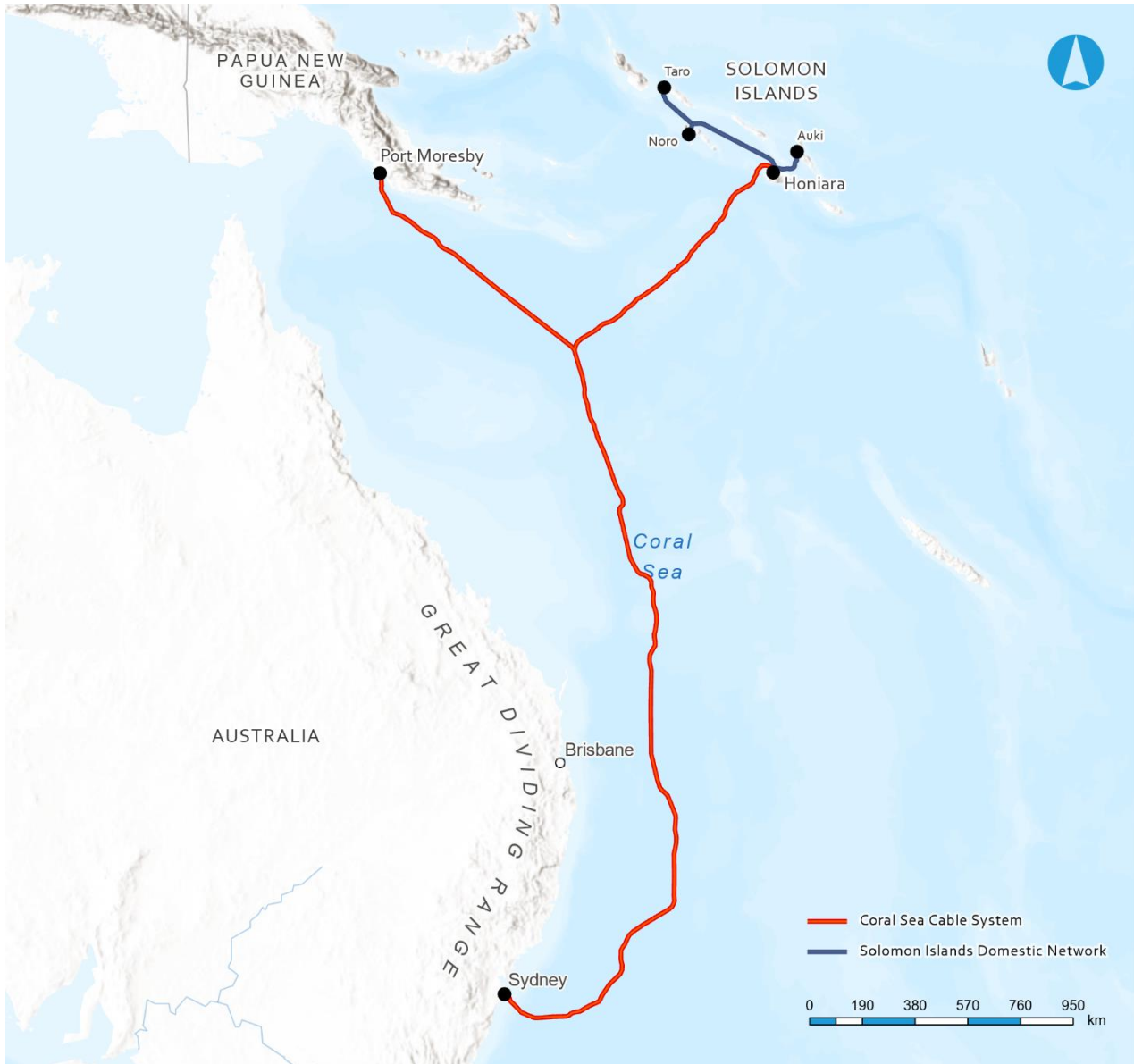


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Coral Sea Cable System (Australia – Papua New Guinea – Solomon Islands)



Source: Ramboll

Location	Sydney (Australia) – Port Moresby (Papua New Guinea) – Honiara (Solomon Islands)
Sector	Information and Communications Technology
Procuring Authorities	Australian Government
Project Company	Coral Sea Cable Company
Contract Obligations	Design and Build (for the first phase)
Financial Closure Year	2019
Capital Value	AUD 200 million (USD 131 million – 2019 value)
Start of Operations	2020
Key Facts	100% governmental subsidies

Project highlights

The Coral Sea Cable System (CS2) is a 4,700 kilometre (km)-long fibre optic submarine telecommunications cable, which links both Papua New Guinea and Solomon Islands to the major East Coast Internet Hub in Sydney, Australia. The project also includes a Solomon Islands Domestic Network (SIDN), a 730km submarine cable connecting Honiara to three provincial centres (Auki in Malaita Province, Noro in Western Province and Taro in Choiseul Province).

The aim of the CS2 project is to provide faster, affordable and more reliable internet connection to Papua New Guinea and Solomon Islands. Prior to the project, the two countries were dependant on either low-capacity submarine cable connections (Papua New Guinea) or expensive satellite links (Solomon Islands).

The CS2 has a four fibre-optic pair core, sheathed in one physical cable from Australia over 2500 km to a Branching Unit (BU) in the Coral Sea, where the four fibre-pair core is then split into two cables, each containing a two-fibre pair core, that make their way to landing stations in Port Moresby and Honiara.

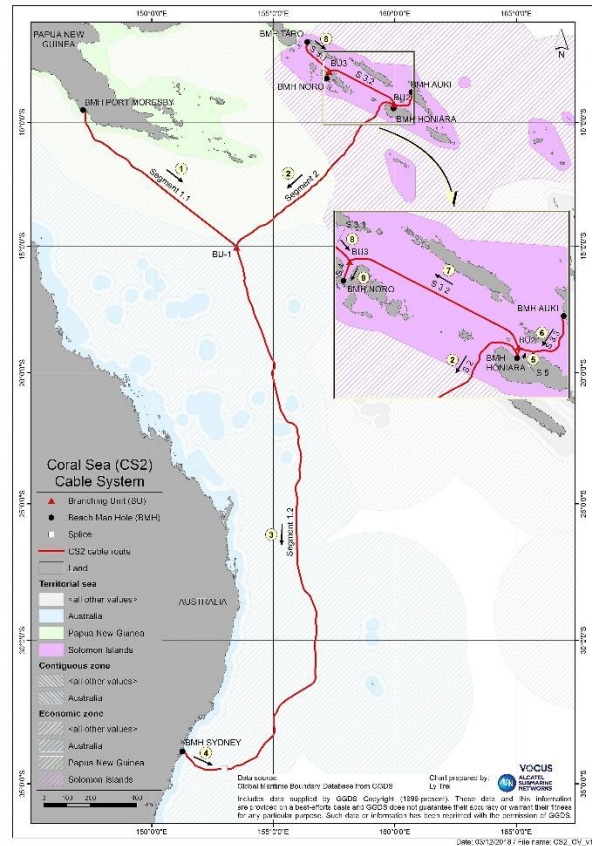


Fig. 1 Project site overview (Source: Vocus and Alcatel Submarine Networks)

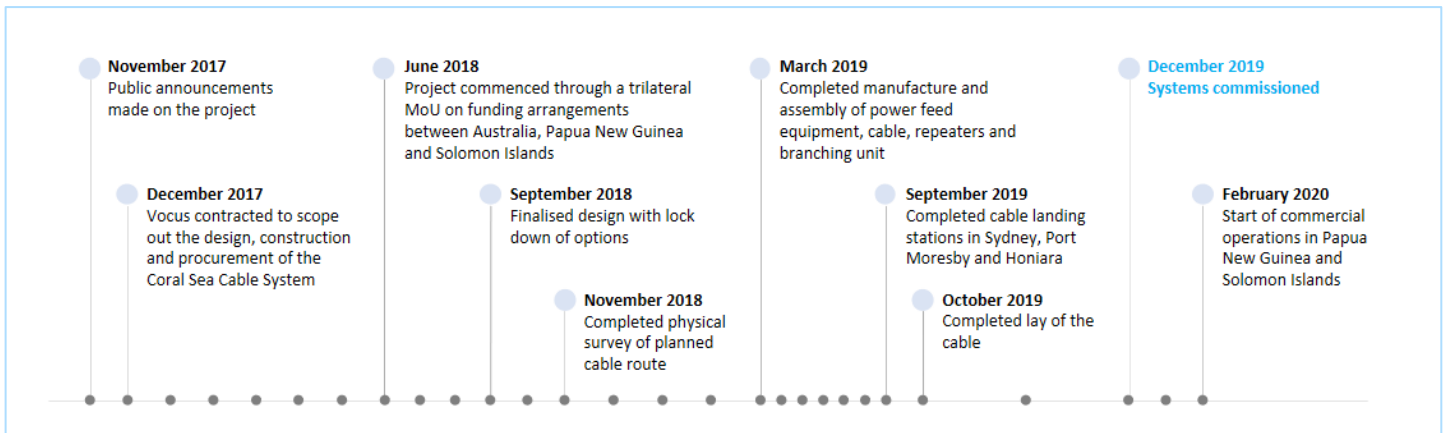
The four fibre-pair system has a total capacity of 40 Terabits/second (sec). Each country will be able to access up to 20 Terabits/sec of bandwidth if the cable was expanded to full capacity. The initial installed capacity of the system is 200 Gigabits/sec to each country.

The CS2 project was carried out in partnership between the Australian Government (DFAT, Department of Foreign Affairs and Trade) and the two infrastructure providers: PNG DataCo Limited and the Solomon Islands Submarine Cable Company Limited (SISCC). The design, construction and installation were managed by Vocus Communications (an Australian fibre optic cable network provider and operator), while the technology was supplied by Alcatel Submarine Networks.

The project was initiated in late 2017 and operationally ready in December 2019. Its total project budget was about AUD 200 million (USD 131 million in 2019). The Australian Government provided the majority of funding, with the Papua New Guinea and Solomon Islands Governments jointly contributing up to one third of the project costs.

This report contains information retrieved from the literature on the project, validated through stakeholder interviews.

Project timeline¹



Development

The policy and planning setting

Papua New Guinea, Solomon Islands and Australia are committed to supporting inclusive economic growth in the Pacific region. The partnership with the Pacific is one of the highest foreign policy priorities of the Australian Government, as highlighted in the 2017 Foreign Policy White Paper². This approach recognises that closer cooperation among Pacific countries is essential to the region’s long-term economic and security prospects.

The Australian Government further enhanced its commitment to work with governments in the Pacific through the Pacific Step-up announced in September 2016. The Step-up is a 'step-change' in the way Australia responds to sovereignty, stability, security and prosperity needs in the Pacific region.

One of the dedicated instruments for closer regional cooperation is the Australian aid program, operated by the Australian Government, with the majority of expenditure managed through DFAT³. The purpose of the program is to promote Australia’s national interests by contributing to sustainable economic growth and poverty reduction with a strengthened focus on the Indo-Pacific region. Targeting private sector development and human development, the program invests in infrastructure, trade facilitation and international competitiveness, agriculture, fisheries and water, effective governance, better quality education and health systems, and building resilience to natural disasters and economic shocks, as well as gender equality and empowering women and girls.

The program’s infrastructure portfolio aims, among other things, to unlock transformational information and communication technologies to expand access to banking services, market information, and commercial opportunities. This will help create the right conditions for the private sector and expand trade.

¹ Source. Project website, <https://www.coralseacablesystem.com.au/progress/>

² <https://www.fpwwhitepaper.gov.au/>

³ <https://www.dfat.gov.au/aid/Pages/australias-aid-program.aspx>

Challenges and opportunities addressed by the project

With the advancing digitalisation of the global economy, access to and demand of high-quality information and communications technologies (ICT) play a key role in achieving sustainable social and economic growth. High-capacity networks ensure better business productivity, help modernise public services and may reduce access inequalities - providing cost-effective solutions to more people⁴. The demand for high-bandwidth services is growing rapidly yet supply is hampered by very high capital expenditure investment to deliver hardware and software and obtain the related licences and permissions.

In the Pacific region, this connectivity constraint is being addressed by progressive deployment of submarine optical fibre cables, through a combination of private and public funding, as well as investments by telecom services in low-latency medium earth orbit satellite services (O3B Networks⁵) and conventional satellite services⁶.

Submarine fibre cables offer a higher capacity and lower latency (delay) than satellite systems, which implies more reliable service and – prospectively - more reasonable customer pricing. On the other hand, if the cable is damaged and needs to be repaired, there may be service disruption. Moreover, their end capacity (at customer) depends on the quality of domestic network infrastructure to which the submarine cables connect at landing points.

The satellite technology, although it can help cover larger geographical areas, has a lower signal speed and capacity, and requires specific equipment (such as a transmitter, dish and modem). In addition, the transmission may be susceptible to noise and interference because of weather conditions, for example, heavy rainfalls and thunderstorms, which leads to quality deterioration.

In late 2017, the three governments expressed commitment to working together to lay a new submarine high-speed telecommunications cable for the purpose of supporting the future digital economy in Papua New Guinea and Solomon Islands, and enabling these two countries to reap the economic and development benefits of fast and reliable telecommunications.

In 2017, only 11-12% of the population of Papua New Guinea and Solomon Islands had access to the internet⁷. Prior to the CS2 project, Papua New Guinea had two international submarine fibre optic cable connections to Australia. The APNG-2 submarine cable, in service from 2006, has a total capacity of 1.12 Gbps⁸, while the PNG Spur of the PPC-1 cable completed in 2009 provides a total of 10 Gbps⁹. The CS2 provides capacity 20 times higher than the capacity of the latter.

Solomon Islands, in turn, had been reliant on satellite links for international voice and data broadband communications. The submarine cable is expected to raise broadband capacity by 6,000 times¹⁰, relative to estimated 2019 satellite usage.

Perceived long-term benefits

⁴ Verougstraete M., <https://www.gica.global/resources/mpfd-working-paper-public-private-partnership-cross-border-infrastructure-development>

⁵ Satellite services primarily intended to provide voice and data communications to mobile operators and Internet service providers in emerging markets

⁶ World Bank research (Assessment of the Potential Impact of the ICT Revolution in the Pacific on Economic Growth, Employment, and Government Revenue; Pacific Possible Technical Note by Robert Utz, June 28, 2017

⁷ Data by the World Bank, <https://data.worldbank.org/indicator/IT.NET.USER.ZS>

⁸ Telecom PNG, <https://www.telikompng.com.pg/index.php/wholesale/apng2-submarine-cable>

⁹ <https://www.submarinenetworks.com/en/systems/australia-usa/ppc-1>

¹⁰ <https://www.coralseacablesystem.com.au/articles/sidn-lay-completed/>

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The CS2 investment is expected to facilitate access to the global digital economy for Papua New Guinea and Solomon Island. By offering more cost-effective bandwidth to licensed operators, it should make the telecommunications services more affordable to their retail customers.

Even though prices of entry level internet packages in Papua New Guinea had fallen by as much as 70% in the 2013-2016 period, the cost per gigabyte was still many multiples of that in developed countries. At around 10–20% of average monthly incomes, entry-level internet prices prior to the project were still out of reach for the majority of Papua New Guinea citizens. The pricing was also above the International Telecommunications Union’s benchmark for driving rapid uptake of internet of less than 3–5% of average monthly income¹¹.

A wholesale access rate was as high as about USD 1700 per Mbps per month in 2013. It reduced to about USD 445 per Mbps per month in mid-2016 and fell further to USD 170 per Mbps per month in 2017. The rate is estimated to be further reduced to USD 98 per Mbps per month for a 1 Gbps connection when the CS2 is commercialised¹². The maximum wholesale price for international submarine cable transmission capacity in Papua New Guinea is determined by the National Information and Communication Technology Authority (NICTA)¹³ and, per public notices, the maximum wholesale price for the CS2 was set to drop to an equivalent of USD 52 per Mbps per month for 2020, USD 38 per Mbps per month for 2021, USD 25 per Mbps per month for 2022 and USD 21 per Mbps per month for 2023¹⁴.

Also, the SISCC self-assessment model indicates an initial reduction in the wholesale price offered to licensed operators of well over 50%, followed by continuing significant reductions with increased demand¹⁵.

The significant improvements in internet reliability, speed, quality and affordability in Papua New Guinea and Solomon Islands will be transformative to business development and will bring substantial social benefits. The cable offers capacity well beyond forecasted demand in Papua New Guinea and Solomon Islands. The CS2 could unlock new opportunities for growth and connectivity for the two countries as it connects their tourism and agribusiness industries to the global marketplace, offering easier access to business and education services and boosting people-to-people contacts.

Through the complementary Solomon Islands Domestic Network (SIDN), key provincial centres should benefit from the new international cable system to extend the economic and social benefits of high-speed internet to the Solomon Islands’ highly dispersed population. In Papua New Guinea, the CS2 is part of Papua New Guinea’s vision to achieve stability in connecting the country to the international network by means of various backup options and to improve domestic connectivity.

The CS2 project is expected to allow the application of digital technologies in education and healthcare and will contribute to better governance (e.g. by digitisation of government services).

As the increased connectivity also results in higher cybercrime risks for the countries’ national infrastructure, the Australian Government has, in parallel, deepened cooperation with the Pacific region countries to improve cyber resilience. For example, as part of Australia’s International Cyber Engagement Strategy, a Cyber Security Operations Centre was established in Solomon Islands, while the Solomon

¹¹ The National Research Institute Papua New Guinea. Discussion paper ‘Why are internet prices high in Papua New Guinea?’, <https://pnqnri.org/images/Publications/DP148---201610---Deloitte---Internet-Prices.pdf>

¹² <https://www.pngdataco.com/services-over-the-coral-sea-cable-system-now-on-offer/>

¹³ The National Information and Communications Technology Authority (NICTA) is a government agency responsible for the regulation and licensing of Information Communication Technology (ICT) in Papua New Guinea.

¹⁴ <https://www.nicta.gov.pg/downloads/download-info/no-g1014-specific-pricing-principles-submarine-cable-service-2019/>

¹⁵ <https://static1.squarespace.com/static/5b3afcce1aef1d74ee49c86a/t/5be8f003c2241bb5cb83e384/1541992453808/ISSUE+42+SSC+copy.pdf>

Islands Government ICT Support Unit is a partner in the Australian Government’s Cyber Cooperation Program to help build its technical capacity and cyber incident response skills of its staff.

Similarly, a Memorandum of Understanding between Papua New Guinea and Australia aims to strengthen cyber cooperation between the two countries. This includes, among other things, the establishment of a Cyber Security Operations Centre (CSOC) to monitor threats and controls, and enhancement of Papua New Guinea's newly established Computer Emergency Response Team.

Financing

Infrastructure financing

The project was co-funded by the Governments of Australia, Papua New Guinea and Solomon Islands under the terms of a Memorandum of Understanding on the funding of construction and installation of the CS2 signed on 11 July 2018.

Australia grant-funded 66.7% of the total cost, with the remainder covered by the two other countries. The exact co-contribution was based on the formula that Papua New Guinea and Solomon Islands each pay 16.7% of the total cost of the cable system to the Branching Unit (BU) and, similarly, equally split the co-contribution to overall project management. From the BU to each country, the country in question pays 33.3% of the costs of that part of the system. Australia and Solomon Islands funded SIDN with the same two-thirds, one-third approach.

The Solomon Islands Government contribution was made through the Solomon Islands Submarine Cable Company Limited (SISCC). It is a joint venture company established in August 2016 to build and operate submarine fibre optic communication systems for Solomon Islands.

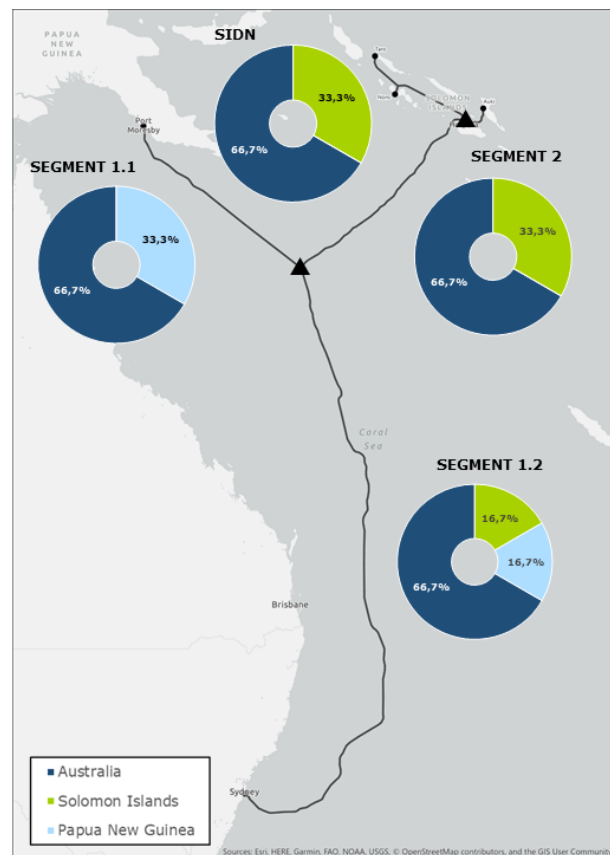


Fig 1. Cost distribution for each segment of the investment (Source: Ramboll)

The shareholders of SISCC are the Investment Corporation of the Solomon Islands (ICSI) with 51% of the share capital and the Solomon Islands National Provident Fund (SINPF) with 49% of the share capital.

Although it is not a State-Owned Enterprise, SISCC operates under direct government investment and control through the ICSI and the participation of all Solomon Islanders through the SINPF.

SISCC signed the Solomon Islands Landing Party Agreement with the Australian Government on 13 June 2018. Under this agreement, SISCC constructed all the landing party infrastructure in Solomon Islands ready for the installation of the cable. An equivalent Landing Party Agreement for Papua New Guinea was signed between the Australian Government and PNG DataCo Limited.

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PNG DataCo Limited (DataCo) operates and manages over 2100 km of fibre optic network comprised of both terrestrial and submarine cables. It was established by the Government of Papua New Guinea as a State-Owned Enterprise in February 2014 to own, manage, operate and maintain telecommunications wholesale infrastructure and assets. PNG DataCo's objective is to ultimately provide high capacity, resilient and robust wholesale international and domestic network telecommunications at competitive and non-discriminatory prices to retail service providers in Papua New Guinea.

Since the project completion in December 2019, Papua New Guinea and Solomon Islands majority-own the international cable and receive all revenue generated. Solomon Islands also owns its domestic cable and all revenue generated. SISCC and DataCo were each granted Indefeasible Rights of Use (IRU) over two fibre pairs for the full lifetime of the CS2 (25 years).

SISCC and DataCo are each a wholesale provider of internet and communications bandwidth to licensed operators in Solomon Islands and Papua New Guinea, respectively, on a non-discriminatory basis. Their main business aim is to provide the lowest cost possible for internet bandwidth while recovering investment for their shareholders (from licence fees and any other sources), to strive for a greater uptake of services through the retail operators and thus to deliver economic growth and greater social benefits.

Private sector involvement

Vocus, a leading Australian fibre optic cable network provider and operator, entered into an agreement with Australia's DFAT in December 2017 to scope out the design, construction, and procurement of the CS2. The three-month scoping study involved gathering detailed requirements; engaging the governments of Papua New Guinea and Solomon Islands in consulting on cost, performance and feasibility options for the investment; and commencing permits.

Through the tender process following the scoping study, Vocus was chosen to manage the rollout of the cable system on behalf of the Australian Government under an Engineering, Procurement and Construction (EPC) contract that was signed on June 18, 2018. The assignment stemmed from the vast experience of this company in building and managing fibre optic infrastructure. The CS2 was the third submarine cable project undertaken by Vocus since 2014. The company had already completed the 2,100km North West Cable System (NWCS) in the Pilbara region, Western Australia, in 2016 and the 4,600km Australia-Singapore Cable in 2018.

By the contract terms, Vocus was to sub-contract a suitably qualified submarine cable system vendor to design, construct and install the cable system. Through a rigorous tender process, a shortlist of vendors was made, and, ultimately, Alcatel Submarine Networks (France) was commissioned to provide the technology for the cable system.

Management**Political and operational coordination**

The three governments worked closely in the project planning and construction stage to ensure its compliance with the legal frameworks of the countries involved. While each country was responsible for compliance with its own jurisdiction in relation to the project, legal advisers to the governments would arrange meetings to go through all documentation and agree on measures to overcome any disaccords in laws, licences and permits as determined by each country's legislation and national security needs. Arrangements, such as the technical standards for the cable landing stations in Papua New Guinea and Solomon Islands, were included in the Landing Party Agreements.

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The daily operations of the Coral Sea Cable System following construction completion are run by the newly formed Coral Sea Cable Company Pty Ltd (CSCC). It is an Australian proprietary company limited by shares, a Special Purpose Vehicle created to manage and maintain the cable. CSCC must maintain solvency under the Australian Federal Corporations Act (2001). Papua New Guinea and Solomon Islands each have IRU, allowing them to obtain revenue from selling the cable capacity. Meeting operating costs is a condition of the IRU agreements.

CSCC has three equal shareholders, with Australia, Papua New Guinea and Solomon Islands each represented by directors in the company. The board of directors is composed of representatives of the SISCC (Solomon Islands), DataCo (Papua New Guinea) and the Australian Government. The Australian Director, while a representative for the Australian Government, is not a government official. The Australian Director was appointed based on strong financial expertise and board experience.

The board of directors acts on behalf of the three shareholders and is responsible for the financial, legal, technical and governance requirements for the CS2. The company is responsible for the operation and maintenance services for the investment, including submarine network management and the network operations centre for preventive and corrective maintenance. The Australian Government maintains a decision-making role in the ownership and operation of the cable to protect the cable's connection to critical infrastructure in Australia.

While CSCC owns and operates the cable, under the terms of IRU, PNG DataCo and SISCC each own capacity on the cable, receive revenues and are responsible for financing the operational costs of the company. Operating costs include landing party services from Telstra in Australia, outsourced Operations and Maintenance services, and a Marine Maintenance contract with a regional repair ship provider.

DFAT engaged in a series of complementary policy dialogue and bilateral activities to assist in realising the economic and development benefits of the cable. These efforts also support the ability for the cable to generate revenues to meet operating expenses, while still ensuring affordable access.

DFAT advocated for, and funded, technical support, that has led to reduced wholesale prices and increased transparency and competition. Conditions to enable fair and non-discriminatory access to the cable were included in IRU agreements with both countries. Under the Cyber Cooperation Program, work is underway to strengthen the cyber security framework in Papua New Guinea and Solomon Islands, helping to mitigate cyber risks posed by the cable. Both of DFAT's bilateral programs with Papua New Guinea and Solomon Islands are investing in activities to strengthen domestic telecommunications infrastructure and the regulatory framework. The bilateral programs have also commissioned initial analytical work and pilots to realise the economic and social benefits.

Communication and dissemination

The CS2 has a dedicated website¹⁶ which contains project highlights, cable system details and work milestones, and press publications. However, after project completion, the website is to be archived, and updates on the CS2's performance will be provided by the respective governments.

During construction, the project had extensive communication activities via joint government media releases, social media announcements and video, the website and public exhibitions. Project milestones were acknowledged with different events, such as ribbon cuttings of cable landing stations in provinces in Solomon Islands, soil turning events and tours by Ministers of the cable laying ship, ensuring visibility of project progress and increasing community awareness of the project.

¹⁶ <https://www.coralseacablesystem.com.au/>

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One interesting approach, which follows industry practice in undersea cables, was naming the 42 repeaters after prominent or inspirational ICT professionals, predominantly women¹⁷.

Conclusions

- **Public benefits** – the Coral Sea Cable System is a unique cross-border project, motivated by the potential benefits that can arise from improved accessibility to high quality, low cost and secure internet. It saw the partnership of three national governments working together for the first time on a cross-border infrastructure project that will improve the connectivity of their economies and societies.
- **Adherence to national development priorities and staff mobilisation** – the Coral Sea Cable System project responded to the national development priorities of Papua New Guinea and Solomon Islands and maintained high-level stakeholder engagement in Australia, Papua New Guinea and Solomon Islands through all the project stages. In Australia, the project mobilised skills across the whole of government and the private sector to, within the given time and budget frameworks, deliver a high-quality infrastructure project meeting the expectations of the partner countries' governments. For that purpose, DFAT allocated dedicated staff resources, including senior executives in Canberra and in country, to oversee and support the project from scoping to construction.
- **Fair business model** - The Coral Sea Cable System project developed a business model that would safeguard the interests of Papua New Guinea and Solomon Islands in relation to ownership and access to revenues from operation of the cable. While the infrastructure was funded mainly through Australian aid, the ownership and associated revenues generated have been transferred to Papua New Guinea and Solomon Islands.
- **Long-term growth opportunities** - For Papua New Guinea and Solomon Islands, the project has the potential to be transformative for economic growth and development. Through access to cheaper, faster and more reliable internet services, it could boost development opportunities for local businesses and communities. Realising the full potential of the cable will depend on the regulatory environment and investments in the domestic ICT network infrastructure in Papua New Guinea and Solomon Islands.
- **Strong governance and monitoring mechanisms** - The project installed, at the outset, strong governance and monitoring mechanisms to follow the project's progress, address concerns and manage risks promptly. These included:
 - The development of and active engagement with a risk register to identify the project's risks and their mitigation strategies;
 - Contracting external, independent specialists to assist with knowledge gaps.
- **Strong communication activities** - Stakeholders involved in the project communicated at a minimum on a weekly basis to provide updates on project progress. The project team worked closely with partner governments to engage with the community and promote the project's progress, bearing in mind significant investment, long lead time, and high community anticipation.
- **Leading practices** – valued by its stakeholders These were:
 - The use of a commercial company to scope out the design, construction, and procurement of the infrastructure investment;
 - The land acquisition approach - placing the terrestrial cables in Papua New Guinea and Solomon Islands on state land to minimise social and economic impacts of the groundwork;
 - Project communication/ stakeholder engagement approach - extensive communication activities to increase project visibility and community awareness.

¹⁷ <https://www.coralseacablesystem.com.au/files/20191213-AHC-media-release.pdf>