

# Pacific Regional Connectivity Study

The World Bank-Polyconseil

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## Executive summary

In many respects, Pacific Island countries<sup>1</sup> are similar:

- they are isolated from the rest of the world and located relatively far from each other;
- their populations are dispersed internally, often in remote “outer islands”;
- many societies are still bound by tribal links, and land ownership is customary.

But in other respects, they differ strongly:

- their population varies from a few thousand to several millions;
- their telecom markets may be monopolistic or competitive;
- their distances from interesting telecom peering points vary strongly from one country to another.

What they have in common, from a telecoms perspective, is a growing demand for international connectivity in a context where demand for broadband is accelerating around the world.

Until now, satellite has been the main provider of bandwidth at high prices which large parts of the population cannot afford. When making long term projections on how demand for bandwidth will grow for Pacific Island countries, they can be split into three groups:

- **Low demand countries** for which satellite will remain the most economical option for international connectivity for many years to come. Those countries

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<sup>1</sup> Countries involved in this study are members of the World Bank: Samoa, Tonga, Fiji, Vanuatu, Solomon Islands, PNG, Timor-Leste, Palau, Federated States of Micronesia, Marshall Islands, Kiribati. Other countries considered are: Niue, New Caledonia, French Polynesia, American Samoa, Wallis&Futuna, Cook Islands.

are Cook islands, Niue, Wallis & Futuna and islands of the Northern Pacific (Palau, Marshall, Kiribati and Federated States of Micronesia);

- **Medium demand countries** for which technical solutions other than satellite (i.e. submarine cable) will become more economical within less than 5 years because of their growing needs for international connectivity. Those countries are Timor-Leste, Samoa, Solomon Islands, Vanuatu, Tonga and American Samoa;
- **High demand countries** for which a submarine cable solution is already by far the most economical solution. Those countries are Fiji, French Polynesia, New-Caledonia and Papua New Guinea (PNG).

Several cable projects are already underway. The “high demand countries” listed above already have or will soon have a submarine cable landing on their territory. Fiji is connected to the Southern Cross cable which is already a secured system. New-Caledonia is connected to Gondwana, but might need some improved way to secure this submarine cable. French Polynesia will be in the same situation with the Honotua cable . Finally, PNG is connected in the short term by APNG-2 (reconditioned PACRIM-West) and should be connected in the long term by PPC-1 (Pipe Networks).

In addition to the high demand countries, American Samoa and Samoa will soon be connected by the ASH project which is the upgraded PACRIM East submarine cable to connect American Samoa to Hawaii. But this is only a short term solution. Also, Solomon Islands may have an opportunity to connect to PPC-1 if it reacts rapidly.

There are 3 kinds of scenarios which can answer the “medium demand” Pacific Island countries needs for increased international connectivity:

- **Point-to-point submarine cables:** those would simply help to connect a Pacific country to the nearest place where there is cheaper bandwidth to be bought (called a *backhauling point*). An example would be a direct link between Tonga and Fiji to allow Tongans to benefit from the Southern Cross prices;
- **Subregional submarine cables:** those connect several Pacific Island countries together to a backhauling point;
- **Regional or trans-pacific submarine cables:** those would not only connect Pacific Island countries to a backhauling point but also potentially carry trans-pacific traffic allowing for a better return on investment (ROI). The proposed “South Pacific Islands Network” or SPIN is an example of such a project.

Point-to-point scenarios are operationally easier to put in place than Subregional or Regional scenarios: the level of investment needed per project is less important, the decision-making involves fewer participants.

However, from a Pacific Islands regional perspective, there are important reasons and potential economic benefits from participating in a sub-regional or regional project. Sub-regional or Regional scenarios create momentum for collaboration between countries and allow potentially for better synergies as investments are shared. Also, if trans-Pacific traffic can be transported, this may result in lower cost of international bandwidth (e.g. STM-1 price) for connected countries.

The case for an individual Pacific Island country to join a Subregional or Regional project thus depends on whether there is a more attractive point-to-point scenario for that country.

The following table is a synthesis of preferred projects for countries studied for which there are Point-to-Point, Subregional and Regional project alternatives:

Type	Net ID	Network name	Samoa	Tonga	Fiji	Vanuatu	Solomon Islands	PNG
Pt2pt links	28	Fiji-New Caledonia			X			
	29	Fiji-Samoa	X					
	24	BU 3.5 PPC1-Solomon					X	
	31	Fiji-Tonga - unrepeated		X				
	42	New Caledonia (Poindimie)-Vanuatu				X		
Subregional network	15	PN (PNG - New Caledonia)						X
	4	FS (Fiji - Solomon)				X	X	
	9	FTTS (Fiji - Tonga - Samoa) repeated	X	X				
Regional network	13	FNC (Fiji - New Caledonia)			X	X		
	6	GF south (Guam - Fiji)						X
	8	NCFP	X	X	X	X	X	

Each country, except PNG, has its own preferred point-to-point project (networks 28, 29, 24, 31 and 42). For Timor-Leste, the preferred scenario is connecting to Kupang to reach the Palapa ring (network 52 for 6MUS\$ for annual STM-1 price of about 0.625MUS\$).

Samoa and Tonga could collaborate on a subregional project linking Samoa to Tonga and Tonga to Fiji (network 9). This subregional project offers a much better cost perspective to Tonga than its point-to-point project. For Samoa, it is similar to its point-to-point project in terms of cost. The advantage of such a subregional project is that it can draw more interest from investors and international institutions. As an option, network 9 could potentially be extended to Wallis & Futuna if it can secure the necessary funding.

Vanuatu and Solomon Islands could collaborate on a subregional project linking Solomon Islands to Vanuatu and Vanuatu to Fiji (network 4). This subregional project offers similar cost perspective to both countries than their point-to-point project if it is extended to connect to PPC-1. Such a sub-regional project could attract interest from investors and international institutions. As an option, instead of connecting to Fiji, this project could connect both countries to New-Caledonia (Poindimie).

Both subregional projects identified above could also be managed as one bigger single subregional project linking Solomon Islands, Vanuatu, Fiji, Tonga, Samoa (and Wallis & Futuna in option).

It is important to highlight that such a project would be very dependent on the price of international connectivity in Fiji. However, if Fiji public pricing is applied, the economics of this project are not good. If this group of countries, with the support of international institutions, manage to get Southern Cross public list prices for Fiji-Australia or Fiji-US IRU as presented in this study, then the business case for those countries is excellent.

The following table lists main cost and pricing data for preferred projects identified:

Type	Net ID	Network name	CAPEX (MUS\$)	STM1 price (MUS\$/year)	
				Minimum	Maximum
Pt2pt links	28	Fiji-New Caledonia	35.6	0.992	1.611
	29	Fiji-Samoa	30.5	0.972	1.521
	24	BU 3.5 PPC1-Solomon	17.6	1.156	2.017
	31	Fiji-Tonga - unrepeated	26.1	1.925	2.915
	42	New Caledonia (Poindimie)-Vanuatu	17.0	1.178	1.972
Subregional network	15	PN (PNG - New Caledonia)	81.5	0.994	2.092
	4	FS (Fiji - Solomon)	60.1	1.171	2.059
	9	FTTS (Fiji - Tonga - Samoa) repeated	46.1	1.032	1.581
	13	FNC (Fiji - New Caledonia)	51.8	1.020	1.661
Regional network	6	GF south (Guam - Fiji)	196.2	0.751	3.798
	8	NCFP	252.4	0.910	2.451

If only **point-to-point projects** were to be launched (networks 28, 29, 24, 31 and 42), the total CAPEX needed would be **US\$126.8M**. Five separate projects would have to be managed involving Fiji, Samoa, Tonga, Solomon Islands, Vanuatu, New-Caledonia and the owner of the PPC-1 cable.

To come to a similar result, **two subregional projects** could be launched: on the one hand, networks 4 connecting Solomon Islands and Vanuatu to Fiji (or New-Caledonia) and, on the other hand, network 9 connecting Samoa and Tonga to Fiji. The total CAPEX needed would be **US\$106.2M**. Those two projects could even be merged into a single project connecting Solomon Islands, Vanuatu, Fiji, Tonga and Samoa (and Wallis & Futuna in option).

In conclusion, the best subregional approach for Samoa, Tonga, Vanuatu and Solomon Islands is to connect to Fiji, after having secured competitive backhauling pricing on Southern Cross, by launching both network 4 and network 9 subregional projects.

With regard to **regional projects**, it should be noted that, based on available documentation, the SPIN commercial offer (i.e. one STM-1 for US\$1.5M per year over 25 years; 50% rebate for subsequent STM-1; including backhauling; excluding landing station) appears competitive and if countries rely on SPIN, there is no need to manage a project and prices are set in the long term. However, a more thorough study of the full SPIN contract proposition for each country should be made before engaging in such a route.

Out of all the regional projects studied, the best trans-Pacific project identified is a **submarine cable linking New-Caledonia to French Polynesia and potentially serving Vanuatu, Solomon Islands, Fiji, Tonga, Samoa and American Samoa** on the way. That infrastructure could also potentially serve low demand countries on the way if those get the necessary funds for such a project. In this study, we call this regional scenario NCFP, which is the acronym of the two ends of the system: New-Caledonia, French Polynesia.

Such a project, NCFP, would need a total capital expenditure (CAPEX) of US\$252M if all 11 countries on the way were included. The following table shows how the cost of such a project can be allocated to the main backbone (for a total of 115MUS\$) or to each of the spur & landing stations needed for each country (for a total of 137MUS\$).

Country	Spur length (km)	Spur & landing station cost (US\$)	Main Backbone (US\$)	Total cost (US\$)
American Samoa	196	9 902 024	10 462 336	20 364 359
Cook Islands	326	12 430 923	10 462 336	22 893 259
Niue	269	11 150 014	10 462 336	21 612 349
Samoa	226	11 479 191	10 462 336	21 941 527
Tonga	675	20 485 875	10 462 336	30 948 211
Solomon Islands	1 369	33 843 318	10 462 336	44 305 653
Vanuatu	840	23 587 411	10 462 336	34 049 747
Wallis & Futuna	195	9 568 722	10 462 336	20 031 057
Fiji	-	4 907 833	10 462 336	15 370 169
French Polynesia	-	-	10 462 336	10 462 336
New-Caledonia	-	-	10 462 336	10 462 336
<b>Total</b>	<b>4 095</b>	<b>137 355 311</b>	<b>115 085 691</b>	<b>252 441 002</b>

As for all other scenarios, the bandwidth price is very dependent on traffic that goes onto the cable. Price could range from as low as US\$0.910M per STM-1 per year to as high as US\$2.451M depending on the country demand scenario and the amount of trans-pacific traffic carried.

We have also examined a **simplified version of NCFP involving only French territories, Fiji, Samoa and Tonga** for a total CAPEX of US\$161M. The main data for the NCFP project and its simplified version are summarized in the following table:

Net id	Potential projects	STM1 price @ 6% Discount rate (M US\$)									CAPEX (M US\$)	Backh. systems	Trans Pacific	Potential fibered connectivity (Gbps)			
		No transpacific traffic			Little share of transpacific traffic			Bigger share of transpacific traffic						US	S.Asia	Jp	AU
		Low	Medium	High	Low	Medium	High	Low	Medium	High							
8bis	Backbone simplified NCFP	\$2,357	\$1,966	\$1,568	\$1,613	\$1,379	\$1,136	\$0,496	\$0,498	\$0,488	\$160,9	4	Sydney Hawaii	3 201	0	0	3 200
8	Backbone NCFP	\$2,451	\$2,089	\$1,643	\$1,953	\$1,686	\$1,350	\$1,207	\$1,082	\$0,910	\$252,4	4	Sydney Hawaii	3 201	0	0	3 200

The NCFP project has the potential to serve many countries in the region at a very competitive price providing that the following conditions are met:

- The country demand scenario should be at least medium and preferably high. Countries can strongly influence this by allowing increased competition on their local market and open access to the international gateway;
- The NCFP project has to be competitive on the trans-pacific market to secure revenue streams from Australian or US telecom operators; at both ends of the NCFP cable, the OPTs have to offer competitive backhauling prices.

New-Caledonia and French Polynesia could secure their international connectivity by connecting to each other. The cost of the main backbone to achieve this goal is US\$115M. If those French territories decided to go forward with such a project, they could then propose to the other countries to join the project. In this case, participating countries could be asked to finance their spur and landing station as well as pay for main backbone bandwidth.

Before countries go forward with an NCFP project, the conditions presented above should be clearly resolved. If they cannot be resolved, then the subregional projects presented above remain the best solution. The commercial alternative to the NCFP project, the SPIN project, would have to secure the same conditions to be a successful project.

Whether an NCFP project is launched, subregional projects are launched or the SPIN project goes forward, some common legal and regulatory recommendations apply.

To allow for the submarine cables benefiting fully to the economy of the countries, it is recommended that the regulations of all countries converge to an open access model whereby international gateway is open to competition and cost oriented when that is necessary due to lack of competition. Countries would commit to opening up their telecom markets to competition and especially the international gateway because such an evolution is the best guarantee that bandwidth will grow and that the prices set for international bandwidth will be fair and at their lowest.

In case of a regional or subregional project launched by countries, it is proposed that the project be owned by a specifically created Special Purpose Vehicle (SPV) whose goal would be to get reasonable ROI while obeying a certain number of preset rules established by a Forum which would include the involved Pacific Island countries. Among those rules, cost orientation of prices would apply. That SPV would openly make its bandwidth available to all operators and service providers.

All-in-all, there are clear subregional solutions to solve the connectivity issue of several Pacific Island countries. There is also a much larger trans-pacific solution (NCFP) and its commercial alternative called SPIN. Whether those projects will succeed is a matter of involvement in this project of all the parties potentially interested: private investors, country operators and governments and international institutions like the World Bank.