Secretariat discussion paper for the open-ended Working Group on the Asia-Pacific Information Superhighway

Open-ended Working Group on the Asia-Pacific information Superhighway

Incheon, Republic of Korea
1-2 September 2015

Contents

Introduction

As is the case in other infrastructure sectors such as transport, energy, inland-waterways, the coherence and integration of ICT networks constitutes a typical case of regional public good. As such, regional cooperation and coordination are essential in ensuring well-functioning ICT transmission networks, and costs and benefits may not always accrue to individual countries in a uniform manner. As in other infrastructure sectors, therefore, there is a need for long-term regional cooperation in ICT infrastructure issues.

Despite the substantial gains reaped from broadband Internet across all sectors, progress has been unevenly spread across Asia and the Pacific. The reasons for these persistent inequities across the region, and within countries, are complex. The Internet is the product of different types of hard and soft infrastructure, continuous technical innovation and agreements between various parties, all of which are interlinked through business models that continue to evolve. One of the key underlying components is the availability of international bandwidth, which provides a general measure of the capacity to deliver affordable and reliable broadband Internet. The physical infrastructure of the Internet, mainly submarine and terrestrial fibre optic networks and Internet exchange points (IXPs), plays an important role in determining the supply and price of international bandwidth in Asia and the Pacific.

In the coming years, demand for international bandwidth is expected to grow significantly in Asia and the Pacific. In addition to higher economic growth and deeper regional integration, a significant transition to higher capability mobile devices amongst the people of Asia and the Pacific is expected to drive the increased demand. These devices are capable of hosting bandwidth-intensive applications for video streaming, social media and cloud computing services, and are becoming the norm at home and in the workplace. GSMA Intelligence forecasts that global 4G and 3G connections in 2020 will number more than two billion and three billion respectively, with much of this growth coming from developing countries[1]. This will lead to much higher levels of data transfer and require an enormous increase in overall international bandwidth capacity. It is important to note that smart mobile devices receive the last leg of data through a wireless network, but still require backhaul networks to carry data from towers and servers to the global Internet. The rapidly increasing demand for data over wireless networks, therefore, will put an increased pressure on backbone networks in the region. Furthermore, the deeper integration of ICT into intelligent transport systems and other Internet of Things applications will also increase the need for bandwidth and will increase pressure on limited radio spectrum resources, further adding to the need for data transmission through fibre[2].

Increasingly also, mobile broadband internet traffic is being offloaded to WiFi, in order to lessen the stress on mobile networks. Analysis and Mason estimated that in 2013 the share of Internet traffic generated from mobile devices that use mobile networks will fall from 38% in 2013 to only 20% in 2018, with the bulk of the increase going to WiFi networks, in a context where overall mobile broadband traffic is to be multiplied by six[3]. This enhanced role of WiFi will doubtlessly increase the need for fibre optic networks for traffic aggregation and long distance backhaul.

The growing appetite for bandwidth is leading operators and carriers to renewed efforts for deploying fibre for capacity, in particular submarine fibre optic cables. In April 2015, TeleGeography estimated that 65 Tbps of new capacity was deployed in 2014, which is comparable to nearly the entire amount of

[1] Available from www.gsmamobileeconomy.com/GSMA_ME_Report_2014_R2_WEB.pdf.

[2] ESCAP (2015): *Intelligent Transportation Systems for Sustainable Development in Asia and the Pacific*. Upcoming ESCAP working paper.

[3] Internet Society: *Global Internet Report 2014 – Open and Sustainable Access for All*. Available at: https://www.internetsociety.org/sites/default/files/Global_Internet_Report_2014_0.pdf.

bandwidth in service globally in 2011. This trend is led by private networks, particularly those of large content providers which deliver services such as video[4].

The widening digital divide is a legitimate source of concern in the ESCAP region, in particular in view of the rapidly increasing demand for bandwidth. In this context, the national and regional broadband fibre optic cable networks are undergoing growing pressures. This will accentuate the need for fibre network upheaval and for the addition of new routes to complement existing ones.

The first section of this paper starts with exploring the current shortcomings in ICT transmission infrastructure – mostly fibre optic cables – that can be addressed by better regional cooperation in developing Asia-Pacific. The second section investigates how better cooperation in Internet traffic management could enhance broadband connectivity in Asia-Pacific. The third section analyses issues related to the improvement of ICT network resilience, while the fourth section briefly reviews the need to improve connectivity in rural and underserved areas. The paper concludes by laying out key issues for the consideration of the Working Group.

I. Improving broadband infrastructure for an Asia-Pacific Information Superhighway

With regards to physical infrastructure, the Asia-Pacific Information Superhighway initiative seeks to improve broadband connectivity by (i) building "missing" linkages for a better regional coherence of national fibre networks, (ii) maximising the co-deployment potentials of cross-sectoral synergies, and (iii) promoting open-access to publically funded infrastructure. These three elements are analysed in the below section.

a. Improving ICT physical infrastructure connectivity through the building of missing links

The current terrestrial networks of fibre optic cables in developing countries of Asia and the Pacific are typically dominated by submarine access to international transit. While in the OECD countries, backhaul (national) networks are increasingly interconnected terrestrially, in developing countries – including many ESCAP countries – backhaul networks are poorly meshed and follow a "river system" pattern whereby networks spread from submarine landing stations thinning out into countries' hinterlands[5].

In developed counties' markets, the widespread interconnectivity of terrestrial backhaul networks, coupled with the presence and active use of numerous Internet Exchange Points (IXPs), result in highly competitive backhaul markets, which in turn contribute to the relatively low costs of broadband to consumers. Meanwhile, in developing countries, network configuration and the heavy reliance on submarine networks for international transit, tends to reinforce the role of incumbent operators and data carriers. Smaller (Tier-2 and 3) Internet Service Providers rely on a limited number of options to procure international transit, which limits the scope of competition to bring down prices on backhaul (national backbone) networks. As key infrastructure such as cable landing stations or international gateways at borders tend to be owned and managed by incumbent operators, these usually have an incentive to overcharge their potential competitors for access to such infrastructure. An example in point was the high access facilitation charges and colocation charges at cable landing stations in India, until the Telecom Regulatory Authority of India (TRAI) intervened to redress this situation and enforce a steep decline in

[4] TeleGeography Research Update, 23 April 2015 "Global Network construction resurgence".
[5] OECD Digital Economy papers No. 232: *International Cables, Gateways, Backhaul and International Exchange Points* (OECD, 2014).

such charges[6]. The charges for access to the cable landing stations were deemed by some observers to be 251 times higher than in comparable jurisdiction[7]. Such higher costs limit price competition and ultimately penalize the final consumers. Generally, the role of incumbent operators that have historical ties to Governments tends to be predominant in the management of such infrastructure. As an indication of the situation in another developing region, the World Bank recently estimated that in 13 out of 19 Middle East and North African countries, access to international submarine cable connectivity is under the sole control of the incumbent operator[8]. The resolution of such regulatory issues can have repercussions across borders, as they may affect the conditions under which countries can access bandwidth in their neighbouring countries. There is, therefore, an incentive in bringing such issues and their potential resolution at the regional level, for example through the Asia-Pacific Information Superhighway.

For landlocked countries, the lack of diversity of terrestrial routes is even more constraining as they obviously have no direct access to submarine cables for international IP transit. The market structure and conditions of access to bandwidth in neighbouring countries therefore dictate the terms under which Landlocked Developing Countries can procure international transit.

The limited number of fibre interconnections across countries also limits the availability of total and per-capita international bandwidth. Again, this issue is affecting more severely landlocked countries that do not have direct access to a submarine cable landing station and who rely on few and outdated terrestrial connections. Bandwidth could be improved in these countries through deliberate efforts to interconnect national fibre backbone with those of neighbouring countries through state of the art high-speed connections.

In this context, the required improvements in regional fibre networks can be realised either through improvements of existing infrastructure (notably by upgrading the capacity of transmission and routing equipment), or by deploying new fibre connections. Simply upgrading existing transmission capacity can be a viable option when network redundancy and competition for international transit issued are already resolved. However, in many ESCAP developing countries, deployment of additional fibre connections is often a preferable option to improve market competitiveness and network redundancy.

The ESCAP secretariat's undertaken initiatives of mapping the existing fibre infrastructure, as well as a series of in-depth subregional studies of broadband infrastructure have facilitated the identification of bilateral connectivity in the greatest need of upgrade. This list of potential priority projects is provided in the annex (page 20). This list includes pairs of countries between which current transmission infrastructure has been identified as being non-existent (such as Nepal-China, Malaysia-Indonesia on the Borneo Island), or insufficient either due to the obsolescence of current linkages (such as Kyrgyzstan-Uzbekistan, Turkmenistan-Uzbekistan), or insufficient to ensure satisfactory redundancy on key trunks of the regional network (such as Bhutan-India, India-Myanmar).

The list in the annex can constitute initial material for discussions by the Working Group on regional fibre network improvements. However, it is not exhaustive[9] and additional analytical efforts will be required to

---

[6] http://www.trai.gov.in/WriteReadData/WhatsNew/Documents/Final%20CLS%20AFC%20&%20CLC%20Regulations%20_21.12.2012.pdf

[7] http://www.asiapacificcarriers.org/sp/user/attach/2012-04-19_APCC%20Response%20to%20TRAI%20Consultation%20on%20CLS%20Charges%20190412%20FINAL.pdf

[8] World Bank 2014: *Broadband Networks in MENA, accelerating High-Speed Internet Access*.

[9] Terabit Consulting studies realised for ESCAP do encompass additional projects identified as "medium" and "low" priority.

complete it and update it regularly. In this context, the secretariat could provide analysis of network performance (upload/download speed, latency, jitter, etc.) in the concerned countries.

b. Tapping cross-sectoral synergies for fibre-optic deployment

Fibre deployment involves different types of costs. It is generally agreed, however, that the dominant constituent in fibre deployment costs is, by far, civil engineering works. A recent review of available literature by the secretariat[10] shows that in general, close to 80% of the costs for deploying terrestrial fibre networks is associated with digging, trenching and laying down the conduits in which fibre is subsequently laid. Moreover, securing rights-of-ways for the passage of fibre, as well as construction permits can be a time-consuming and complicated process.

Thus, there is a strong incentive to resort to infrastructure-sharing to deploy fibre optics between major population centres, at reduced costs. This involves deploying fibre, or at least the ducts for subsequent fibre deployment, along infrastructure such as major roads, railways, power transmission lines, pipelines or waterways. Many modern infrastructure segments deploy fibre by default, for their own Supervisory Control and Data Acquisition (SCADA) purposes. This is the case of high-voltage electricity transmission networks which also use fibre for optical ground wire (OPGW). Modern railway systems typically use fibre for internal communication needs, while pipelines need them for distributed sensing technology[11]. Road transport will increasingly require fibre optic cables to consolidate and transmit information in the context of future intelligent transport systems. Some of the fibre deployed along these infrastructure networks can be used for telecommunication and Internet data traffic purposes. This creates additional economic opportunities for the owner of the underlying infrastructure.

Good practices abound in the Asia-Pacific region for fibre optic co-deployment[12]. Among other examples, China TieTong Telecommunication Corporation integrates the telecommunication systems of Chinese railways. In India, POWERTEL has emerged as a major national carrier having one of the largest national terrestrial fibre backbones deployed mostly along the power grid. The World Bank is currently considering supporting a subregional fibre optic network deployed along the electric transmission lines to be built under the CASA-1000 project, which will link Kyrgyzstan to Pakistan through Tajikistan and Afghanistan[13]. On the other hand, it has been reported that Afghanistan, which is completing its fibre optic network ring, is facing coordination issues in systematically deploying duct along major segments of roads that are being funded through external assistance[14]. This could unduly slow down the completion of the Afghan backbone and undermine the advent of Afghanistan as a fibre optic regional hub in line with its strategic geographical position at the heart of Asia[15].

ESCAP countries should seek to tap on the numerous cross-country or pan-regional infrastructure deployment projects that are facilitated by the current high economic growth in the areas of transport,

---

[10] ESCAP (2014): *Working paper on Harnessing Cross-sectoral Infrastructure Synergies*. http://www.unescap.org/resources/working-paper-harnessing-cross-sectoral-infrastructure-synergies

[11] Fibre optic distributed sensing technology can be used to help keep track of changing pressures, temperatures and ground movements, among other such uses which help in detecting and pinpointing the occurrence of events on pipeline networks before they develop into an actual threat. Ibidem.

[12] Ibid.

[13] http://www.unescap.org/resources/presentation-world-bank-regional-broadband-programs-and-proposed-central-asian-regional

[14] Presentation by MCIT on Afghan Fiber Optic Ring, http://www.unescap.org/resources/presentation-afghan-fibre-optic-ring

[15] Currently, Afghanistan already has fibre optic connections with five of its six neighbours and is considering building a new fibre linkage with China. Ibid.

energy, water, etc. ESCAP member States could decide to systematically co-deploy fibre along regional infrastructures, on an open-access basis.

The ESCAP secretariat has proposed to systematize co-deployment of fibre optic cable along the Asian Highway and Trans-Asian Railway, two transport international agreements for which it acts as secretariat. This proposal by the ESCAP secretariat was discussed during the 4th session of the ESCAP ICT Committee in Bangkok, in October 2014. The proposal will be examined by the respective organs in charge of the two Agreements under the ESCAP aegis later this year. Concretely, this could entail systematically deploying additional ducts and/or fibre when building the infrastructure that constitutes these two networks. In the case of the Trans-Asian Railway, spare fibre could be deployed in addition to that installed for the use by the railway itself. In both cases, the additional ducts and fibre could be rented to telecom operators or other data carriers, in order to provide an additional source of income for the roads and railways entities.

The Asia-Pacific Information Superhighway Working Group should explore ways to maximise such cross-sectoral synergies when building additional linkages in the region.

c. Improving regulatory frameworks and promoting open access to public-funded infrastructure

As identified above, regulatory frameworks and market practices in Asia-Pacific often limit competition in both the international transit and national backbone segments of broadband transmission markets. This is typically the case when such conditions maintain incumbents in dominant positions through the control of key infrastructures such as cable land base stations or international gateways. Accelerating reforms to foster competition on broadband transmission markets is seen as a key priority to lower the costs of broadband for final consumers. Successful policy measures in this respect involve simplifying the licencing regimes for access to submarine and cross border connections, and reducing the exclusive control of incumbents on international gateways and submarine cable land base stations[16]. As uncompetitive regulatory frameworks and practices have a potential regional impact, especially in LLDCs, the working group on the Asia Pacific Information Superhighway should review cases where accelerating such reforms could have a positive impact on regional broadband connectivity.

The deployment of new fibre links, including as suggested above, along segments of the Asian Highways and Trans-Asian Railways as they are built or maintained, should be accompanied with mandatory open-access requirements. Open-access requirements involve allowing all duly licensed operators to obtain access to the fibre infrastructure (or fibre infrastructure services) on an equal non-discriminatory footing, and under transparent and cost-recovery pricing basis. Open-access typically requires establishing clear guidelines of non-discrimination between telecom operators and access to the utility infrastructure at fair prices, which include the recovery of costs in addition to a small profit margin. Rental and maintenance