

Impact Study

Taiwan Data Center

2024



Google's Data Center Impact in Taiwan

Google's data center in Taiwan is helping to rapidly grow the digital economy. It is what you rely on to pull up a map to a new restaurant, attend online classes, or access your healthcare records.

Google's digital infrastructure investments in Taiwan drive local economic development through job creation, promote environmental stewardship through carbon-free energy production, and foster thriving communities.

Google has been part of Taiwan's digital infrastructure since 2011. This Impact Study provides a summary of key economic, environmental, and social metrics that Google's digital infrastructure investments have had on Taiwan in recent years.

Economic

Google's investments in digital infrastructure in Taiwan support jobs in construction, engineering, and the service industry.

Google's data center contribution to labor income in Taiwan is equal to supporting **~23,630 households in the country each year.**

TWD ~127,444M¹

Annual contribution to Taiwan's GDP² (2017-2023)

~41,340

Annual jobs supported (2017-2023)

Environmental

As part of Google's commitment to operate all of its data centers using carbon-free energy by 2030, in 2024, Google announced a partnership with BlackRock's Climate Infrastructure business to support the **creation of a 1 GW pipeline of new solar capacity in Taiwan.**

18% (2023) | 18% (2022)

Percentage of electricity matched with carbon-free energy^{3,4} supply at every hour of every day at Google's data center in Taiwan

Social

Google's community investments include support to Junyi Academy STEM⁵ program which helped empower students from rural areas, **generating a TWD ~107.60⁶ social benefit for every Google-invested dollar** and fostering a more digitally skilled future workforce in Taiwan.

TWD ~15M⁷

Invested in Taiwan communities surrounding Google's data center in 2022 and 2023

This report provides a summary of Google's data center impact. The overall impact of all Google operations is significantly larger, encompassing contributions beyond data centers, including economic benefits from its platforms, products, and services used across various sectors.

Notes: 1. Equivalent to USD ~4,300 Million. 2. GDP stands for gross domestic product. 3. Google defines carbon-free energy (CFE) 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. 4. Google's CFE is influenced by various factors, such as overall electricity usage, purchases of carbon-free energy, technological advancements, and changes in the broader energy landscape. 5. STEM stands for science, technology, engineering, and mathematics. 6. Equivalent to USD ~3.5. 7. Equivalent to USD ~489K.

Economic Impact: 2017-2023^{1,2,3}



TWD ~127,444M⁴

**Annual Contribution
to Local GDP**

*Includes⁵ TWD ~67,156M direct,
TWD ~38,903M indirect, and TWD
~21,386M induced*



~41,340

**Annual
Jobs Supported⁶**

*Includes ~385 direct jobs, ~32,450
indirect, and ~8,510 induced*



TWD ~26,853M⁷

**Annual
Labor Income**

*Includes⁸ TWD ~668M direct, TWD
~20,589M indirect, and TWD
~5,596M induced*

Google aspires to increase its contribution to Taiwan's GDP by supporting the growth of the country's digital economy and digital infrastructure goals.

Google's data center contribution to direct, indirect, and induced labor income in Taiwan is equal to supporting ~23,630 households in the country each year.

Top GDP Contributions



Professional, scientific, and
technical services⁹

**(21% of Total GDP Contribution
from Google's investments in
Taiwan)**



Wholesale Trade

(11%)



Other (various sectors such as
manufacturing and real estate)

(68%)

Spotlight: Subsea Cables

Google's global cable infrastructure extends into Taiwan, including Apricot, a subsea cable connecting Singapore, Japan, Guam, the Philippines, Taiwan, and Indonesia and the recently announced TPU that will connect Taiwan, the Philippines, and the US. In fact, Google's submarine cable investments in Taiwan have created more than 64,000 jobs and contributed TWD ~771 Billion¹⁰ to Taiwan's GDP.

Direct: includes Google employees and contractors (incl. their payroll and benefits) and annual spend on Google's suppliers

Indirect: includes Google's suppliers' employees and contractors, the suppliers' payroll and benefits due to Google orders, and suppliers spend

Induced: includes impact generated by the household spending of Google's employees and their suppliers in their local economies

Notes: 1. Numbers were converted into local currency using the average 2017-2023 exchange rate (IRS). 2. GDP and labor income rounded to the nearest one-million; Jobs and household numbers rounded to the nearest multiple of five. 3. This Impact Report builds upon Taiwan's Data Center Impact Report published in early 2024. 4. Equivalent to USD ~4,300 Million. 5. Equivalent to USD ~2,266 Million direct, USD ~1,313 Million indirect, and USD ~722 Million induced. 6. Google's support to jobs includes construction, engineering, networking, renewable energy jobs, security, and services, among others. 7. Equivalent to USD ~906 Million. 8. Equivalent to USD ~23 Million direct, USD ~695 Million indirect, and USD ~189 Million induced. 9. Includes computer systems, data processing, software services, and other computer-related facility management support, etc. 10. Equivalent to USD ~26 Billion.

Environmental Impact: 2022 & 2023^{1,2}

18% (2023) vs. 18% (2023 Regional Grid)

18% (2022) vs. 18% (2022 Regional Grid)

24/7 Carbon-Free Energy (CFE)

Google has matched 100% of its global annual electricity consumption with renewable energy purchases, and has further committed to operating at 24/7 CFE by 2030. This means matching electricity demand with CFE supply every hour of every day.

1.12 (2023)

1.12 (2022)

vs. 1.58 (industry average)

Avg. Power Usage Effectiveness

Compared to the industry average, Google's Taiwan data center is achieving a 79% reduction in overhead power usage. For every watt of power used to run servers and network equipment, only 0.12 watts are used to run supporting infrastructure like cooling and lighting.

Spotlight: Carbon-Free Energy

To advance Google's 24/7 CFE commitment, in 2024, in partnership with BlackRock's Climate Infrastructure business, Google will help support the creation of a 1 GW pipeline of new solar capacity in Taiwan through an investment in New Green Power (NGP), a Taiwanese solar developer.

Google is projected to procure up to 300 MW of solar energy through this pipeline and may offer some of the clean energy to its semiconductor suppliers and manufacturers within its supply chain to support their own sustainability goals.

"Our long-standing data center efficiency efforts are important because our data centers represent the vast majority of our direct electricity use. Google's [global] data center consumption was more than 24 TWh in 2023 which translates to approximately 7-10% of global data center electricity consumption."

- 2023 & 2024 Google Environmental Reports

>90%

Industrial Water

Used for cooling at the Changhua County data center, reducing demand on the potable water system used to serve the general public. Google strives to protect water quality and ecosystem health in the communities where it operates, including Taiwan.³

Sustainability Spotlight

Google is working with CLEAN International to install rainwater harvesting systems and storage tanks at schools in Taipei City, New Taipei City, and Changhua County. The water will be used for cleaning, landscape maintenance, sanitation, and cooking.

Notes: 1. For more information on the environmental statistics, refer to the 2023 & 2024 Google Environmental Reports. 2. As applicable, the water consumption represents total water consumption across all data centers in the country; CFE and PUE are averages across data centers. 3. Google seeks to replenish 120% of the freshwater volume it consumes, on average, across its offices and data centers by 2030.

Social Impact: 2022 & 2023¹



TWD ~15M²

Given to communities
in 2022 and 2023

*Surrounding Google's data center
in Taiwan in addition to other
Google.Org programs³*



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Organizations supported
in 2022 and 2023

*Focused on education, workforce,
and community development,
among other areas*



TWD ~107.60⁴

Social benefit per
Google-invested dollar⁵

*Based on STEM educational
program⁶*

Google invested TWD ~15M² in Taiwan communities, including:

Community Empowerment

In 2023, Google gave TWD ~3M⁷ to Taiwan Green Energy for Charity Association to support Wang Gong Oyster Cultural Association's efforts to promote community marine education and increase employment opportunities for elderly individuals and migrant women of Fang Yuan. Google's support included:

- Energy Equity: The purchase and installation of solar panels to help transition the community to solar energy and lower energy bills.
- Climate Education: Support for the creation of climate resilience education materials and activities for the community, with a particular focus on immigrant women.

STEM Programming

In 2022 and 2023, Google gave TWD ~3M⁸ to help Junyi Academy provide game-based digital learning programs for rural students in Changhua and Miaoli.

- The partnership began when Google employees volunteered to help integrate Google's CS First curriculum into Junyi's online courses and has since evolved to reach over 3,000 students and teachers in the community.
- Google's efforts have helped generate the social benefit referenced above.

"Google's funding allows us to train local teachers in Miaoli and Changhua to integrate digital tools into their teaching to improve the academic ability of disadvantaged students in rural areas of Taiwan."

- Ray Lu, Chairman and CEO, Junyi Academy

Notes: 1. Numbers were converted into local currency using the average 2022-2023 exchange rate and rounded to the nearest one-million. 2. Equivalent to USD ~489K. 3. The amounts listed are in addition to other Google programs, like Grow with Google, Google.Org's Impact Challenge, and other initiatives. 4. Equivalent to USD ~3.5. 5. This calculation is directional and represents Google's step toward understanding social value associated with its community investments. 6. Calculation based on Junyi Academy program. 7. Equivalent to USD ~100K. 8. Equivalent to USD ~110K.

The Google Differentiator

Google recognizes that its data center operations and value chain can be engines of economic, environmental, and social progress. Google aims for its investments to catalyze positive spillover effects within Taiwan.

Google thinks about its investments holistically.

Google recognizes that it can catalyze greater impact when it looks at its economic, environmental, and social efforts collectively, which is why Google's 2024 Impact Study in Taiwan articulates Google's impact across these three domains. As Google considers its future strategy in Taiwan, it will continue to look for opportunities to keep digital infrastructure secure and sustainable while driving local economic development, fostering thriving communities, and spurring environmental stewardship.

Google seeks to harness AI to drive innovation and accelerate climate action.

Google continues to invest in state-of-the-art infrastructure to support its artificial intelligence (AI) efforts and rapidly grow the digital economy in Taiwan. However, Google recognizes that these benefits also come with increased energy usage and emissions and might have unintended consequences if not properly managed. As part of its AI for Sustainability strategy, Google is taking steps to use AI to accelerate climate progress and through its AI Opportunity Agenda, Google is providing recommendations for governments to amplify the positive impacts of AI for the broadest possible range of people.

Google seeks to engage directly with community members to advance and measure impact.

Google continues to work closely with community members in Taiwan to understand its impact and refine its strategy. This report represents a step toward measuring impact as Google moves from measuring inputs to measuring impact and value. This includes Google's approximation of a "social return on investment", intended to estimate the social value created per Google-invested dollar based on educational empowerment and future job opportunities. Google will continue to find ways to be more transparent and articulate its impact to local communities across all dimensions.

Thank you!

To the many community members and Googlers who strive to make Google's ambitious economic, environmental, and social goals a reality.

For additional information or any questions please reach out to:



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DISCLAIMER: This Impact Study was prepared by Deloitte Consulting LLP ("Deloitte") for Google LLC ("Google") during Fall 2024. The purpose of the study is to assess the economic, environmental, and social impacts of Google's data centers modeled from the years of 2021-2023. The modeling, analysis, and results shown as part of the impact are based on information provided directly by Google LLC, publicly available information, and third-party information. Any revisions to those data will affect the assessments shown as part of the study. To calculate economic impacts, this study used an input-output model developed by IMPLAN. In preparing this study, Deloitte has, without independent verification, relied on the accuracy of information made available by Google.