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Promoting investment in the Asia-Pacific Information Superhighway (AP-IS)

The digital divide in Asia and the Pacific continues to widen over time. It affects ESCAP low-income countries (mostly LDCs, LLDCs and SIDS) which need ICT connectivity the most in their efforts towards achieving the Sustainable Development Goals (SDGs). In response, ESCAP member countries recently endorsed the AP-IS Master Plan and Regional Cooperation Framework Document which provide a regional platform for key stakeholders to coordinate and collaborate towards expanding investment in developing missing fibre-optic networks and improving inclusive broadband access. In that context, this brief explores how to promote broadband infrastructure investments.

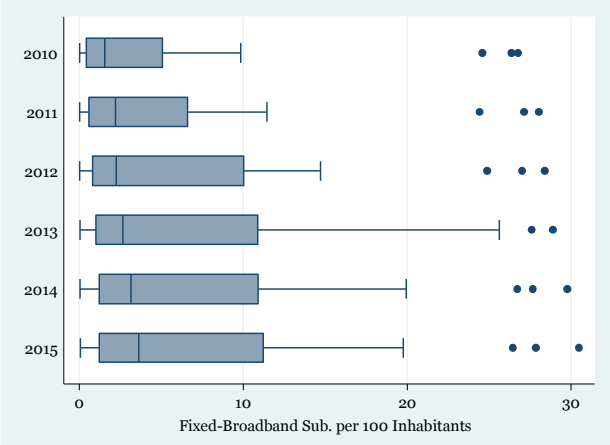
The digital divide

ICT connectivity in Asia and the Pacific has witnessed phenomenal growth and the region is home to some of the top performers in ICT development. For the first time, the majority of global fixed broadband subscribers are registered in the ESCAP region (52 per cent), followed by Europe (22 per cent) and North America (14 per cent). On average, fixed broadband connectivity has improved in ESCAP member countries, from a 3 per cent penetration rate in 2005 to around 9 per cent in 2015. Likewise, mobile broadband connectivity has been rising from 5 per cent average penetration rate in 2009 to around 39 per cent in 2015.[1,2]

However, this performance is heterogeneous across the ESCAP sub-regions and countries. ESCAP's analysis reveals that 75 per cent of the fixed broadband subscriptions are registered in East and North-East Asia alone. Data also show that 20 countries in the region have less than 2 per cent fixed broadband penetration rates, while leading countries, such as the Republic of Korea, Japan and Hong Kong, China score over 30 per cent for the same indicator.[3] Over time, the digital divide (in terms of fixed-broadband subscription rate) is widening between low income ESCAP countries compared to high income ones with no sign of catching up unless specific interventions are undertaken.[4]

The box and whisker plots (see Figure 1) shed further light on the digital divide in the 32 ESCAP countries with data available on fixed-broadband subscription rate. While the median (line inside the rectangle box) for the ESCAP countries sample has increased since 2010, certain countries have not improved much by 2015 - as shown by the closeness to zero of the minimum values of the whiskers and the 25 per cent quartile. In addition, the interquartile range (width of the box) has widened over time, indicating that the variation in countries' connectivity performances have increased over time. However, there are strong performers in the ESCAP sample, as indicated by the maximum values of the whiskers and the 75 per cent quartile. The median for the ESCAP sample in 2015 is around 3.6 per 100 inhabitants, with a mean of 7.7 and standard deviation of 8.6.

Figure 1. Box and whiskers plot of ESCAP sample in 32 countries, 2010-2015



Source: Produced by ESCAP, based on data sourced from ITU World Telecommunications/ICT Indicators Database (accessed July 2016). For list of countries included in the sample, please see www.unescap.org/sites/default/files/State%20of%20ICT%20in%20Asia%20and%20the%20Pacific%202016.pdf.

The reasons for these persistent inequalities are complex. Based on ESCAP's research, the main causes originate from the lack of: investment in resilient ICT infrastructure; effective Internet traffic and network management; conducive and enabling regulations for investment; and capacity and awareness among policy makers and regulators.

The AP-IS initiative and master plan

Recognizing these connectivity deficits, ESCAP member countries initiated the Asia-Pacific Information Superhighway (AP-IS) in 2015. The AP-IS initiative aims to increase the availability and affordability of broadband Internet across Asia and the Pacific, by strengthening the underlying Internet infrastructure in the region through four pillars: (1) physical infrastructure development; (2) Internet traffic and network management; (3) promoting e-resilience and (4) broadband for all.

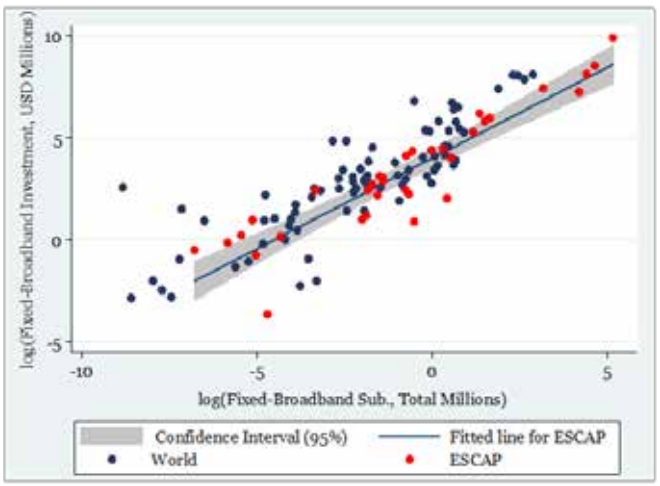
During the inaugural session of the Committee on Information and Communications Technology, Science, Technology and Innovation in October 2016, ESCAP member countries endorsed the AP-IS Master Plan[5] and Regional Cooperation Framework Document[6] which outline the principles, deliverables, timeline and financing mechanisms towards developing regional broadband networks, narrowing the digital divide and accelerating the achievement of the Sustainable Development Goals (SDGs). The AP-IS Master Plan provides a regional platform that brings together several stakeholders including ESCAP member governments, donors and financiers, research and academic institutions, regional and sub-regional organisations, and the private sector.

The AP-IS Master Plan has seven initiatives: (1) Identify and promote the expansion of regional backbone networks; (2) Promote the establishment of a sufficient number of Internet exchange points at the national and sub-regional levels to prevent Internet traffic tromboning, decrease transit costs and improve service quality; (3) Coordinate regional studies on the impact of ICT connectivity on social and economic aspects of people; (4) Promote ICT infrastructure resilience (through diversification of fibre-optic routes, increase redundancy through increasing the number of cables/satellite connects, and cybersecurity preparedness); (5) Promote policy and regulations for inclusive broadband initiatives; (6) Capacity-building (sharing of good practices and lessons learned at the regional level to ensure that increased connectivity is utilised for productive use); and (7) formulation of an Asia-Pacific information superhighway funding platform. Among these different topics, this brief focuses on the financing issue, which remains a persistent challenge in developing ICT infrastructure in the region.

Investment and ICT connectivity

Investment in ICT infrastructure is critical to improving ICT connectivity and lessening the digital divide. Using a cross-section of averages between 2000 and 2015 for countries in the world with available data on investment and access, a positive relationship is found for fixed broadband and mobile broadband, demonstrating the critical role of investment in infrastructure on increasing access to ICT. The positive correlation coefficient (0.87)[7] is statistically significant ($p<0.01$) for fixed broadband subscriptions (Figure 2). The statistically positive relationship between investment and fixed broadband subscription provides support for the important role of investing in physical ICT infrastructure for fixed broadband networks to increase access.

Figure 2. The relationship between telecommunications investment and total fixed broadband subscriptions in 2000-2015



Source: Produced by ESCAP, based on data sourced from ITU World Telecommunications/ICT Indicators Database (accessed July 2016)

Tracking cost

To facilitate future investments, it would be useful to have access to more detailed information on ICT project costs and planning. To date, there are, however, no publicly available data consolidating existing and planned ICT projects in Asia and the Pacific. Available information was collected from project documents, press releases and news reports on ICT projects by various donor institutions and member countries in the region. Based on this information, it can be estimated that fibre-optic network projects cost range from $25 million to $300 million.

As part of the AP-IS Master Plan implementation, a repository of ICT projects in Asia and the Pacific will be maintained with estimates on costing and other relevant information vital for promoting a funding mechanism platform. Stakeholders need to be aware of which ICT infrastructure projects are being planned or currently being implemented in their respective sub-regions. Sharing information also facilitates coordinated efforts and interventions towards addressing the remaining missing links.[8]

Funding regional networks

Most of the international connections are made through submarine cables and to a lesser extent through terrestrial networks, which are more expensive to build but a valuable complement to undersea cables. To finance these international connections, telecom operators from different countries have traditionally partnered in consortium, the objective for each operator being to secure an allocation of bandwidth capacity (proportional to its investment) to serve its home market. This "consortium" approach also enables risk and cost sharing.

Another model involves projects led by non-telecom companies where private investors build cables with the objective of selling access to third parties. This is a more speculative model as it relies on strong future demand. If the demand is overestimated, oversupply capacity is created. This is what occurred in the early 2000s when the industry crashed following the dot-com bubble burst.[9]

In the period 2008-2014, approximately $4.5 billion were invested in submarine cables in the ESCAP region (around 37 per cent of the world total). The majority of these investments were made by telecom carrier-led consortium (83 per cent of worldwide investments in recent years) while the rest were financed by governments and multilateral development banks (MDB) (9 per cent) and private investors (7 per cent).[10]

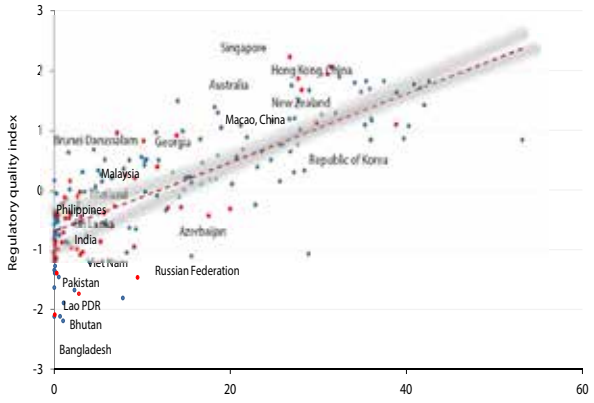
Relying fully on market forces to ensure network development is, however, not always possible as serving less-developed markets or remote countries tends to be unviable on pure commercial terms. Therefore, these frontier markets need support from development partners and multilateral development banks. For example, connecting Fiji and Samoa has required public support and development assistance.

Improving regulations

Conducive government regulations and effective institutions also play an important role in influencing private telecom operators' investment in ICT infrastructure. For instance, the presence of a strong and independent judiciary system and the quality of the regulatory bureaucracy have been found to positively impact private investment in telecommunications infrastructure (Levy and Spiller, 1994 & 1996).[11,12] Other researchers have promoted the establishment of an independent regulator as a means to give comfort to private companies for whom regulations affecting long term investment are unlikely to change during the licensing agreement period (Bertelli & Whitford (2009), Lee and Levendis (2006), and Wallsten (2003))[13,14,15]. Similarly, the literature on telecommunications regulatory reform has found positive effects of quality of regulatory governance on telecommunication industry performance (Ofa, 2012; Fink et al., 2003; Wallsten, 2001 among others).[16,17,18]

This positive relationship between quality regulations and better access[19] is found to be case for ESCAP member countries (Figure 3). There is a strong correlation between the quality of regulation[20] and fixed broadband adoption in Asia Pacific countries. Quality regulations in the area of ICT might include pro-competitive policies, open international gateways and efficient internet traffic management. In fact, the perception of the level of quality of regulations is a common shared challenge for the 20 ESCAP member countries with less than 2 per cent fixed broadband adoption. Thus, developing quality regulations, establishing an independent regulator and allowing for a fair and competitive environment are likely to encourage private investors to consider investing in these countries.

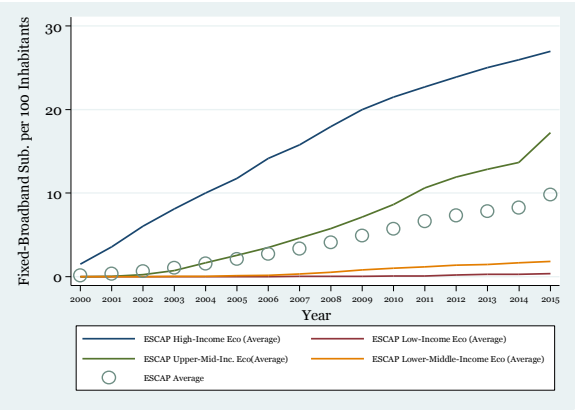
Figure 3. Perception of quality of regulations and fixed broadband connectivity, 2014



Sources: Produced by ESCAP, based on data sourced from ITU World Telecommunications/ICT Indicators Database (accessed June 2015); and Regulatory Quality Index sourced from World Governance Indicators, World Bank.

Note: Estimates for regulatory quality ranges between -2 (poor regulatory quality) and +2 (very good regulatory quality); 95 per cent confidence interval shaded in grey.

Figure 4. Fixed broadband subscriptions per 100 inhabitants by income group, 2000-2015



Source: Produced by ESCAP, based on data sourced from ITU World Telecommunications/ICT Indicators Database (accessed July 2016).

Another critical challenge deterring demand for ICT investment is the level of income in countries (see Figure 4). Higher income countries have higher demand for fixed broadband adoption and vice versa in ESCAP countries. This trend - which appears not to improve over time - shows that the ESCAP low-income countries (particularly, LDCs, LLDCs, and SIDS) have the lowest ICT connectivity.

Concluding remarks

The digital divide in Asia and the Pacific continues to widen over time. It affects ESCAP low-income countries (mostly LDCs, LLDCs and SIDS) which need ICT connectivity the most in their efforts towards achieving the Sustainable Development Goals (SDGs). In response, ESCAP member countries recently endorsed the AP-IS Master Plan and Regional Cooperation Framework Document which provide a regional platform for key stakeholders to coordinate and collaborate towards expanding investment in developing missing fibre-optic networks and improving inclusive broadband access. This is critical as more investment leads to better connectivity. This brief highlights the need to improve access to project information as well as the different mechanisms for financing these projects. This policy brief also stresses the importance of conducive regulations for promoting private investment in developing broadband infrastructure.

[1] Seven Asia-Pacific countries (Australia, Hong Kong China, Japan, Republic of Korea, New Zealand and Singapore) are among the top 20 countries in terms of overall ICT readiness in the Networked Readiness Index. Please see World Economic Forum, *The Global Information Technology Report 2016* (Cologny, Switzerland, 2016).

[2] The United Nations Conference on Trade and Development (UNCTAD) published the Business-to-Consumer (B2C) E-Commerce Index in July 2016 with updated e-commerce indicators to help policy makers assess the readiness of their economies to engage in online commerce. According to the index, three of the Asia-Pacific economies (Japan, Republic of Korea and New Zealand) are among the top 10 economies in e-commerce readiness. Furthermore, the United Nations E-Government Survey 2014 ranked the Republic of Korea, Australia and Singapore as the world's top three e-government leaders, followed by Japan and New Zealand, ranked 6th and 9th, respectively. The International Telecommunication Union (ITU) ICT Development Index 2015, which measures ICT access, usage and skills, lists the Republic of Korea at the top of the list, followed by Hong Kong, China (9th), Japan (11th) and Australia (13th).

[3] For detailed discussion on the state of ICT trends in Asia-Pacific countries, please refer to ESCAP, *State of ICT in Asia and the Pacific 2016: uncovering the broadband digital divide* (Bangkok, 2016).

[4] *Ibid*.

[5] ECOSOC, document E/ESCAP/CICTSTI(1)/2. Available from www.unescap.org/sites/default/files/pre-ods/CICTSTI1_2E_rev1.pdf.

[6] ECOSOC, document E/ESCAP/CICTSTI(1)/3. Available from www.unescap.org/sites/default/files/pre-ods/CICTSTI1_3E_rev1.pdf.

[7] Pearson's correlations indicate almost normal distribution for both variables.

[8] As of October 2016, no fibre-optic submarine cable is connected to Tuvalu and Nauru respectively in the Pacific. These two Pacific island countries rely on satellite communication only. For ddditional information on mission links see Asia-Pacific Information Superhighway Maps. Available from www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway/asia-pacific-information-superhighway-maps.

[9] Project Finance International, 'Subsea cables tap funding markets', 10 February 2016. Available from https://www.milbank.com/images/content/2/3/23470/PFI-570-54-56.pdf.

[10] Terabit Consulting, *Submarine Telecoms Industry Report 2014* (Cambridge, 2014). Available from www.terabitconsulting.com/downloads/2014-submarine-cable-market-industry-report.pdf. Note: The investment estimate for the region is calculated from Figure 4 taking into account 50% of investments for cross-continental cables involving Asia.

[11] Brian Levy and Pablo T. Spiller, "The institutional foundations of regulatory commitment: a comparative analysis of Telecommunications regulation", *The Journal of Law, Economic and Organization,* vol. 10, No. 2 (October 1994).

[12] Brian Levy and Pablo T. Spiller, "A framework for resolving the regulatory problem", in *Regulations, Institutions, and Commitment*, B. Levy and P.T. Spiller, eds. (Oxford University Press, Oxford, 1996).

[13] Anthony M. Bertelli and Andrew B. Whitford, "Perceiving credible commitments: how independent regulators shape elite perceptions of regualtory quality", *British Journal of Political Science*, vol. 39, No. 3 (July 2009).

[14] Sang H. Lee and John Levendis, "Creation of a separate telecommunications regulatory agency: a duration analysis of its time pattern" , *Contemporary Economic Policy* , vol. 24, No. 3 (July 2006).

[15] Scott J. Wallsten, "Of carts and horses: regulation and privatization in telecommunications reforms", *Policy Reform*, vol. 6, No. 4 (2003).

[16] Siope Vakataki 'Ofa, *Telecommunications Regulatory Reform in Small Islands Developing States: The Impact of the WTO's Telecommunications Commitment* (Newcastle upon Tyne, Cambridge Scholars Publishing, 2012).

[17] Carsten Fink, Aaditya Matoo and Randeep Rathindran, "An assessment of telecommunications reform in developing countries", *Information Economics and Policy*, vol. 15, No.4 (December 2003).

[18] Scott Wallsten, "An econometric analysis of telecom competition, privatization, and regulation in Africa and Latin America", *The Journal of Industrial Economics*, vol. 49, No. 1 (March 2001).

[19] From the literature, several studies use the only publicly available data from the International Telecommunications Union such as 'fixed-broadband subscriptions per 100' as a dependent variable for panel data estimation. The purpose of using this variable by many studies however slightly differs. In some studies, the use of this variable is to proxy for the telecom industry's performance (implying that better access means that the industry is performing well). However, in the context of this policy brief, the use of the variable is to simply proxy the magnitude of access to broadband (implying that higher access means digital inclusion, and contributing to narrowing the digital divide). The two differing purposes for using this variable however, are both contributing to narrowing the digital divide. The digital divide has negative, long term implications for low income countries, in the transition to the digital economy and society as well as the transformative capability of ICT.

[20] Using the World Bank's Worldwide Governance Indicators. Available from http://info.worldbank.org/governance/wgi/index.aspx#home.

The ESCAP Policy Briefs aim at generating a forward-looking discussion among policymakers, researchers and other stakeholders to help forge political will and build a regional consensus on needed policy actions and pressing reforms. Policy Briefs are issued without formal editing. The content of this issue was prepared by Atsuko Okuda and Siope Vakataki 'Ofa. This policy brief benefited from comments by Yusuke Tateno and Mathieu Vergougstraete. For further information on this issue, please contact Hamza Ali Malik, Officer-in-Charge, Macroeconomic Policy and Financing for Development Division, ESCAP (escap-mpdd@un.org).

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