

SPEED MATTERS

The Case for an International Cable Internet Connection for Timor-Leste

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EXECUTIVE SUMMARY

Timor-Leste is one of only a handful of countries in the world not connected to the internet via a fibre optic cable. Instead, Timor-Leste currently connects to the internet via satellite, which is significantly slower and more costly. The analysis presented in this report suggests that if Timor-Leste invested in a submarine fibre optic cable, this would provide substantially faster, cheaper and more reliable internet access, which would, in turn, provide significant economic and social benefits for the country.

Timor-Leste's 3G mobile phone coverage is excellent, with 97 per cent of the population having access. Yet as of 2017, only 12 per cent of mobile phone subscriptions included 3G internet access and just 25 per cent of Timorese use the internet. This means there is tremendous potential for growth in internet usage.

There are also downside risks of not upgrading Timor-Leste's internet connection. Average internet speeds in Timor-Leste are already 25 times slower than the average for other countries in Asia and the Pacific, and this is likely to get worse as demand grows. Similarly, the costs of internet services are many times higher in Timor-Leste compared to neighbouring countries, adding significantly to the costs of doing business.

Even using conservative estimates, the financial analysis indicates an investment in a fibre optic submarine cable would pay for itself within a few years. Experience from other countries suggests such a cable would bring significant

economic benefits to Timor-Leste, boosting economic growth and job creation. A submarine cable will also enable a range of social benefits, including education and health outcomes.

There are a small number of risks related to submarine cables. Firstly, there is a risk of accidental or deliberate damage, particularly near any cable 'landing' site. Secondly, there is a low risk of spying. Such risks can be reduced by good choices about country connections and technical specifications.

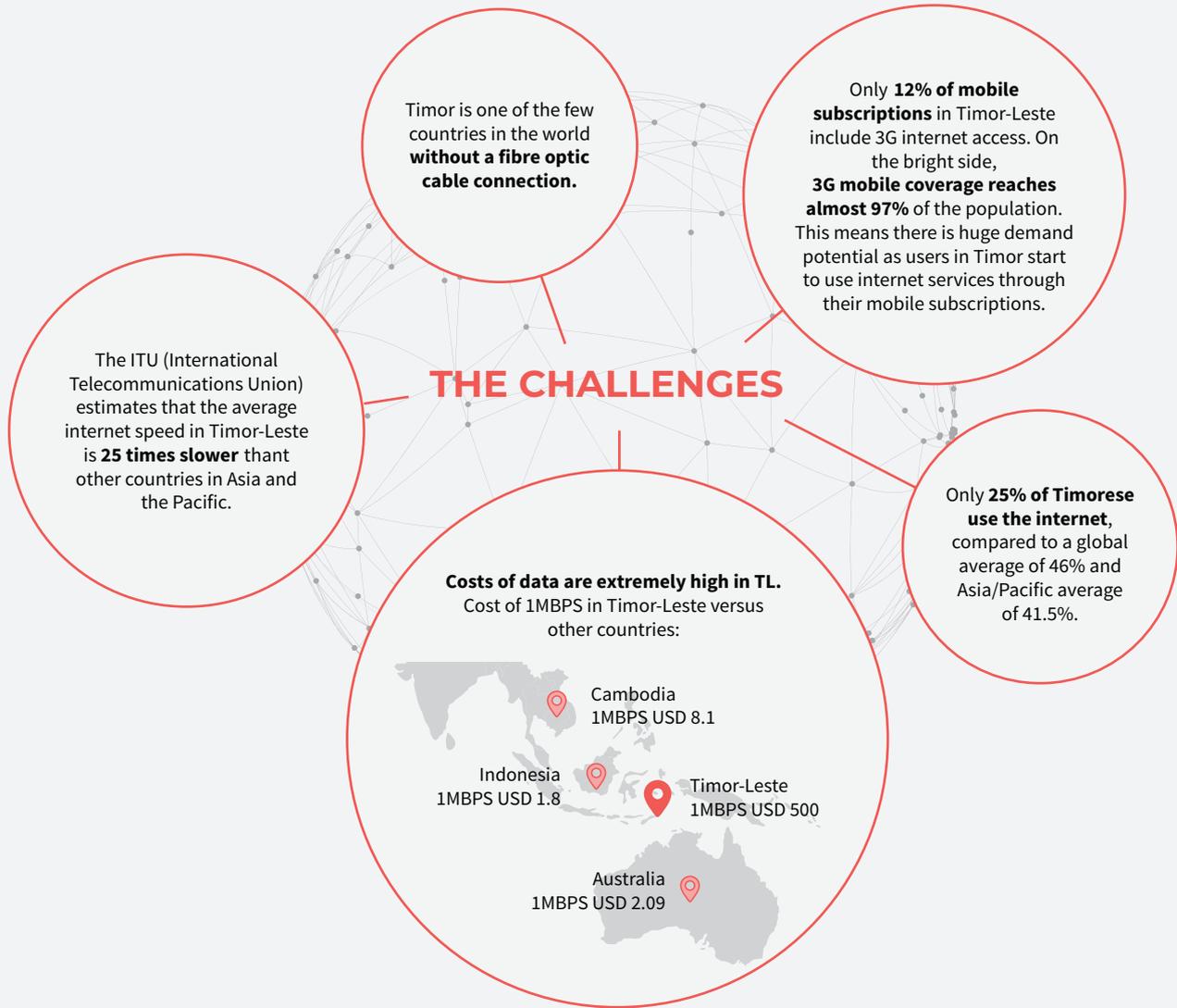
Timor-Leste has a number of options with regards countries to connect to via submarine cable, including Indonesia, Singapore and Australia. There are varying cost, reliability, security and quality factors associated with each of these destinations. Many countries aim for redundancy, connecting at least two cables in the long run.

Submarine cables are increasingly owned and managed by the private sector. However, for Timor-Leste at this time, a public-private partnership would likely offer some advantages. Private partners would bring delivery expertise, whilst partial government ownership would assist problem-solving, reducing risks to the private sector, and protect the broader interests of society. Careful design of a process for implementing a major infrastructure project like this can help alleviate most risks and concerns. Specifically, it would be beneficial if the submarine cable development is done in a transparent manner, if competitive processes were used to select one or more private sector partners, and if a shared ownership model was chosen.

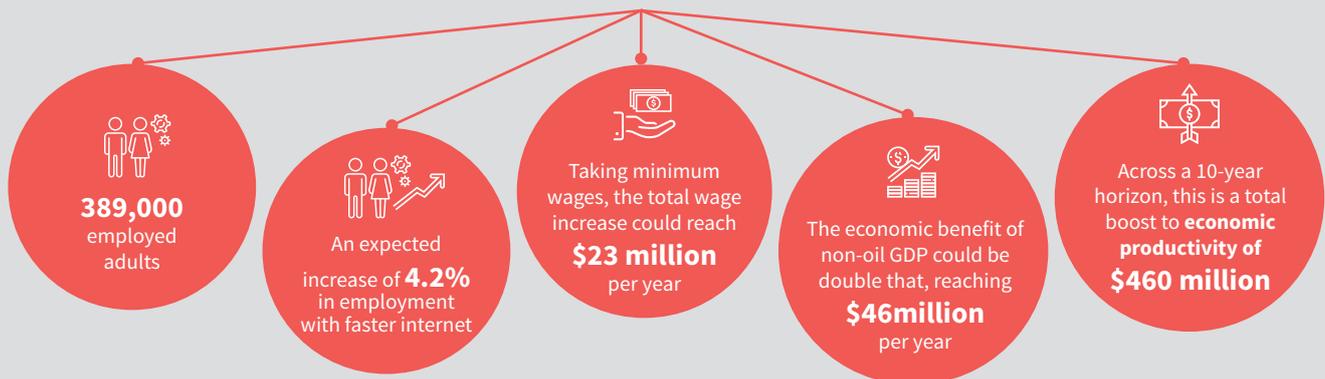




KEY FINDINGS



VALUE TO THE TIMOR-LESTE ECONOMY



IMPACT



Economic impacts

Tourism

Tourism providers have the opportunity to promote their services directly with clients in a range of real-time, dynamic means.

Agriculture

Farmers can access information, share resources, understand markets and develop skills through greater connection.



Social impacts

- Education
- Healthcare
- Government

International evidence suggests that the arrival of **submarine cable internet leads to growth in economic activity**. Businesses will benefit and there will be significant employment creation.

FASTER, CHEAPER, MORE RELIABLE INTERNET



Growth in employment is driven by profitable business opportunities.



Profit comes from timely and accurate information.



Transparency

Concerns about fairness, protection and operations can be alleviated if the government follows an open and transparent tender process.

Transparency includes providing information to civil society, as well as giving opportunity for input from civil society and other stakeholders.



Shared ownership

A public-private-partnership model provides a potentially helpful ownership structure for the process of building and managing a major piece of public infrastructure. The state (i.e. the citizens) benefits from profit, and also retains direct involvement in the project, allowing them to focus on protecting the public interest.

OVERCOMING OBSTACLES



Competition

Market competition provides an effective way to protect against the power of owners/businesses.



1 INTRODUCTION

In a globalised modern world, knowledge and information are the foundation of societies and economies.

Internet connectivity can provide the core means of acquiring and exchanging this information.

Fast and reliable internet access unlock such potential in improving well-being in every dimension, including:

- Improved access to health information, and co-ordination across different health providers
- Access to the best minds and resources in the world, to make for a top-quality education experience at a fraction of the price of traditional education
- Enormous gains in business efficiency
- Efficient functioning of government and transparency through access to information.

All of these improvements can be delivered at very low cost. Infrastructure / start-up costs are comparatively small. And the ongoing “marginal cost” of delivery of the service is almost zero.

This brief document will consider the case for investing in submarine cable technology as a means of yielding an order-of-magnitude improvement in both the speed and cost of accessing internet services. This relatively inexpensive piece of infrastructure has the potential to lead to a paradigm shift in the provision of social services, functioning and transparency of Government, and supporting business environment.

As is well-documented, the Timor-Leste economy is in the early stages of a transformation from being a largely rural, subsistence economy. Recent years have seen a small decline in the number of households who rely on agriculture as their main income source (from 76% in 2010 to 69% in 2015), and steady urbanisation, alongside relatively high fertility rates.

However, the non-agricultural economy is not experiencing sufficient growth to generate employment for the growing numbers of working-age population. Non-agricultural employment is dominated by public sector jobs, while there are very low levels of employment in the private sector, heavily concentrated in Dili.

It is also widely acknowledged that one of the major obstacles to a rapid growth in the non-government sector is the difficult business environment, particularly business-enabling infrastructure. What is needed is investments that have the potential to unlock significant increases in economic activity.

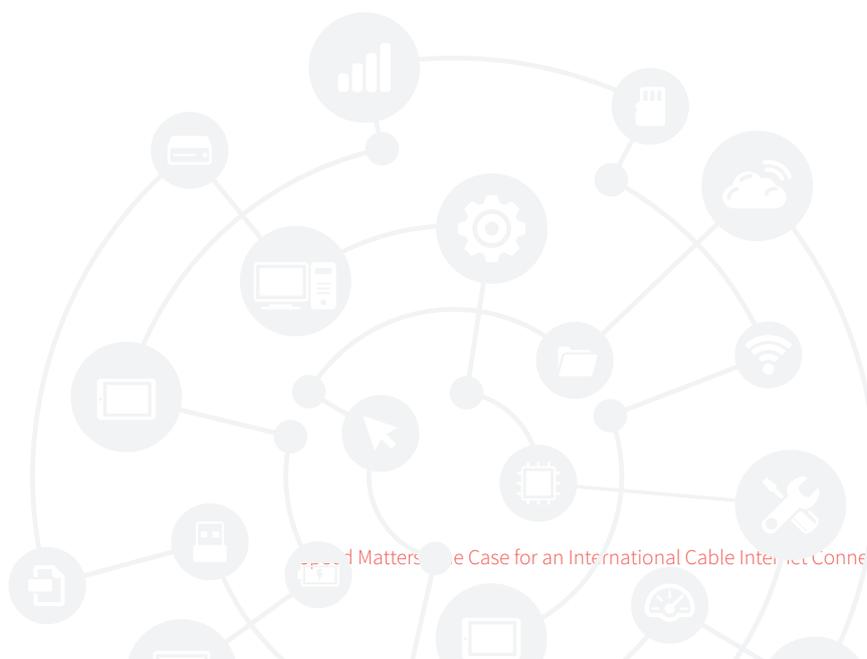
In turn this will create more rapidly growing employment. We will make the case in this report that substantially faster, cheaper and more reliable access to internet is a critical step to unleashing the growth potential.



It is worth noting that the benefits from ICT use are unlimited and are far higher than the costs of ICT* use.

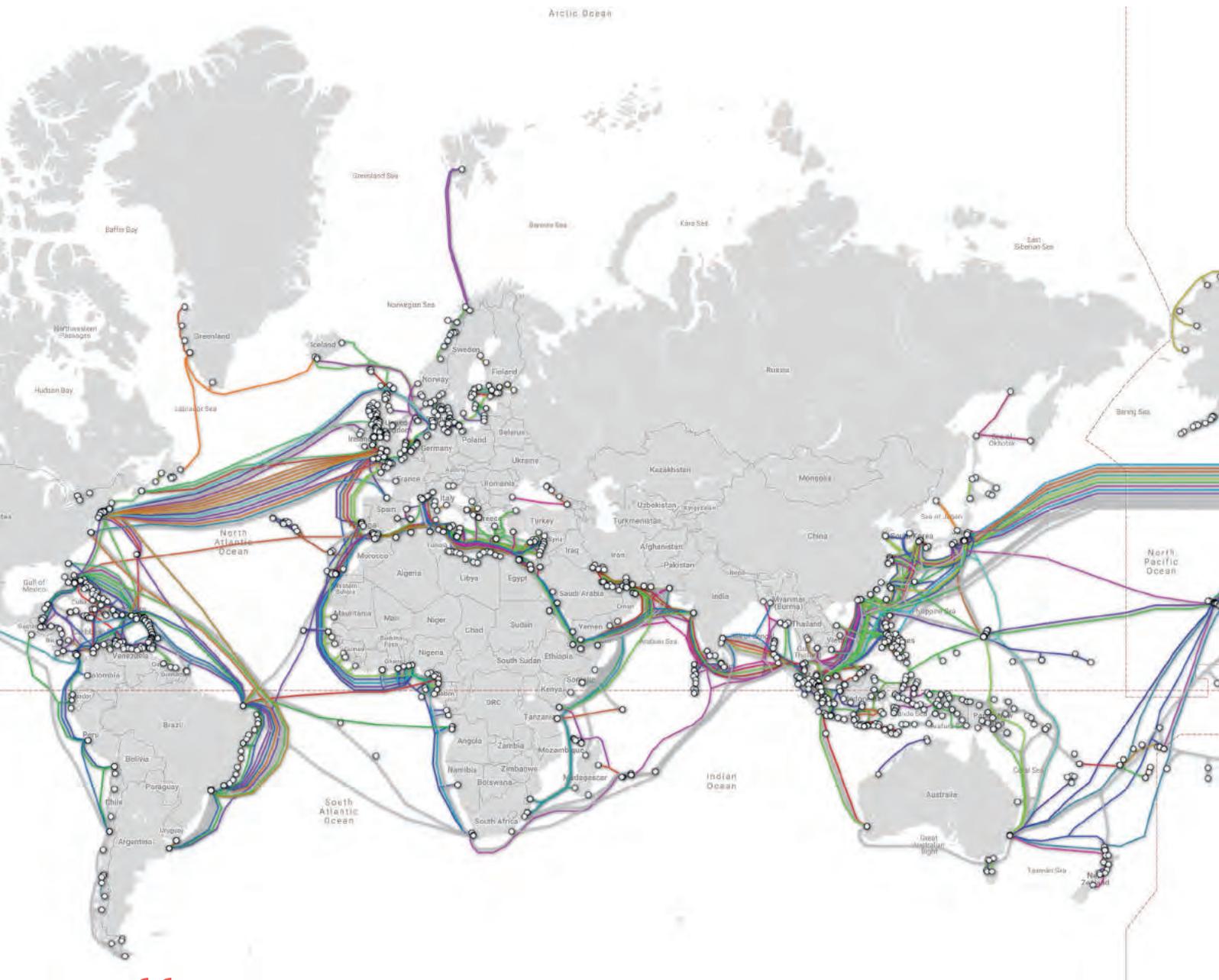
Vu, 2011.

* ICT = Information and Communications Technology





2 THE SITUATION IN TIMOR



Countries with lower level of ICT penetration should be more aggressive in promoting the diffusion of ICT, especially the Internet.

The marginal effect of the penetration of ICT is larger when at its lower level, especially for the Internet and mobile phone... catching up on ICT penetration should be a top priority in any country's endeavor to further economic development.

Vu, 2011.

Here are a few basic facts from the International Telecommunications Union (ITU) (2017) that characterise the current situation in Timor-Leste (TL):



TL relies almost exclusively on the relatively slow and expensive satellite services for connection to the wider web. No submarine cables are currently in operation or under construction. This is despite the World Bank finding in 2008 that Timor-Leste would have enough to demand make a submarine cable a better, more economical option than satellite connection within five years (World Bank, Polyconseil, 2008).



Usage of internet / data is comparatively low in TL (on a per person basis) compared to other countries in the region. Virtually all internet use is via mobile subscriptions (99.7%), with very few fixed broadband services (0.3%).



Mobile phone usage and associated data usage have been growing rapidly in recent years. **In 2017, it was estimated that 3G mobile coverage can reach about 97% of the population.** On top of this, there were 1.25 mobile phones registered per person in Timor-Leste, also well above global averages. This rate has more than doubled in 5 years.



Alongside Timor's very rapid uptake of mobiles sits a relatively low use of data/internet. **Only around 12% of mobile subscriptions in Timor-Leste include 3G internet access.** This represents a huge potential for growth: globally, close to 60% of mobile users also have internet access via their mobile. There is likely to be massive growth in demand for internet services in Timor-Leste, as users 'catch up' with the rest of the world.



Costs of data are extremely high in TL. Estimates of the costs compared to other countries vary a lot, but here are some specific examples:

Table 1: Cost of 1MBPS in Timor-Leste versus other countries

	Speed	Price
Cambodia	1MBPS	USD 8.1
Australia	1 MBPS	USD 2.09
Indonesia	1MBPS	USD 1.8
Timor-Leste	1MBPS	USD 500



One main reason for the high cost of obtaining access to the internet outside Timor-Leste, is that it is currently accessed via satellite. As a guide, the ITU estimates that the wholesale price of internet bandwidth provided via satellite is at least 5 times higher than for submarine cable internet (ITU & PITA, 2017).



Reliance on satellite access to the global internet also has a big impact on speed. ITU estimates are that average speed in Timor-Leste are 25 times slower than the average for other countries in Asia and the Pacific. This means it will take an average of 25-times longer to download a set piece of data (a document, image, song, video, etc) (ITU, 2017).

This situation will continue to worsen as demand grows. When a service has more users, a fixed amount of 'bandwidth' has to be shared among those users, meaning each gets a smaller share, and their speed slows even further.

As of June 2017, it is estimated that **25% of Timorese people use the internet**, compared to a **global average of 46%** and **Asia/Pacific average of 41.5%**.

ITU (2017).





The current situation in Timor-Leste and the future trends

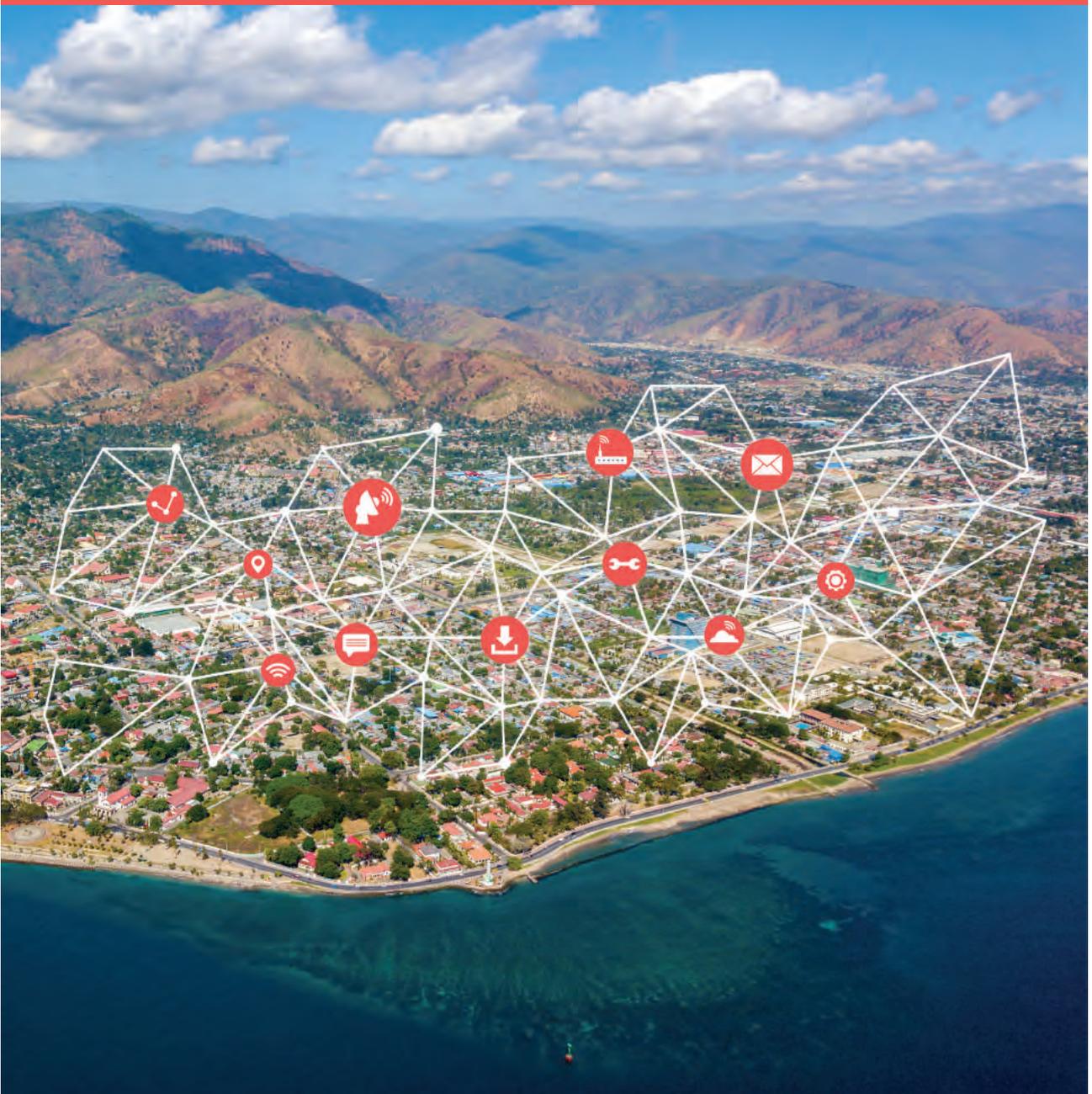


Given the low levels of internet use currently and signs of rapid growth already, demand for internet services is likely to grow dramatically over the next 5-10 years.



Current services are inadequate, both in terms of price and speed, and this is only likely to get worse as the demand grows.

In other words, the case is strong for a significant upgrade in technology. Timor-Leste is one of only a handful of countries in the world without a fibre-optic cable connection.





A MATTER OF PRIORITY



It is a Timor-Leste Strategic Priority

The Strategic Development Plan (República Democrática de Timor-Leste, 2010) makes the case for a number of improvements in information and communication technology in Timor-Leste, including high speed broadband. The plan also presents a preliminary view about submarine cable options.



It is an ASEAN priority

Connection to high speed broadband is included under the ASEAN (Association of Southeast Asian Nations) ICT Masterplan (AIM) 2015 and then AIM 2020. Priority 4 in the 2015 plan on Infrastructure included a goal of establishing a complete ASEAN Broadband Corridor, connecting all ASEAN countries. This was mostly achieved by 2015. The new plan (AIM 2020) includes repair of some submarine cables to improve the corridor further. Can Timor-Leste join the ASEAN Broadband Corridor?



It is a global priority within the Sustainable Development Goals (SDGs)

The SDGs are a series of targets established by the United Nations General Assembly. Their purpose is to provide clear goals across a range of areas, from poverty to social justice, for all 193 Member States to work towards.

The ninth SDG, under the heading “build resilient infrastructure, promote sustainable industrialization and foster innovation”, is where ICT is emphasised. Specifically, the last target under this goal is “Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020” (UN, n.d.).

One key benefit of this infrastructure improvement is that it **impacts a high proportion of the population**, and **brings returns across several sectors, both social and economic**.

The Economic Impacts of improved internet speed are potentially very large.

Consider just two examples: Timor-Leste's priority sectors for economic diversification, Tourism and Agriculture.



Tourism has huge potential to benefit.

The key elements to a tourism industry are the customer (the tourist) and the providers of tourism services (hotels, restaurants, transportation, tour operators, destination managers, and many other service providers). Traditional tourism models rely on travel agents as the providers of information about tourism services. This mediator role is vital, especially with relatively unknown destinations like Timor-Leste, and taking account of the fact that virtually all tourists are international.

Under a new, internet-driven model for tourism, providers have the opportunity to promote their services directly with clients in a range of real-time, dynamic means. Modern tourism means a wide range of online access to information, active websites promoting attractions and accommodation, online booking facilities, blogs and social media marketing, online payments, real-time client feedback, video marketing, access to third party websites (e.g. TripAdvisor).

When high-speed submarine cable internet arrived in Kenya in 2009, within one year most businesses in the tourism industry had adopted a range of new means of marketing and relating to clients (especially improved websites and use of social media), and reported significant improvements in business productivity and outreach (Waema & Katua, 2014).



Agriculture globally is experiencing the fourth industrial revolution.

Even low income, smallholder farmers in developing countries are experiencing the benefits of the digital ICT age. Improvements in managing inputs, sharing resources with others in the community, understanding global markets, developing skills, etc all come through greater connectivity and access to information.



New technologies enable small farmers to shift from input-intensive to knowledge-intensive agriculture. Precision agriculture can improve the timeliness of planting, secure the best market prices through market information and e-market reforms, provide fertiliser subsidies via direct bank transfers that eliminate or reduce the cost of financial intermediaries, and improve agricultural extension. Combined with improved seed supply and land and water management, which can in turn increase double and triple cropping, farmers' income can grow.

Lele, 2017 (World Economic Forum).

More broadly, improved ICT Infrastructure creates the environment to support business growth. Improved government services that support business, as well as improved efficiency of business-to-business services can transform business productivity and lead to substantial growth. This growth can produce a multiplying effect across the whole private sector, resulting in significant growth in employment and incomes.

For example, recent evidence from Africa suggests very big employment effects: "we find a significant relative increase [of 4.2 to 10 percent] in the employment rate in connected areas when fast internet becomes available" (Hjort & Poulsen, 2017).

The social impacts of cheaper, faster and more reliable internet are potentially huge. Particularly in the areas of education and health, technology can be used to deliver substantially better quality service delivery at orders-of-magnitude lower cost.

Improvements and cost savings from better connectivity are not just incremental, but take these services into a different paradigm. For example, health communications can be improved dramatically, and there is much evidence for the value of timely information in improving health outcomes.

A fantastic example of an ICT-powered paradigm shift is the Aravind Eye Hospital in Tamil Nadu, India, where wireless broadband enabled doctors to remotely administer eye tests via video conferencing for 1,500 rural patients each per month. The previous dial-up network did not possess the capacity for high-quality video calls, indicating that the investment in ICT infrastructure allowed the diagnosis and resolution of minor eye problems without the need for rural patients to travel long distances to clinics. It also greatly increase the productivity of each doctor. Another economic benefit derived was that 8% of men and 58% of women who lost employment because of visual impairment could rejoin the workforce post-treatment (Qiang, Rossotto, & Kimura, 2009).



Education

Affordable and accessible internet opens up numerous opportunities for quality education, and prepares young people for the working environment of the future, with much greater reliance on IT skills and ongoing learning. In a recent report on the skills required for modern-day work and employment in (Hargreaves & Shaw, 2007), the authors emphasise that traditional focus on literacy and numeracy is not sufficient: the knowledge economy requires skills in Information Technology (IT), as well as soft skills relating to the ability, flexibility, and positive attitude towards learning continuously and collaboration in diverse teams. This kind of educational experience requires students to have easy access to high quality and globally connected ICT facilities.

"A 2011 study conducted by researchers from Harvard University and MIT noted that technology such as computer aided instruction or mobile phone aided instruction can boost student learning in rural and other disadvantaged areas." (Livingstone, 2016).



Submarine vs Satellite:

Faster, Cheaper, More reliable

- 👍 Costs are an order of magnitude **cheaper**
- 👍 Speeds are an order of magnitude **faster**
- 👍 Reliability is an order of magnitude **better**



Can we quantify the economic and social benefits?

The overall benefit to society of this technological advance is difficult to measure. For example, it is likely that there will be a significant benefit in terms of improved health that comes from cheaper and better quality health care. But how much improvement? How is this improvement translated to a financial value? How is improved health then added together with improved education and more economic activity to give “total benefit”. There are tools that allow such calculations, but they are complex and not universally accepted.

For now, we will undertake a much more modest task: we will estimate the dollar value of additional economic activity likely to arise from the improved broadband speed. We ignore all the other benefits. Then we compare this narrow subset of the benefits with the costs.

Economic impact can be measured via employment generation. A comprehensive study of the employment impacts of submarine cables across several countries in Africa found the following:



We find a significant relative increase [of 4.2 to 10 percent] in the employment rate in connected areas when fast Internet becomes available.

Hjrt & Poulsen, 2017.

The study uses the fact that different countries received submarine cable broadband in different years, allowing them to see the direct impact of the cable on employment, as there would be a noticeable jump for a particular country soon after the high-speed internet arrived in that country.

Let's apply the finding for these African countries to Timor-Leste. We will assume the lowest estimate of the employment benefit – a 4.2% increase in employment, giving us a conservative estimate of the potential economic benefits.



The analysis for Timor-Leste:

- With **389,000 employed adults** (GDS, UNICEF & UNFPA, 2017), 4.2% higher employment is more than **16,000 new jobs** (ongoing).
- Using the minimum wage to indicate the wage return for these extra jobs, we get a **total wage increase of \$120** (per month) x 12 (months) x 16,000 (new jobs) = **\$23 million** per year.
- Economic activity (GDP) is roughly double the direct wage benefit of a growth stimulus, so we can expect a **non-oil GDP increase** of 2 x \$23 million = **\$46 million** per year.
- Across a 10-year horizon, this is a total boost to **economic productivity of \$460 million**.



Preliminary analysis suggests that implementing the broadband cable could cost up to \$100 million. Clearly these estimated benefits outweigh the costs. Even with conservative calculations, costs are recouped after just two years of increased economic activity. After 10 years, the cumulative benefits are estimated to be around five times bigger than the initial cost. Furthermore, much of the cost of this infrastructure can be borne by the private sector. This makes the balance of benefits and costs even more persuasive.

What is the “theory” by which improved internet would lead to such rapid economic and employment growth?

- Businesses grow when profits are made. When profitable businesses exist, this creates the surplus to allow them to expand and adopt new aspects to their activities, and other businesses to emerge in pursuit of that profit.
- The big obstacle to profitability is the “cost of doing business.”
- Business costs are largely associated with the costs of making linkages between different activities. The more efficiently these linkages can be made, the more efficiently businesses can make decisions. The key to these linkages is information.
- Businesses interact with other businesses (suppliers of inputs, business services, market outlets, etc.) and the effectiveness of these interactions is determined almost exclusively by Information – the more real-time information I have about what my market needs, about what my suppliers can provide, etc, the more I can respond, plan and act.

Example

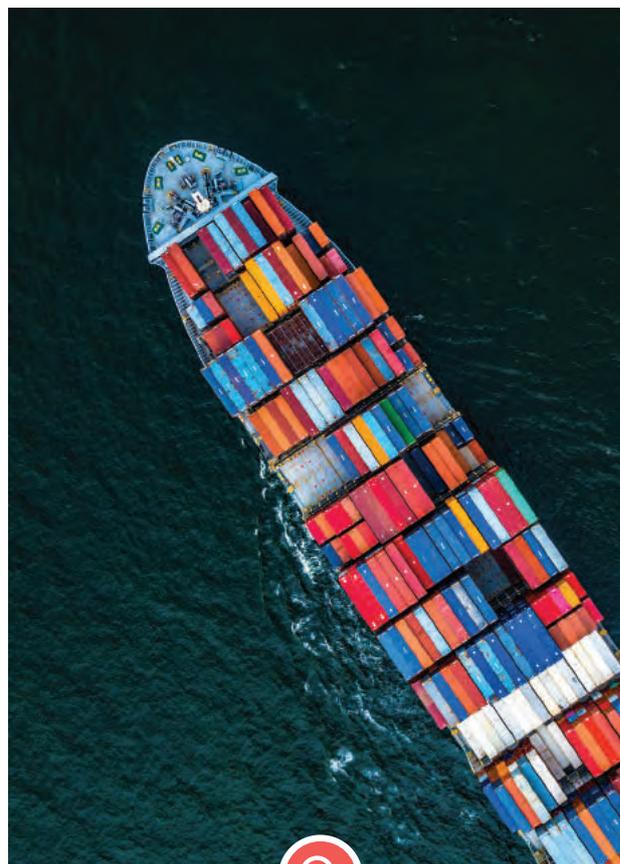
Imagine a mobile phone app where anyone can track the movement of a fleet of transportation vehicles throughout the municipalities of Timor-Leste. Space on a vehicle for a particular time and place can be booked online, and real time updates provided of movements and timing. A small business operator (e.g. a local farmer or local shop) can use that information to access supplies or to send produce to market at very low cost and very quickly.

Example

Imagine a phone app that allows coffee farmers to track the movements of prices and buyers for their product. That same app also captures information about farmer production, yields, prices, climate, what training or inputs they have received or used, allowing analysis of production trends and key issues that need addressing urgently, as well as appropriate targeted extension work to be planned in response to the collation of that information.

Example

An example of a sophisticated use of a high-speed network is WISEPORT, a low-cost, high bandwidth and secure connection for all ships approaching Singapore’s southern coastline. This allows for communication and real-time navigational data between ships, but also enables access for customers and business partners. Here, mobile internet is used to attract business to Singapore (Qiang et al., 2009).



The Economic Case

Faster, cheaper, more reliable

- 👉 Growth in employment is driven by profitable business opportunities.
- 👉 Profit comes from timely and accurate information – knowing how to link with all the other businesses, consumers etc that my business activity interacts with.
- 👉 Information is gold.

Faster, cheaper, more reliable internet allows this gold to be mined.



4 CONSIDERING OPTIONS



Over the past several years, various proposals have been put for submarine cable options. There are technical, cost and security factors to consider in settling on a preferred option. Here we will explore briefly some of the parameters of such a decision. More detailed work analysis of the options has been undertaken by others with greater technical expertise.

1

Cost

The key driver of cost is distance – connecting to a location further away will cost more. This is why links to Indonesia, such as West Timor, or the East Palapa ring, offer the most economical options, potentially as little as \$20million. At the other extreme, a much longer cable connecting directly to Singapore could cost as much as \$200million.

2

Reliability / Quality

While it might seem obvious to go with the lowest-cost connection, it is important to consider the quality / capacity of the network Timor-Leste could be linking up with in each case. For example, while Kupang is connected to the ASEAN Broadband Corridor via submarine cables, if its capacity is limited, then connecting via Kupang may lead to less significant improvements in broadband capacity and speed for Timor-Leste than one of the alternatives. The question of cost versus quality must be weighed in any technical analysis.

Anecdotal evidence is there is a good chance of unreliable connection via West Timor. It is part of a network which relies on significant terrestrial (overground) cabling.

3

Security

A low-cost option for a submarine cable connection would be to connect to the Palapa Ring – this Indonesia submarine network is currently under construction (due for completion in 2019), connecting the eastern half of the archipelago. Alor Island, only 100km away from Dili, is a landing point for the cable, making it a very economical option.

However, this option highlights another factor that is important in weighing up different options: security. Concern has been expressed about how a cable that is used for sending and receiving data internationally can be subject to potential espionage or other activity that would put at risk national security. This is seen as a very real risk with certain neighbouring countries.

It is worthwhile giving greater consideration to this issue. How real is the threat of espionage / spying? Is the risk of deliberate or accidental disruption to service a greater risk? How should the various factors of cost, reliability and security be weighed and balanced?

Next we give some background on the potential security and reliability risks and appropriate responses.



5 SECURITY AND RELIABILITY



Security Risk: Spying

A cable, by definition, connects two places together, which unfortunately leaves an opening for countries to spy upon each other. But how credible is this threat of espionage?

It is possible to tap a submarine cable. However, there are numerous technical barriers. Firstly, a specially equipped submarine complete with trained technicians would be required. The cable would need to be brought into the submarine, at which point technicians strip away the outer protective layers and bend the inner cladding and optic fibres at a particular angle such that some light leaks out, but not so much as to alert security systems of tampering. This technique is called macro bending.

While there are other methods of extracting data from fibre-optic cables, each requires similarly high levels of technical expertise and equipment (Iqbal et al., 2011).

Similar methods to tapping the cable can also be used in cable landing stations, where some of the difficulties of working under the ocean can be avoided.

As Timor-Leste is a small country with minimal domestic internet content, there is a potential imbalance in the distribution of power with a neighbouring country that hosts the cable connecting Timor-Leste to the rest of the world. As most traffic would access content hosted overseas, there would be a lot more traffic flowing from Timor-Leste to the country on the other side of the cable (and on to its destination). Considerably less traffic would flow in the

opposite direction that is initiated by users of the other country. This means the neighbouring country would feel less of a threat of retaliation if it decided on espionage/ intercepting Timorese traffic – it could do a lot more harm to Timor-Leste than vice-versa.

Combatting espionage

Security methods such as encrypting network traffic and packet switching are standard in the digital world. This means that even if network traffic is intercepted, stolen data is unintelligible without significant decryption ability. Furthermore, there are methods of construction that make undetectable tapping exponentially more difficult, such as incorporating an outer ring of exclusively signal-monitoring cables. This enables security systems to detect tampering, including macro bending. Further methods of countering espionage are outlined by Iqbal et al. (2011).



Conclusion:

While security risks from spying potentially exist, these can be combatted with relatively standard use of encryption and other security measures.



Security Risk: Sabotage or Accidental Damage

Imagine a situation where a foreign power wishes to sabotage the activities of the Timor-Leste economy and government. While spying may be difficult, what is more realistic is to sabotage the internet connection. Even a short interruption to internet service can have great costs for a society as it becomes more and more dependent on internet services for daily activities.

In addition, cables are a physical infrastructure, and there is a small risk of damage due to unintended actions. For example, near landing locations, the cable may be in quite shallow water, and there is a risk of ship's anchor dislodging the cable. Alternatively, some disturbance due to weather or other events could lead to damage to the landing station, also disrupting service.

In 2011, an elderly Georgian woman sliced through an underground cable while scavenging for copper, accidentally cutting off internet access for all of Armenia. The country spent five hours offline. The impact was so dramatic because this single cable from Georgia provided nearly all of Armenia's access to the internet, making that one cable vitally important (Lomsadze, 2011; Parfitt, 2011)

There are regular incidents of this type (almost all are accidental damage) associated with submarine cables across the world (around 100 per year globally). The majority of these incidents are minor and service can be restored quickly, but even short interruptions can be costly.



Strategies to Minimise Risk

i Select a destination with strong security and protections

In light of the risks outlined above, it is wise for Timor-Leste to seek to maximise the security and reliability of its (first) submarine cable. Selecting a destination that has institutions and/or strong rules that protect this infrastructure is of utmost importance.

In this respect, Australia or Singapore have the best credentials. Despite the higher cost associated with the distance from Timor-Leste when compared to its much closer neighbour Indonesia, Australia has a record of taking responsibility of its connections to the global Internet, and Singapore also receives favourable reports.



Australia and New Zealand have modern and extremely effective deterrent laws that generally comply with the U.N. Convention on the Law of the Sea (UNCLOS). In both nations proactive monitoring of cables and effective enforcement of domestic laws has essentially reduced cable faults to zero.

Burnett, 2011.

Two different questionnaires conducted within APEC in 2009 and in 2012 showed a low general level of awareness concerning submarine cable network protection and maintenance [in the Asia-Pacific region]. Australia and Hong Kong, China are two exceptions which could serve as role models.

APEC, 2013.

Governments should have a single point of contact for cable-system owners and cable ships to report suspicious or hostile actions...to date, only Australia and Singapore have designated such single points of contact.

Burnett, 2011.

ii Work towards having more than one cable



Additional redundancy and geographic diversity is needed in order to decrease risks from cable disruptions and to improve the overall network resilience.

APEC, 2013.

The key strategy for minimising risk is built on the concept of 'redundancy': in most cases, countries rely on more than one submarine cable for internet connectivity. If one cable is sabotaged or damaged, traffic is rerouted via alternative cable(s) in order to reach its final destination. This may result in poorer speeds and higher latency, but at least basic connection and operation is preserved (Asia-Pacific Economic Cooperation, 2013).

In Timor-Leste's case, at least for the short-term, there will be only a single cable connecting the country to the global Internet. As broadband penetration increases, there will be growing reliance on this single cable. As such, the economic impact of damage to the cable (whether malicious, negligent or otherwise) will increase significantly.

In an ideal world, building a second cable (i.e. redundancy) would be beneficial, particularly as the superior speed and lower cost of cable internet is likely to lead to the progressive phase out of satellite services, so these will not provide a viable back-up option.

The priority for this cable should be the diversification of cable infrastructure rather than building the highest quality cable available (which should be the focus of the first cable). A second cable would of course also provide a means of satisfying the rapidly growing demand for high-speed Internet.

A connection to the Indonesian cable network would seem a potential option for this second cable. There are several relatively low cost options, such as connecting to nearby Alor Island, Indonesia, where the Eastern section of the Palapa Ring cable is scheduled to be connected in 2019.

Indonesia, with its multiple cables connecting many islands, is active in its approach to protecting these vital assets:



Singapore, Malaysia, and Indonesia also have taken bold steps to partner with the regional cable industry on AIS [Automatic Identification System] sharing and in working with the International Maritime Organization to control shipping threats to cables in regional waters."

Burnett, 2011.

Security is a management issue, not a political issue

As discussed above, the risk of espionage is relatively small compared to outright sabotage or accidental damage. Fortunately, the latter is much easier to tackle. The protection and management of facilities (i.e. the cable itself, landing stations) should be the primary concern, which involves bilateral agreements and monitoring of the connected countries. In addition, the provision of two cable options allows the sabotage risk to be diversified.

Institutional agreements already exist that facilitate good management. UNCLOS, ratified by Timor-Leste, Australia and Indonesia, provides formal rules relating to submarine cables that bind member states. This agreement would greatly benefit from additional measures undertaken by connected countries.





6 HOW DOES TIMOR-LESTE MAKE IT HAPPEN?

What are the Obstacles?

Over the past few years, a few proposals have been brought forward by established telecommunications companies to introduce a specific submarine cable. At the time of writing this report, none of those proposals have produced tangible results.

Here we will explore some of the potential issues and concerns with decision making processes such as these, and put forward a few simple thoughts for how they can be addressed.



Some questions that can make what seems like a simple decision seem more complex might include:

Will the profit-motivated company produce the benefits they promise?

Will there be opposition to the project that will hurt the government's reputation?

Will there be people (or physical areas) who lose in this project, whom the government needs to protect?

Will we be creating a monopoly for a private company that disadvantages the government and the people in future years?

How do we price the licences so that the financial benefits go to the citizens, not just to a private company?

How do we ensure a fair process for which companies receive the licences?



Reflecting on these concerns and questions, these can largely be addressed if the following issues can be well addressed in the process: Transparency, Shared Ownership, and Competition.



Transparency

Many of these concerns are alleviated if government follows an open and transparent process throughout. Transparency includes providing information to civil society, as well as giving opportunity for input from civil society and other stakeholders.



Shared ownership

A public-private-partnership model provides a potentially helpful ownership structure for the process of building and managing a major piece of public infrastructure. The state (i.e. the citizens) benefits from profit, and also retains direct involvement in the project, allowing them to focus on protecting the public interest.



Competition

Market competition provides an effective way to protect against power of owners/businesses. For example, a sole owner of the only submarine cable entering the country may be tempted to charge high prices for access, knowing there is no competition. This kind of behaviour is difficult to control and usually requires regulating prices. The best protection from these behaviours is competition. For the first cable that is introduced, an open tender process forces firms to compete for the right to own this project. Tendering can include a price commitment by the company. In the longer term, introducing a second cable will be the key to maintaining that competitive pressure.

What does the Government Need to do?

The first step in implementing a major infrastructure project is for the Government, on behalf of the people, to identify the scope of the project, and to determine where it sits in terms of priorities. The next step is to identify a process for implementation.

In terms of implementation, in most cases cables are laid and (largely) funded by private sector investors. The Government's role is to define the scope of the project so that it delivers the desired economic and social benefits. Private sector

investors will prioritise financial return on their investment, which may mean some “uneconomical” aspects of a project are not supported without government intervention.

Beyond this, the Government role usually extends to giving licences, designing laws that provide investor certainty (incentive to attract the private investor) but also protect from super-profit (e.g. via collection of royalties and by regulating prices).

Ownership and Implementation

A project like this can be approached in a few ways.

1. Government initiated and owned.
2. Public Private Partnership (PPP).
3. Private project – respond to request / submission OR tender.

Shared ownership (PPP) appears to be the most favoured option at present. Following are some thoughts about PPPs, and their relevance to this project.





Public-Private Partnership



What is a PPP?

A Public-Private Partnership is the joint ownership of an asset or piece of infrastructure between a government and private firm(s). The reason for sharing the asset is usually due to a large upfront cost that renders its construction economically unattractive for the private sector, while limited public funds and project expertise constrain the government from acting alone. A PPP also helps alleviate private investor concerns about sovereign risk.



PPP benefits

Where a PPP could be successfully used to i) reduce the use of public funds, ii) spread out total costs over time, and iii) deliver efficient and fairly-priced services to users (government, businesses, and citizens). The latter is due to the ability and expertise of private parties to perform and the regulatory power of the government.



PPP challenges

The major challenge to the successful planning and execution of PPPs is the government's role of finding a balance of a fair return to the private side, whilst ensuring equitable prices and access to services for users. One on hand, there must be a sufficient profit incentive for firms to invest their resources and take on risk. On the other hand, there is a responsibility of the government to limit monopoly power, and perhaps set a timeframe to disassemble this market structure and allow competition. There is a difficult balance between private and social returns.

Another long-term challenge for the government is the management of the facility. This includes monitoring current usage patterns and forecasting future demand, in part to evaluate whether current infrastructure can adequately service usage growth.



Example of a PPP Submarine Cable

The Malaysian government, in conjunction with Telekom Malaysia Berhad, created a PPP to better connect Peninsular Malaysia and Malaysian Borneo. The cable was completed in September, 2017. Salleh Said Keruak, Malaysian Minister of Information and Communication highlighted the benefits the cable would bring; "this is among the measures which the Government is undertaking to improve the socio-economic status of people in Sabah and Sarawak through ICT adoption and broadband connectivity" (Mah, 2017). This example is particularly relevant to Timor-Leste as it could be utilised as a template for a similar Timorese project.



CONCLUDING SUMMARY

- 👍 Over recent years, the Timor-Leste cell phone network has expanded substantially, and achieved almost universal coverage, among the best in the world.
- 👍 Adoption of internet has until now lagged behind phone coverage but **is likely to catch up rapidly in the coming years**. This growing demand will increase the imperative for cheaper, faster and more reliable internet.
- 👍 Based on the current situation in Timor-Leste, the case for investing in submarine cable infrastructure is compelling.
- 👍 There is great potential for many social benefits that can come as a result of cheaper, faster and more reliable internet: vastly improved government communication and services, access to global education resources direct to the classroom, and overcoming many of the information and geographic barriers to excellent health care.
- 👍 Evidence suggests that the arrival of submarine cable internet leads to significant growth in economic activity, and especially employment creation. Any public investment in internet cables could easily pay for itself within a few years, depending on the balance of investment between private and public investment.
- 👍 The security and reliability of a submarine internet cable is very important. While the risk of spying is very low (with the use of well-established technology and processes), the risk of deliberate or accidental damage to a cable and interruption of supply is real. This will be a key consideration in the selection of the country with which to partner in establishing the cable. A country with high standards in regulating and enforcing security protections would be preferred, even if the costs are much higher. Moving quickly towards establishing a second cable (redundancy) would also be important.
- 👍 Obstacles to implementing this project can be avoided with a process that emphasises Transparency, Shared Ownership (signalling strong government commitment) and Competition (a competitive process for selecting participants).
- 👍 Submarine cable developments are increasingly being owned and managed by private sector providers, as they offer good possibilities for profit. However, for Timor-Leste at this time, a public-private partnership would offer some advantages: private partners bring the expertise to deliver the project, while some government ownership ensures the project is well supported by government, reduces the risk to the private sector, and also protects the broader interests of society.

**Faster, cheaper, more reliable
internet is coming!**

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