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Google’s network infrastructure investments in Taiwan

Investments in submarine cables

**FASTER**
*2016*
- Cable landing points: Japan, Taiwan, USA

**PLCN**
*2020*
- Cable landing points: Taiwan, USA, the Philippines

**Apricot**
*2024*
- Cable landing points: Singapore, Japan, Indonesia, the Philippines, Taiwan, Guam

- **6** cities with GGC nodes
- **5** peering locations in 2 cities

Benefits to digital connectivity

SUPPORT USE-CASES FOR POST-PANDEMIC DIGITAL TRANSFORMATION:
- Cloud services
- e-Commerce
- Video-conferencing

**2026 FORECAST**

- **36%** usage of Internet enabled
- **26%** reduction in end-user latency
- **25%** reduction in IP transit prices
- **32%** increase in Internet bandwidth
Economic impact

Forecast to support up to 110,000 additional jobs in 2026

Supported up to 64,000 additional jobs in 2021

USD26 BILLION FROM 2010 TO 2021
USD37 BILLION FROM 2022 TO 2026

2010 2021 2026
GDP

Regulatory and investment regime

Need to enable ease of:

- Deployment and landing of submarine cables
- Protection and maintenance of submarine cables

Taiwan can benefit from following best practices from other leading APAC economies

Potential areas of progression

- Implement non-discriminatory and cost-oriented access to cable landing stations to promote stronger competition between operators
- Government facilitated discussions between the fishery and submarine cable owners – an area that has been historically difficult
This report is an update of the *Economic impact of Google’s APAC network infrastructure – focus on Taiwan* report, released in 2020.\(^1\) We have further refined our methodology first used in 2020.\(^2\)

Since 2020, digital connectivity and the economic landscape of Taiwan have seen significant development, largely due to the impact of the Covid-19 pandemic. This report will refresh our quantitative impact estimates in line with these developments and our improved methodology.

Taiwan is one of the most technologically advanced economies globally and also has a relatively developed telecoms landscape, with the majority of broadband subscriptions being full fibre.\(^3\) Internet traffic generated across both fixed and mobile networks has grown strongly at an average of 43% annually from 2010 to 2021, reaching a total of 30EB in 2021.

In terms of regulation, Taiwan has a strong regulatory environment that is conducive to foreign investments in infrastructure. In 2021, Taiwan was connected to 14 international submarine cables.\(^4\) The four most recent cables to be deployed (FASTER – 2016, APG – 2016, NCP – 2018, PLCN – 2020) and both of the announced future cables (SJC2 – 2022, Apricot – 2024) all have investments from CASPs such as Google, Meta, and Microsoft.

There are three main mobile service providers in Taiwan:

- **Chunghwa Telecom** – the incumbent and largest telecoms operator in Taiwan
- **Taiwan Mobile Company** – the second-largest operator in Taiwan
- **Far EasTone** – the third-largest telecoms operator, focusing on mobile services.

Taiwan is establishing a Ministry of Digital Affairs in 2022 to continue promoting its advantage across the digital economy, cyber security and digital transformation. National policy developments supported by the new ministry, along with other infrastructure investment plans and governmental initiatives such as DIGI+, will promote a diverse range of projects including the Internet of Things (IoT), digital rights and smart machinery.

### 1 Google’s network infrastructure investments generated benefits to the connectivity ecosystem, leading to greater usage of the internet in Taiwan

Google’s edge network and submarine cable investments in Taiwan boost traffic by improving the performance and reliability of Google services and content, as well as the overall internet infrastructure of the economy. New submarine cables bring new supply and improve international

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2. We have updated the list of cables with additional “open-cable” effect to include not just Google cables but that of other CASPs. We have also assessed the impact differently for each Google cable depending on a combination of factors including the number of international submarine cables landing in the country, the number of Google cables landing in the country, the consortium members participating in the cable, and Google’s level of contribution to the consortium.
3. TeleGeography, Analysys Mason Research
4. For the avoidance of doubt, in the count of 14 cables, RNAL/FNAL and EAC 1/2 are considered as 4 cable systems
cable route diversity while directly supporting Google’s edge infrastructure. Internet service providers (ISPs) and end users benefit from lower latency, faster speeds and low international connectivity costs, and consequently there is an uptake of new internet use cases and applications.

Google has invested in two currently deployed cables (FASTER and PLCN) and announced investment in Apricot, which is due to be ready for service in 2024:

- **FASTER (2016)** – trans-Pacific cable connecting Japan, Taiwan and the USA
- **PLCN (2020)** – high-capacity, trans-Pacific cable connecting Taiwan and the Philippines to the USA, with the world’s first use of C+L technology to increase capacity
- **Apricot (2024)** – Pan-Asian cable system connecting Singapore, Japan, the Philippines, Indonesia and Taiwan.

A map of Google’s submarine cable investments that connect to Taiwan is provided in Figure 1. These cables have significantly increased international capacity and internet performance for Taiwan, therefore enabling sustained traffic growth since 2016 and into the future.
Apart from investments in international capacity, Google has also continued its investments in edge infrastructure. Google has deployed points of presence (PoPs) in three private peering facilities and cross-connected to internet exchange points (IXPs) at two locations as summarised in Figure 2 below. Google also invests in content caches, and Google Global Cache (GGC) nodes are already deployed in six cities across Taiwan.

<table>
<thead>
<tr>
<th>Name of facility / fabric</th>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPIX-TW</td>
<td>Public</td>
<td>Taipei</td>
</tr>
<tr>
<td>TWIX</td>
<td>Public</td>
<td>Taipei</td>
</tr>
<tr>
<td>CHT Taipei Aikuo IDC</td>
<td>Private</td>
<td>Taipei</td>
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<tr>
<td>CHT Taipei Banqiao IDC</td>
<td>Private</td>
<td>New Taipei City</td>
</tr>
<tr>
<td>Chief LY Building Taipei</td>
<td>Private</td>
<td>Taipei</td>
</tr>
</tbody>
</table>

Figure 1: Map of Google’s submarine cable investments that connect to Taiwan [Source: Submarine Cable Map, 2022]

Figure 2: List of Google peering facilities in Taiwan [Source: Google, PeeringDB, 2022]
These investments in submarine cables, PoPs and GGC nodes in Taiwan have continued to bring improvements to the connectivity ecosystem.

**End-user latency**  
End-user latency will reduce by an additional 21 milliseconds (or 26%) by 2026 with Google’s investments

**IP transit prices**  
IP transit prices are forecast to be 25% lower by 2026 due to the increased internet supply from FASTER, PLCN and Apricot

**Download speeds**  
In 2021, the average download speeds in Taiwan were more than three times that of less well-connected economies

**Internet traffic**  
By 2026, we forecast that the impact of Google’s investments will have enabled 36% of internet traffic

2 **These investments generate social benefits by supporting new use cases and economic benefits in the form of GDP growth and jobs**

One of the impacts of the Covid-19 pandemic was a notable increase in remote working and online activity, significantly expanding the economic reliance that Taiwan has on internet connectivity. This is expected to have accelerated Taiwan’s transition to digitalisation both in a work context and outside of it. We estimate that the additional internet usage enabled by Google’s network infrastructure investments has driven an additional cumulative USD25.7 billion in GDP (in real terms) in Taiwan from 2010 to 2021. As a result of Google’s historical and future network infrastructure investments in Taiwan, we forecast an additional cumulative USD37.1 billion in GDP enabled by Google’s investments between 2022 and 2026 (see Figure 3 below).

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5 We forecast that Google's network infrastructure investments will drive an additional 56% increase in internet traffic beyond forecasts without these investments by 2026. This results in 36% of total traffic being attributed to Google's network infrastructure investments in Taiwan.

6 GDP figures are in constant USD using 2020 as the base year and using a fixed exchange rate to USD in 2020; GDP statistics in USD are sourced from the World Bank and Euromonitor.
The economic benefits arising from Google’s network infrastructure investments lead to direct job creation in sectors such as telecoms and construction. Indirect job creation is prominent in industries that can benefit most from improved internet connectivity and digitalisation, namely IT, financial and professional services, and manufacturing. Based on the gross value added (GVA) of these industries, we estimate that the increase in GDP from Google’s network infrastructure investments supported up to 64,000 direct, indirect and induced jobs in 2021, growing to 110,000 in 2026 (see Figure 4).

Figure 3: Increase in real GDP attributable to Google’s network infrastructure investments in Taiwan [Source: Analysys Mason, 2022]

Figure 4: Jobs supported by Google’s network infrastructure investments in Taiwan [Source: Analysys Mason, 2022]
3 **Investments in network infrastructure continue to drive security, reliability and performance improvements in cloud services, while cloud adoption is booming**

As discussed in our original report, Google’s network infrastructure investments are beneficial to ISPs and end users in various ways, by providing route diversity, reducing latency, and increasing availability and network resilience. Cloud services, including Google Cloud, can in turn offer improved service quality, security and reliability to their users. Google’s infrastructure also delivers cloud traffic directly, which means that traffic from Google Cloud customers is shielded from internet attacks on traffic carried over public internet infrastructure.

At the end of 2021, Google Cloud deployed in 11 cloud regions in APAC – one of the cloud regions was deployed in the Changhua County data centre that Google first deployed in Taiwan in 2013, and contains three availability zones. In the data centre, Google utilises an efficient cooling system that uses local temperature variation to cool the water that is pumped through the system during the day, ensuring that this is one of Asia’s most efficient and environmentally friendly data centres. Google also purchased the output of a 10-megawatt solar array in Tainan City, Taiwan, therefore reducing the data centre’s carbon footprint and financing renewable energy for the overall economy.7

4 **Taiwan’s mature regulatory environment supports the deployment and maintenance of submarine cables**

In Taiwan, the regulatory and investment regime around submarine cable applications, deployment and maintenance is well established and effective. In December 2021, the government hosted a strategic forum on “Taiwan’s submarine cable industry in the digital economy era”8. At this forum, it was announced that the National Communications Commission had streamlined procedures into a single application window and would act as the ‘one-stop-shop’ for future submarine cable applications.

Taiwan could consider an open cable landing station regime (as exercised by best practice markets like Singapore) which enables access to cable landing stations at non-discriminatory, cost-based terms. The government could also facilitate discussions between the submarine cable and fishery industries to reduce friction and arrive at fairer compensation for the fishery industry.

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7 Google – Changhua County, see: google.com/about/datacenters/locations/changhua-county/

8 Telecom Technology Center, see: ttc.org.tw/News/Event_more?id=1ed13c2b560e472987980389fa43f525