Labor Income and Employment calculations: Building + Site Infrastructure, General + Office Equipment, Land, R&D and Vehicles while the Capex categories of Networking, Computer & IT Equipment, Software were excluded.

When values needed to be converted from USD to EUR, a conversion rate of 1 USD = 0.88346 EUR, representing the average exchange rate from 2017-2022, was used.

As part of this analysis, the following industries were considered: Advertising, public relations and related services, Air transportation, Air travel, Automobile manufacturing, Broadcast and wireless communications equipment manufacturing, Business support services, Commercial and industrial machinery and equipment rental and leasing, Computer terminals and other computer peripheral equipment manufacturing, Construction of

new power and communication structures, Electric power transmission and distribution, Electronic and precision equipment repair and maintenance, Electronic computer manufacturing, Employment services, Facilities support services, Ground travel, Hotels and motels, including casino hotels, Legal services, Maintenance and repair construction of nonresidential structures, Management consulting services, Monetary authorities and depository credit intermediation, Office administrative services, Office supplies manufacturing (excluding paper), Other amusement and recreation industries, Other computer related services, including facilities management, Other electronic component manufacturing, Other snack food manufacturing, Postal service, Rail travel, Real estate & rental/leasing, Retail, Transit and ground passenger transportation, Utilities, Wired telecommunications carriers, Wireless telecommunications carriers, Wood office furniture manufacturing.

OECD better life index

This report investigates how the presence of Google's data centres have affected the economic, social and environmental conditions in the country. In addition to the set of indicators outlined throughout the report, it also considers the OECD Better Life Index as a method of measuring the overall well-being of a community. The OECD Better Life Index includes the following eleven topics (and indicators): Housing (Housing expenditure, Dwellings with basic facilities, Rooms per person), Income (Household net wealth, Household net adjusted disposable income), Jobs (Job security, Personal earnings, Long-term unemployment rate, Employment rate), Community (Quality of support network), Education (Years in education, Student skills, Educational attainment), Environment (Water quality, Air pollution), Civic Engagement (Stakeholder engagement for developing regulations, Voter turnout), Health (Self-reported health, Life expectancy), Life Satisfaction (Life satisfaction), Safety (Homicide rate, Feeling safe walking alone at night), Work-Life Balance (Time devoted to leisure and personal care, Employees working very long hours).

Google + Deloitte.

Thank you

To the many individuals across Google and Deloitte who made this report possible.
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