



REPORT FOR GOOGLE

2022 UPDATE: ECONOMIC IMPACT OF GOOGLE'S APAC NETWORK INFRASTRUCTURE FOCUS ON TAIWAN

David Abecassis, Dion Teo, Nabeel Hussain

SEPTEMBER 2022

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Analysys Mason Limited
North West Wing, Bush House
Aldwych
London WC2B 4PJ
UK
Tel: +44 (0)20 7395 9000
london@analysismason.com
www.analysismason.com
Registered in England and Wales No. 5177472

This report was commissioned and sponsored by Google, and prepared independently by Analysys Mason, a global consultancy specialising in telecoms, media and technology.

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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



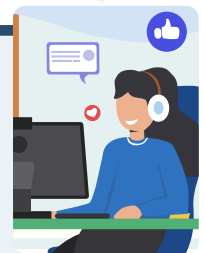
25%

REDUCTION
IN IP TRANSIT
PRICES



32%

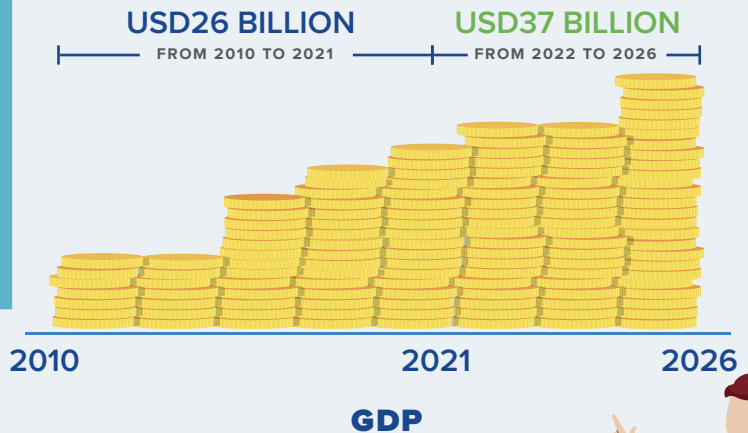
INCREASE
IN INTERNET
BANDWIDTH



Economic impact

Forecast to support up to
110 000
additional jobs
in 2026

Supported up to
64 000
additional jobs
in 2021



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

¹ Analysys Mason – Economic impact of Google's APAC network infrastructure, see: [analysismason.com/consulting-redirect/reports/impact-of-google-network-apac-2020/](https://www.analysismason.com/consulting-redirect/reports/impact-of-google-network-apac-2020/)

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

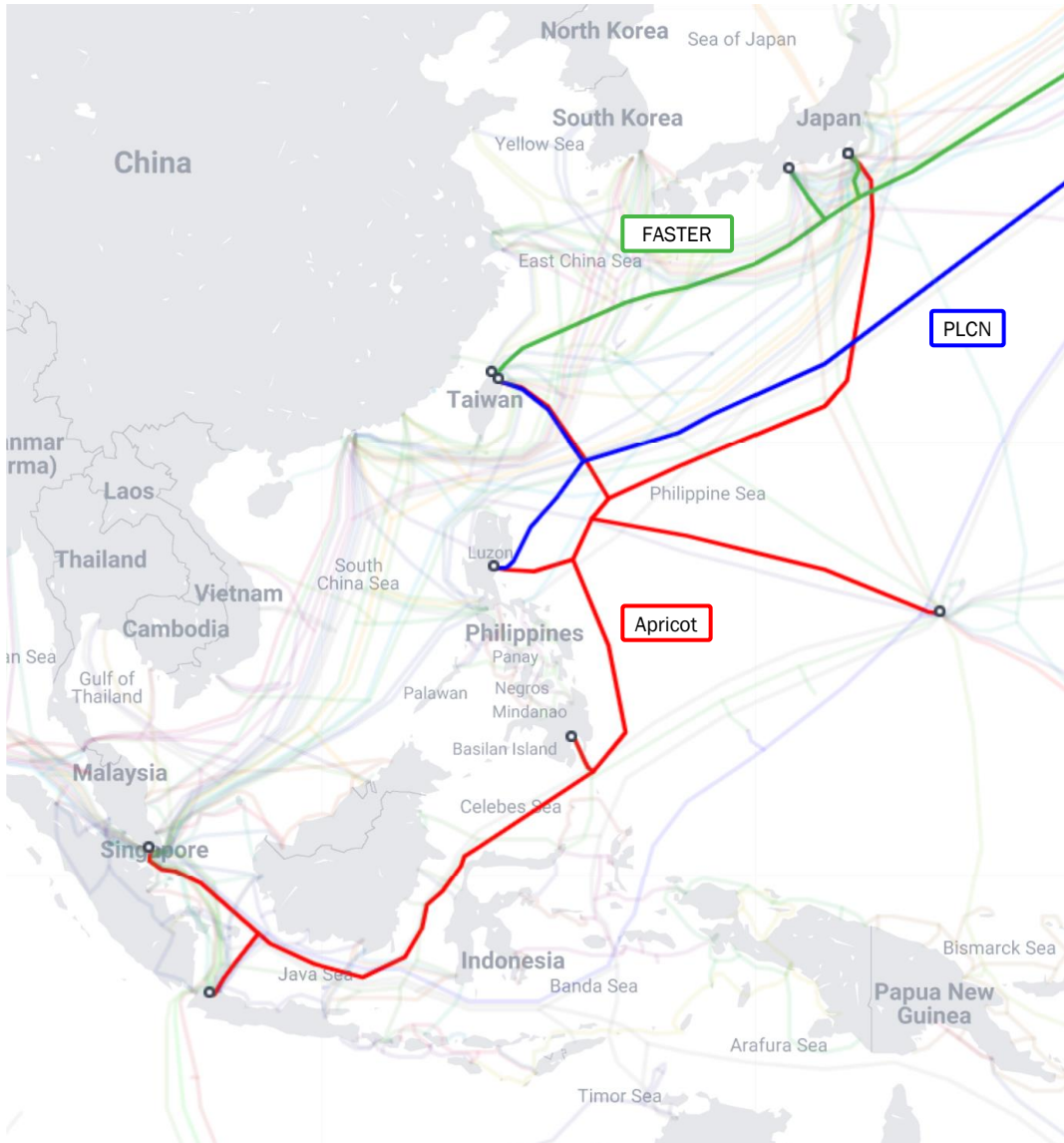
cable route diversity while directly supporting Google's edge infrastructure. Internet service providers (ISPs) and end users benefit from lower latency, faster speeds and low international connectivity costs, and consequently there is an uptake of new internet use cases and applications.

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.

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



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.

Name of facility / fabric	Type	Location
TPIX-TW	Public	Taipei
TWIX	Public	Taipei
CHT Taipei Aikuo IDC	Private	Taipei
CHT Taipei Banqiao IDC	Private	New Taipei City
Chief LY Building Taipei	Private	Taipei

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.

<i>End-user latency</i>	End-user latency will reduce by an additional 21 milliseconds (or 26%) by 2026 with Google's investments
<i>IP transit prices</i>	IP transit prices are forecast to be 25% lower by 2026 due to the increased internet supply from FASTER, PLCN and Apricot
<i>Download speeds</i>	In 2021, the average download speeds in Taiwan were more than three times that of less well-connected economies
<i>Internet traffic</i>	By 2026, we forecast that the impact of Google's investments will have enabled 36% of internet traffic ⁵

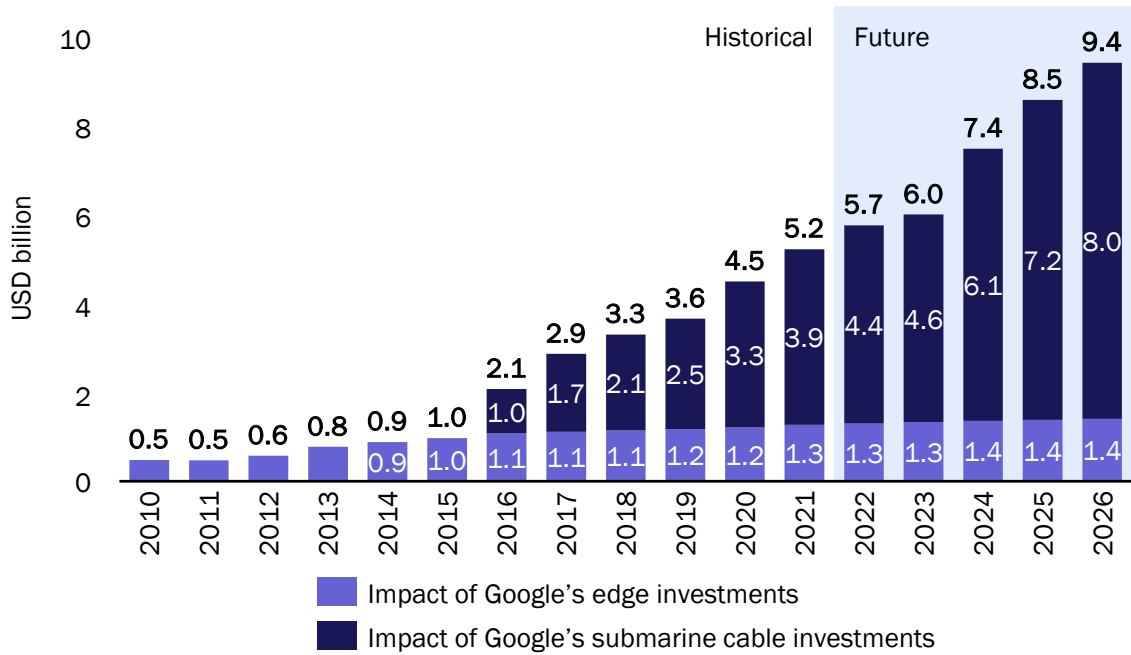
2 These investments generate social benefits by supporting new use cases and economic benefits in the form of GDP growth and jobs

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 terms⁶) 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).

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.

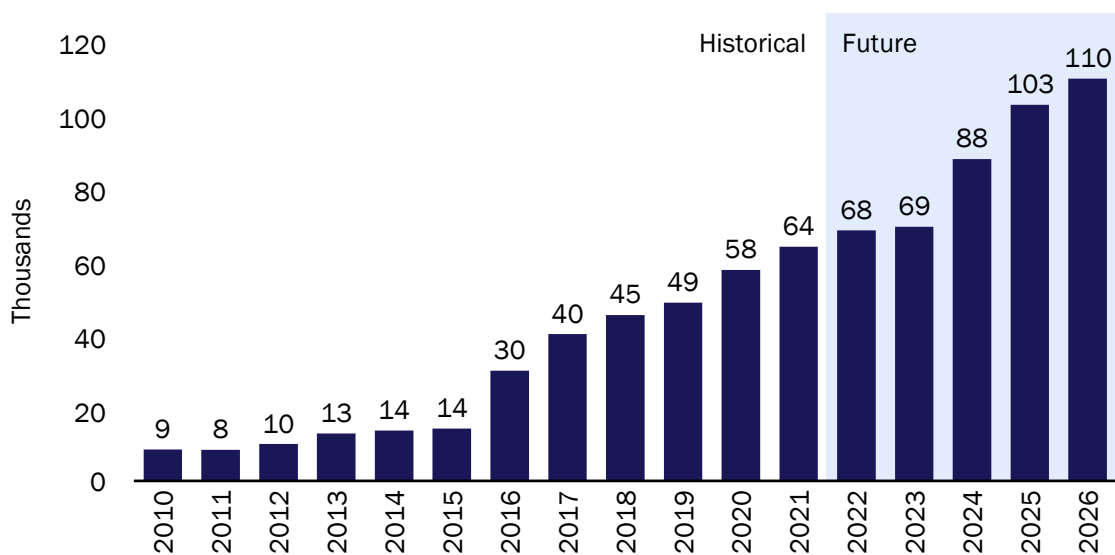
⁶ GDP figures are in constant USD using 2020 as the base year and using a fixed exchange rate to USD in 2020; GDP statistics in USD are sourced from the World Bank and Euromonitor

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



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 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.

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