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Review of issues pertinent to the subsidiary structure of the Commission, including the work of the regional institutions: information and communications technology

Asia-Pacific information superhighway: for inclusive and seamless connectivity

Note by the secretariat

Summary

The Asia-Pacific information superhighway initiative aims to provide seamless regional connectivity between land- and sea-based information and communications (ICT) infrastructure in a way that increases the availability, reliability and affordability of broadband Internet for all. This initiative is driven by uneven progress in Internet connectivity across Asia and the Pacific, which has made the region the most digitally divided area in the world. The reasons for this are complex. The Internet is the result of different types of hard and soft infrastructure, continuous technical innovation and agreements between various parties. One of its key underlying components is the availability of physical infrastructure, mainly submarine and terrestrial fibre optic networks and Internet exchange points (IXPs). Their availability plays an important role in determining the supply and price of international bandwidth in Asia and the Pacific. As demand for bandwidth and greater speed continue to rise, the region is faced with an acute need for additional physical infrastructure. Additionally and perhaps more importantly, by developing seamless and regionally cohesive infrastructure that is integrated with international backbone routes of the land transport sector, large synergies could be tapped into at minimal additional costs.

Given the existing shortcomings, interest among members and associate members has grown regarding the development of pan-Asian terrestrial fibre networks. The Economic and Social Commission for Asia and the Pacific (ESCAP), in its resolution 69/10, requested the secretariat to promote "knowledge related to the development of information and communications technology infrastructure, including in-depth analysis of the policy and regulatory barriers that may impede efforts to synchronize the deployment of infrastructure across the region in a seamless manner". In response to that request, the secretariat has conducted a series of subregional studies and implemented various activities. All of them were aimed at developing a transcontinental fibre network that provides seamless connectivity between land- and sea-based fibre infrastructure, an action that will result in lower consumer prices for broadband Internet and help to meet the growing need for international bandwidth in the region. Furthermore, the Committee on Information and Communications Technology at its fourth session, requested the secretariat to continue working on the Asia-Pacific information superhighway in collaboration with international and regional partners. In realizing this initiative, close collaboration between members and associate members, as well as with private sector partners, international organizations, public funding agencies and development banks, will be needed. Members and associate members are invited to consider the issues and policy recommendations raised by the Committee and provide the secretariat with guidance on the future direction of this work.

* E/ESCAP/71/L.1/Rev.1.

Contents

I. Introduction

1. As the international community intensifies discussions on the United Nations development agenda beyond 2015, broadband Internet is emerging as one of the key means of implementation in which a growing consensus has emerged around the need to "significantly increase access to ICT and strive to provide universal and affordable access to internet in LDCs (least developed countries) by 2020". Broadband-enabled technologies, such as smart grids, intelligent transport systems, integrated water management systems and big data, will increase efficiencies across all sectors of the economy. The Internet also plays an important role in modernizing government services and enhances the interaction and accountability among public administrations, citizens and businesses. Furthermore, in line with the region's risk to natural disasters and exogenous shocks, broadband Internet is increasingly recognized as critical infrastructure for strengthening e-resilience.[1] There is also increasing focus throughout Asia and the Pacific on unleashing infrastructure synergies across sectors for sustainable development. Governments have begun to synchronize the planning, construction and deployment of infrastructure in the information and communications technology (ICT), transport and energy sectors, with the intent to save costs and increase efficiency.

2. Progress and benefits have been spread unevenly across Asia and the Pacific. In the Republic of Korea, for example, 99.6 per cent of young people have been active on the Internet for at least five years, while in Timor-Leste this figure is less than 1 per cent.[2] The reasons for those persistent inequities across the region, and within countries, are complex. The Internet is the result 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. Enhancing connectivity in Asia and the Pacific requires a set of policy actions aimed at strengthening the foundation of the Internet – the hard infrastructure. In that context, the Economic and Social Commission for Asia and the Pacific (ESCAP) is promoting the Asia-Pacific information superhighway initiative, which is aimed at building a seamless connectivity space in the region, with a coherent meshed network of transmission infrastructure. The present report provides the Commission with a review of connectivity in the context of the ESCAP region for the Asia-Pacific information superhighway initiative. It lays out some of the main principles for the information superhighway, and takes note of progress made in its implementation and of the work ahead.

II. The digital divide and persistent inequities

3. Recent data from the International Telecommunication Union (ITU) showed that in 2013, 32 per cent the population of Asia and the Pacific was using the Internet, but that a lingering digital divide existed within the region, with very large disparities in Internet usage. While more than three quarters of the population of the ESCAP ICT advanced economies[3] used the Internet in 2013, only 28 per cent of the population used the Internet in the rest of Asia and the Pacific (figure 1). Within the ESCAP developing economies, the gap in Internet usage is also very large.

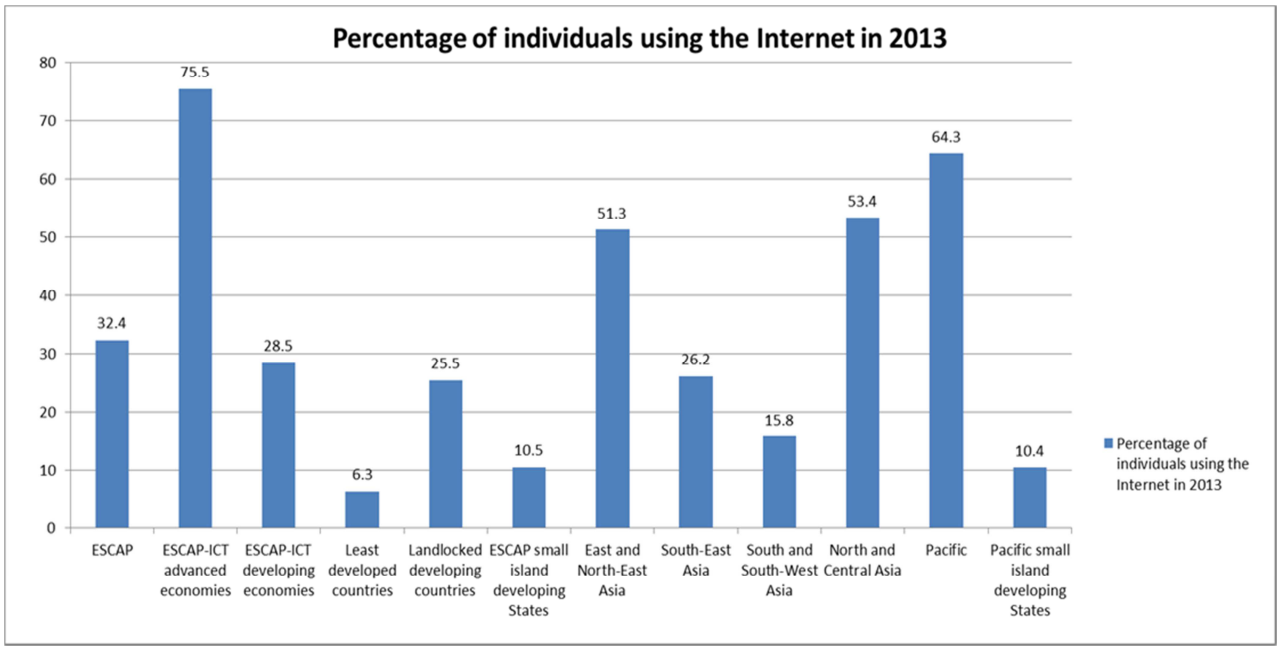
[1] This issue is explored in detail in the document E/ESCAP/CICT(4)/5.

[2] International Telecommunication Union, *Measuring the Information Society 2013* (Geneva, 2013).

[3] This list includes the following: Australia; China; Japan; New Zealand; Republic of Korea; Russian Federation; Singapore; Hong Kong, China; and Macao, China.

4. Although figures show significant progress in basic Internet access, the vast potential of the Internet can only be tapped with a high-speed broadband connection. Data-intensive cooperation between universities and scientific institutions, for example, requires high-speed connections. Governments and businesses require broadband Internet for essential tasks, such as executing financial transactions, meeting through videoconferences and conducting online training. Even the widespread Internet applications that are used daily, such as Skype and YouTube, require broadband Internet. Downloading a 20 megabit video clip at a connection speed of 256 kilobits per second (kbit/s) takes more than 10 minutes, compared to two seconds at a connection speed of 100 megabits per second (Mbit/s)

Figure 1
Percentage of individuals using the Internet in the subregions and economic groupings of the Economic and Social Commission for Asia and the Pacific, 2013



Source: ESCAP calculations based on ITU, World Telecommunications/ICT indicators database 2014.

5. Figures for broadband access, therefore, provide a more useful measure of the impact of the Internet than figures for basic access. A widely used indicator of broadband Internet access, fixed (wired) broadband subscriptions per 100 inhabitants, shows that it remains relatively low. In addition, the gap in access to broadband between more advanced and poorer ESCAP economies is even wider: access to fixed broadband is four times higher in ESCAP ICT advanced economies (25 per cent) than in ICT developing economies (6.1 per cent). Meanwhile, ESCAP least developed countries are even more excluded from the benefits of broadband, with a penetration rate of 0.5 per cent for fixed broadband, which is only marginally lower than the 2.4 per cent penetration rate for mobile broadband. In some ESCAP subregions, the disparities are even greater. In South and South-West Asia and South-East Asia, for example, in 2013, there were only 1.65 and 3.22 fixed broadband subscriptions per 100 inhabitants, respectively, while in

Pacific island developing countries, the average was only 0.3 fixed broadband subscription per 100 inhabitants.[4]

6. A range of factors influence the prevalence of broadband Internet, including policy and regulatory frameworks, income levels and the availability of local language content. One of the key underlying components is the total amount of available international Internet bandwidth (measured in Mbit/s). This indicator measures the volume of Internet traffic that can travel from one country to another, akin to the width of highways in road transport, and provides a general view of the capacity to deliver affordable and reliable broadband Internet.

7. In the context of the large population of Asia and the Pacific, relatively low levels of total international bandwidth translates into much lower international bandwidth per Internet user, as compared to other regions. According to data from ITU, Europe has 144,315 bit/s of international bandwidth per Internet user, more than six times that of Asia and the Pacific, and more than twenty times that of the least developed countries of Asia and the Pacific and Pacific island developing countries (see table 1).

Table 1
Measurements of international Internet bandwidth, selected regions and country groupings

Region or country grouping	Bit/s per Internet user	Total Mbit/s
Africa	3 396	558 618
Arab States	23 453	1 640 792
Asia and the Pacific	22 612	13 147 825
Commonwealth of Independent States	30 362	4 442 981
Europe	144 315	54 787 540
Americas	58 900	26 976 467
Least developed countries of Asia and the Pacific	4 113	67 926
Landlocked developing countries of Asia and the Pacific	24 932	597 373
Pacific island developing countries	6 118	7 430

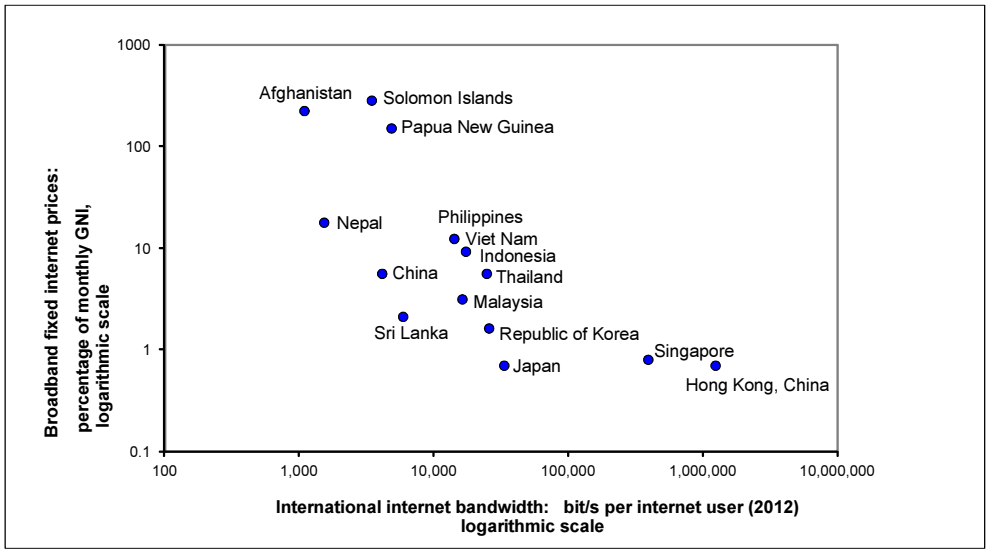
Source: ESCAP calculations based on ITU, World Telecommunications/ICT Indicators database 2014.

Notes: Asia and the Pacific excluding members of the Commonwealth of Independent States. Data for bit/s per Internet user are weighted averages of country GDP in current United States dollars.

8. In most developing economies of Asia and the Pacific, low levels of international bandwidth correlate to the high prices for monthly broadband Internet packages. This means consumers in developed and advanced economies enjoy high-quality broadband at low prices, while consumers in least developed and landlocked developing countries pay high prices for much lower quality connections (figure 2).

[4] The information was compiled by ESCAP based on ITU, World Telecommunications/ICT indicators database 2014.

Figure 2
Broadband indicators, selected economies



Source: ESCAP based on ITU, *Measuring the Information Society 2014* (Geneva, 2013) and World Bank GNI data available from http://data.worldbank.org/%20indicator/NY.GNP.PCAP.CD.

9. 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 among 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,[5] with much of this growth coming from developing countries. 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 increased pressure on backbone networks[6] in the region.

III. Regional Internet infrastructure challenges

10. The physical infrastructure of the Internet, mainly submarine and terrestrial fibre optic cable networks and Internet exchange points (IXPs), plays an important role in determining the supply and price of international bandwidth. In Asia and the Pacific, the low levels of international bandwidth can be partly attributed to a number of factors related to the configuration and efficiency of this infrastructure.

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

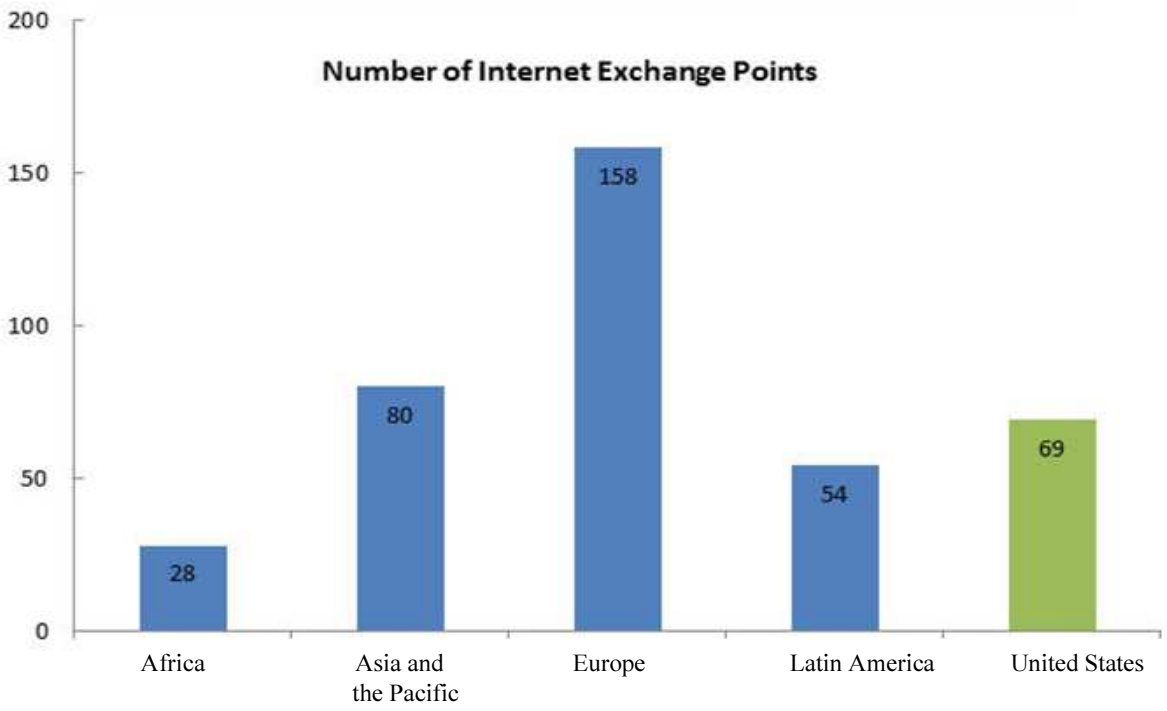
[6] The technical specifications of "backbone networks" and "backbone infrastructure" vary from country to country, but "backbone" is generally understood to refer to the primary data routes connecting computer networks on the Internet.

A. Poor regional coherence of transmission networks and overreliance on submarine cables

11. *Incumbent operators relying on submarine cables*: Many of the terrestrial cross-border links in the region are owned and operated by incumbents associated with submarine carriers. Cross-border terrestrial links are, therefore, configured to route traffic onto incumbent submarine cables, which, in turn, connect to IXPs in other countries and regions. For that reason, regional network traffic in Asia and the Pacific often passes through multiple IXPs located outside the region, with each additional router, switch or kilometre of network affecting the performance, reliability and price of the connection. This reliance on sea-based cables puts the region at risk in the event of a disruption caused by natural disasters, marine vessel accidents or sabotage. In 2009, Typhoon Morakot and the subsequent undersea earthquake damaged 10 submarine cables and adversely affected voice and data traffic across South-East Asia and in China, India and Japan. Similar submarine cable disruptions were observed following earthquakes in Japan and in Taiwan Province of China, and sabotage has become a concern following the deliberate attempt to damage the SEA-ME-WE 4 undersea cable in 2013. It is commonplace to have short-haul Internet traffic traverse several countries, within or outside the region, before returning to a user in a neighbouring country (known as “traffic tromboning”). For example, Internet traffic from Kuala Lumpur could connect to IXPs in Los Angeles and San Francisco before arriving in Singapore. Similarly, traffic from Hanoi to Singapore commonly routes through: Hong Kong, China; Tokyo; and Seattle. Although these circuitous paths take a matter of milliseconds, it reduces network quality, leads to higher prices and takes up valuable transmission capacity that could be used for interregional traffic.

12. *Lack of sufficient regional IXPs*: The availability of additional IXPs in the region would enable more direct routing of Internet traffic and reduce the need to use long-distance transmission capacity for intraregional traffic. Although Asia and the Pacific has the largest landmass of all regions, it has only 80 IXPs (figure 3). Of these, only nine are in least developed countries, landlocked developing countries or small island developing States. Europe has 158 IXPs, and the United States of America has 69 IXPs.

Figure 3
Number of Internet exchange points in selected regions and the United States



Source: Available from https://prefix.pch.net/applications/ixpdir/summary.

Note: Figures accurate as at 11 August 2014.

13. *Infrastructure choke points*: In addition to risk of network outages, reliance on submarine cables has also resulted in infrastructure choke points for international bandwidth. Four regional bottlenecks for submarine traffic have emerged, namely the Strait of Luzon between the Philippines and Taiwan Province of China, the Strait of Malacca between Indonesia and Malaysia, the Strait of Hormuz between the Islamic Republic of Iran and the United Arab Emirates, and the Suez Canal in the Red Sea subregion. Much of the traffic from Asia to Europe, for example, passes through submarine cables that traverse the Suez Canal, a route that is vulnerable to disruptions that could negatively affect network traffic. Increasingly, carriers in Asia and the Pacific are seeking alternative land routes, as a complement to the existing sea-based infrastructure, that would bypass those choke points and add critical redundancy to outgoing and incoming network traffic.

14. *Limited cross-border terrestrial connectivity*: The role of point-to-point connectivity utilizing land-based infrastructure remains limited, making it difficult for inland markets, particularly landlocked developing countries to effectively tap into the global Internet. Much of the fibre infrastructure in the region has been developed in a hub-and-spoke configuration around submarine cable hubs rather than more direct terrestrial fibre in a mesh configuration. Developing and least developed economies rely heavily on international connectivity offered by those hubs, which are mainly located in more advanced economies. The region is heavily dependent on the reliability and capacity of the connecting undersea cables.

15. *Lack of uniformity across terrestrial networks*: The terrestrial networks in the region provide variable quality, cost and service conditions. For example, operators in neighbouring countries may offer different access terms and service guarantees for transmission over its segment of the same international terrestrial network. This leads to market inefficiencies and operational complications, which makes domestic backbone networks unable to compete effectively with submarine cables for international connectivity. As terrestrial connectivity in the region currently functions as a patchwork of domestic networks that rely on submarine cables for international connectivity, the quality and utility of land-based fibre infrastructure is restrained by the weakest terrestrial segment.

B. Transmission infrastructure penalizing vulnerable economies

16. *High wholesale Internet bandwidth prices*: Wholesale Internet bandwidth prices at major IXPs in Asia and the Pacific remain relatively high, particularly when compared to countries in Europe and North America. For example, the median wholesale bandwidth price of one gigabit per second (Gbit/s) in Hong Kong, China, a major international gateway for international bandwidth in the region, has remained three to five times the price in London over the past three years. This means that local Internet service providers operating under transit agreements with international bandwidth providers pay more than their European counterparts to access the global Internet. Furthermore, wholesale prices in the developing economies are even higher than those of advanced economies of the region, which are already high when compared to global prices (table 2). A number of factors affect wholesale prices, including market size, regulatory framework, landlockedness and the availability of alternative routes to alternative submarine hubs that can provide competition in international backhaul.

Table 2
Typical international capacity price on selected markets

Market	Typical international connectivity pricing (US$ per Mbps per month), 2013, unless otherwise specified
Azerbaijan	20
Bangladesh	26
Bhutan	100
Cambodia	80
India	10−15
Indonesia (2012)	60−70
Iran (Islamic Republic of)	58
Kazakhstan (2012)	15
Kyrgyzstan (2012)	>100
Lao People's Democratic Republic (2012)	100
Malaysia	25
Maldives	>100
Myanmar (2012)	>100
Nepal	40−60
Pakistan	14−100

Market	Typical international connectivity pricing (US$ per Mbps per month), 2013, unless otherwise specified
Philippines	>80
Russian Federation (2012)	1.80 to 4
Singapore (2012)	10
Sri Lanka	60−70
Tajikistan (2012)	>100
Thailand (2012)	80
Turkey	2.60
Turkmenistan (2012)	>100
Uzbekistan	347
Viet Nam (2012)	70
Sao Paolo – Brazil (2014)	18
Hong Kong, China (2014)	6
New York - United States of America (2014)	1.64
London - United Kingdom of Great Britain and Northern Ireland (2014)	1.36

Source: Terabit for countries, telegeography for cities.

17. Most least developed countries and landlocked developing countries face very high prices for access to international data transit. Azerbaijan and Kazakhstan constitute exceptions in that they enjoy relatively lower transit prices ($20 and $15, respectively, per Mbps). Both of those countries have multiplied their points of physical connectivity to international networks. Interestingly, they also act as transit countries for through-traffic of third countries, thereby importing large international bandwidth capacity and consequently triggering economies of scale that allow them to command lower prices than other landlocked developing counties of the region, including for their own domestic markets.[7] At the other end of the spectrum, the cost of international connectivity in twice-landlocked Uzbekistan was $347 per Mbps in 2012. The costs for international capacity in most other Central Asian countries, as well as in the Lao People's Democratic Republic were also more than $100 per Mbps. This compares very unfavourably to prices paid by other ESCAP member countries. Only Myanmar, which has a nascent ICT market, faced a comparable situation. For some landlocked countries, their geographical location inflicts a premium on international transit prices. Configuration of international networks is problematic in that it exposes them to bottlenecks that constitute single points of failures. The situation of Bhutan provides a case in point. Its two international gateways are connected to the Indian network. However, all the fibre-based traffic in this part of India travels through a single point: the city of Siliguri, as North-Eastern India is not yet directly connected to international networks. Siliguri, therefore, constitutes a major bottleneck that exposes the domestic network of Bhutan to intense vulnerability, in what is already a highly seismic region.[8]

[7] ESCAP, *Bridging Transport, ICT and Energy Infrastructure Gaps for Seamless Regional Connectivity* (Bangkok, 2014).

[8] Ibid.

IV. Towards an Asia-Pacific information superhighway

18. The challenges outlined above have led to increased interest by Governments in the region to develop greater cross-border terrestrial connectivity, along with sufficient regional IXPs. This would increase overall international bandwidth capacity in the region and help reduce the cost of broadband Internet. Additional terrestrial networks would also boost the competitiveness of telecommunication carriers in Asia and the Pacific. Operators would be relieved of investing in short-haul and medium-haul undersea cable projects, allowing them to invest in long-haul submarine cable projects focused on intercontinental connectivity with Europe and North America. Furthermore, additional IXPs in the subregion would support more efficient interconnection between domestic operators and reduce the prevalence of local traffic leaving the region through uneconomical international transit paths. Landlocked countries, in particular, would benefit from more efficient traffic interconnections and reduced reliance on neighbouring countries for international bandwidth.[9]

19. ESCAP has thus proposed the development of pan-Asian fibre networks to provide cost-effective access to international Internet bandwidth. This could involve a meshed network of submarine and terrestrial fibre optic cables that would extend access to all operators on fair and reasonable terms. A transcontinental network that provides seamless connectivity between land-and sea-based fibre infrastructure would lower consumer prices for broadband Internet and help meet the growing demand for international bandwidth in the region. In particular, the Asia-Pacific information superhighway would enhance the connectivity of landlocked developing countries in the region, many of which currently lack direct links to submarine cables and major IXPs.

20. Cross-border terrestrial connectivity is sometimes perceived to be less effective than submarine cables, however, the experience of landlocked countries of the Organisation for Economic Co-operation and Development (OECD) demonstrate the critical role of both land- and sea-based fibre infrastructure. Of the 34 OECD member countries, six are landlocked and rely solely on terrestrial fibre networks for international bandwidth, yet fixed broadband penetration rates in those six countries are higher than in many countries with direct access to submarine cables. Landlocked Austria, Luxembourg and Switzerland have fixed broadband rates above 25 per cent, and rely on high-capacity terrestrial links to connect to the global Internet. The overall success of landlocked OECD countries, some of which have emerged as key bandwidth transit wholesalers, provide a compelling model for landlocked countries in Asia.

[9] Ibid.

21. The development of an Asia-Pacific information superhighway requires strong international submarine connectivity, enhanced terrestrial fibre infrastructure, the presence of IXPs in the region and satellite services where appropriate, all seamlessly configured in a meshed network. Developing this type of integrated information and communications infrastructure also requires close coordination between members and associate members, as well as with private sector partners, international organizations, public funding agencies and development banks. Towards this end, the Committee on Information and Communications Technology at its fourth session, which was held in Bangkok from 14 to 16 October 2014, requested the secretariat to establish an open-ended working group on the Asia-Pacific information superhighway to develop principles and norms as well as a master plan, covering both the policy and technical aspects of the Asia-Pacific information superhighway.[10] The section below outlines some of the potential principles that the working group may be invited to consider further.

A. Common principles for Asia-Pacific network development

22. *Fully integrated and coherent*: Robust cross-border connectivity, developed in a mesh configuration, would increase international bandwidth capacity and allow for in-network healing in the event of cable disruptions.

23. *Transparency, open-access and non-discriminatory pricing*: Operators accessing the network on equal, transparent and non-discriminatory terms would help lower the costs for international bandwidth. Open-access principles implemented across the region would enable access to transmission infrastructure at fair and reasonable prices, resulting in more affordable bandwidth.

24. *Uniform quality*: A single uniform network with standard terms and quality of service guarantees would address the inefficiencies and operational complications arising from the existing patchwork of domestic backbone networks.

25. *Leverage existing infrastructure:* Utilizing existing passive infrastructure in energy, water, transport and telecommunications, including the accompanying rights-of-way, would lower deployment costs and increase network reliability.[11] This could be achieved through partnerships with existing long-distance infrastructure networks, such as the Asian Highway, the Trans-Asian Railway, or power transmission networks. Traditional utilities could sell transmission capacity on fibre deployed along their networks, raising additional revenues and proposing new Internet transmission routes that connect large urban centres. Up to 80 per cent of the cost of deploying fibre optic involves civil engineering work, such as digging and trenching.[12] Such costs could be avoided or at least greatly reduced if fibre is deployed along transport and other utility networks as they are being constructed or maintained. In the light of such potential win-win outcomes, the Committee on Information and Communications Technology at its fourth session recommended that consideration should be given to amending the

[10] See E/ESCAP/CICT(4)/9.

[11] For more details on cross-sectoral synergies, refer to "Harnessing cross-sectoral infrastructure synergies", a note by the secretariat presented to the Committee on Information and Communications at its fourth session (E/ESCAP/CICT(4)/2 – E/ESCAP/CTR(4)/2).

[12] Ibid.

Intergovernmental Agreement on the Trans-Asian Railway Network and the Intergovernmental Agreement on the Asian Highway Network so as to include cohabitation. Partnerships with ongoing and planned terrestrial links, such as the Trans-Eurasian Information Superhighway, could also feed into a pan-Asian terrestrial network.

26. *Regional and subregional Internet exchange points:* Shorter paths between IXPs, Internet service providers and the consumer would yield a higher performance at lower prices. The establishment of additional regional and subregional IXPs, therefore, should form a key part of efforts to develop pan-Asian terrestrial networks.

27. *Cooperation towards a cohesive regional network:* A regional approach — or at least coordinated subregional approaches — can add significant value. If coordination is lacking, countries may choose to improve international connectivity by negotiating on their own for transit capacity with neighbouring countries, without contemplating the impact of such decisions on the region as whole. Such bilateral approaches have contributed to the existing fragmentation of backbone networks in the region. Developing bilateral relationships with networks in other countries without an overarching regional framework would also limit competition at cross-border links and international gateways.

B. Public funding and regulatory support for broadband infrastructure projects

28. Some Governments have decentralized efforts and successfully funded fibre networks at the municipal level, using local funds to connect cities and towns; however, this approach does not always adequately address the lack of connectivity in rural areas. Experiences from outside the region provide useful examples for addressing this issue. In Colombia, for example, the Government created a list of unconnected municipalities and offered public funding to co-finance backhaul networks if service providers were willing to connect those municipalities. The successful bidder was the firm that offered to connect the greatest number of municipalities, which in this case was 245 previously unconnected municipalities, far beyond the expectations of the Government (70 municipalities).[13] Public institutions can also provide low-cost loans to operators to support fibre deployment in rural areas, a strategy that has been used in developed markets in North America and Europe.

29. It is important to note that even in cases in which public funding is provided for fibre infrastructure projects, partnerships with existing private operators is required in order to ensure seamless connectivity across old and new infrastructure and fair and transparent competition. In some cases, Governments may find that management of the network is best handled by the private sector. For example, the successful broadband strategy implemented by the Republic of Korea can be credited to a combination of deregulation, competition and government investment in the construction of a backbone network. Upon completing various broadband networks, the Government transferred ownership of the infrastructure to the private sector, cognizant that private companies would be better suited to manage the network.

[13] OECD, “International cables, gateways, backhaul and international exchange points”, OECD Digital Economy Papers, No. 232, (Paris, 2014).

C. Open-access principles for cohesive regional network development

30. As public funds are increasingly utilized to develop fibre infrastructure across the region, the adoption of open-access principles has become an important policy objective. Practices from around the world illustrate an emerging consensus on the general principles for open access on fair, reasonable, and non-discriminatory terms.[14] In the European Union and the United States of America, for example, "open access" is used in the public funding frameworks for broadband networks. Increasingly, open-access obligations are imposed by public authorities in the context of private sector mergers or acquisitions, as well as for those operators who are awarded public funding for broadband infrastructure projects. These obligations, widely used when deploying fibre to underserved or rural areas, are aimed at stimulating competition and assisting third-party access to broadband infrastructure.

31. Conferring open access status to civil engineering assets, such as ducts and conduits, could also provide widespread benefits by making it more cost-effective for competitors to deploy fibre, especially to less commercially attractive locations. Municipal authorities with access to local utility networks, such as water, sewage and electricity infrastructure, could also leverage those networks to streamline broadband deployment and earn additional income through the leasing of the transmission infrastructure. Granting access to publicly-operated networks would lower deployment costs, and offer opportunities for co-management of the infrastructure, which could result in additional cost savings. In the Republic of Korea, open access to the wiring infrastructure of apartment buildings was a key element of expanding broadband connectivity throughout the country, as 58.6 per cent of the population live in apartment buildings. The country's Building Certification Programme, which ensures that apartment buildings are equipped with suitable infrastructure for fibre connectivity, significantly increased competitive access to in-house facilities and prevented apartment buildings from being locked into a single provider.[15]

32. Open-access policies are subject to varying interpretations of the basic principles, conflicting regulatory provisions from different authorities and practical challenges in implementation. In that respect, formal and informal cooperation between government authorities, telecommunications regulators, public funding agencies and the private sector should be strengthened. Given the economic, legal and cultural diversity of the region and disparities in the level of Internet infrastructure and connectivity between countries, ensuring open access requires a broad regional platform, such as the one provided by ESCAP, to exchange ideas and formulate guiding arrangements and the appropriate circumstances for open access principles. The need for pan-Asian terrestrial connectivity, achieved in a cohesive manner, has been voiced by members and associate members through various forums, particularly through Commission resolution 69/10 on promoting regional information and communications technology connectivity and building knowledge-networked societies in Asia and the Pacific. To improve connectivity in the region, an overarching framework is required. ESCAP, as the sole region-wide intergovernmental platform and as the main United Nations economic and social development centre in Asia and the Pacific is ideally placed to lay the foundation for such a regional cooperation framework.

[14] OECD, "Broadband networks and open access", OECD Digital Economy Papers, No. 218 (Paris, 2013). Available from http://www.oecd-ilibrary.org/science-and-technology/broadband-networks-and-open-access_5k49qgz7crmr-en.

[15] Ibid.

V. Work of the secretariat in support of the Asia-Pacific information superhighway

33. In response to requests received from member States, the secretariat has undertaken the following:

A. Analytical findings

34. Subregional studies on fibre infrastructure, including detailed analyses of cross-border links, deployment costs and market structures, were carried out for South-East Asia, North and Central Asia, and South and South-West Asia. Those studies were further enriched by contributions from global and regional experts and have been widely disseminated to policymakers throughout the region. The study for North and Central Asia has also been translated into Russian. The geographic design of the Asian information superhighway is of importance and initial findings from the subregional studies ESCAP conducted showed that improved connectivity was urgently needed at a number of international borders. The studies classified those missing linkages calling for investments by order of priority, including high, medium and low priority categories.[16]

35. In partnership with ITU, ESCAP has developed digital maps featuring terrestrial backbone networks in Asia and the Pacific, including optical fibre and wireless networks. It also has added layers featuring the routes of the Asian Highway and Trans-Asian Railway.[17] Interactive maps enable policymakers to identify weak points in regional and subregional fibre infrastructure and opportunities for cross-sectoral infrastructure development in the ICT and transport sectors. Recent additions to the maps include international submarine cables, while the addition of satellite connections is under development. Moreover, new developments are under way to strengthen the analytical contribution of the maps. ESCAP is preparing new layers of the maps that will feature IXPs, root servers and existing and planned regional fibre networks. This new version of the maps will also visualize the missing links in regional fibre optic networks that were identified through ESCAP research. The maps will also identify locations where those missing links can be built along the Asian Highway and Trans-Asian Railway.

36. Technical analysis has been carried out on the speed, reliability and resilience of network traffic in the region. Data have been compiled and analysed from various proprietary and public sources, and the results have been integrated into the regional and subregional backbone network maps and subregional studies. The analysis has helped identify subregional groups that will benefit significantly from the Asia-Pacific information superhighway by enhancing network capacity growth rates, improved latency and network reliability.

37. To gain a complete understanding of the connectivity challenges in the region, consultations have been carried out in each of the ESCAP subregions. Those consultations have guided the work of the secretariat and are reflected in this present note.

[16] The studies are available from www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway/publications.

[17] The maps are available at www.itu.int/itu-d/tnd-map-public/.

B. Outcome of the fourth session of the Committee on Information and Communications Technology

38. The Committee on Information and Communications Technology held its fourth session in Bangkok from 14 to 16 October 2014. One of the sessions of the Committee was held jointly with the Committee on Transport, allowing for the first time, for a joint regional policy dialogue between ICT and transport experts. The Committee marked its support for this approach, which was aimed at strengthening intersectoral cooperation in tackling development challenges.

39. The joint session discussed potential synergies between the transport and ICT sectors, including in the deployment of intelligent transport systems. It also discussed the potential win-win outcomes of fibre optic co-deployment along transport infrastructure, including roads and railways.[18] In this context, the Committee on Information and Communications Technology encouraged open access to passive communication infrastructure, including the infrastructure to be deployed along the Asian Highway and Trans-Asian Railway networks. It also recommended that consideration should be given to amending the Intergovernmental Agreement on the Trans-Asian Railway Network and the Intergovernmental Agreement on the Asian Highway Network so as to include fibre optic cables cohabitation along the infrastructure of those two agreements. In order to do so, the Committee further recommended that such amendments be dealt with through future meetings of the working groups on the Asian Highway and Trans-Asian Railway networks, as established under the respective agreements.

40. The Committee also encouraged the secretariat to carry out further analytical work in support of the Asia-Pacific information superhighway initiative. In particular, the Committee requested that the secretariat further enhance the maps of the Asia-Pacific information superhighway and noted with satisfaction the secretariat's ongoing activities aimed at identifying missing ICT infrastructure links. It also encouraged the secretariat to create a database of pan-regional infrastructure projects with existing or future fibre co-deployment potential. This information could be integrated into the ESCAP/ITU online maps of the Asia-Pacific information superhighway. Furthermore, the Committee encouraged the secretariat to carry out additional analysis of international connectivity and backbone networks at the subregional level, with a view towards developing potential network topologies, funding arrangements and implementation models.

41. Importantly, the Committee also called for the secretariat to create an open-ended working group on the Asia-Pacific information superhighway. The working group shall develop principles and norms, as well as a master plan, covering both the policy and technical aspects of the Asia-Pacific information superhighway. The working group would also collaborate with United Nations system partners and other international organizations, notably ITU and the World Bank, and tap into expert analysis provided by researchers, policy think tanks and regional and national institutions, such as the National Information Society Agency in Seoul and the Internet Society.

[18] E/ESCAP/CICT(4)/2 – E/ESCAP/CTR(4)/2.

C. Work ahead

42. Consequently and in line with the recommendations of the Committee, the secretariat is in the process of:

(a) *Setting up the working group on the Asia-Pacific information superhighway*. Member states have been invited to nominate representatives to the working group. Draft terms of reference, which help delineate the areas of action and priorities for the working group, have been prepared, and the secretariat, in consultation with member States, is organizing the first session of the working group, to be held during the second half of 2015, and another session in 2016. Additional sessions may be organized if needed. The working group will also need to adopt a road map with a calendar to time its work in support of the implementation of the Asia-Pacific information superhighway. Active participation in the working group will require a vision on how the Asia-Pacific information superhighway will contribute to a seamless network at the regional level, using cross-sectoral synergies, where applicable. The ultimate aim is to close the digital divide in developing countries. Of relevance also are the efforts by the secretariat to draw upon network performance data to gain insight into the digital divide, including urban/rural aspects. Those data are also expected to assist in developing resilience indicators for critical ICT infrastructure. Articulating such a vision may require capacity-building support in some developing countries, which the secretariat could extend, starting with support targeted to landlocked developing countries for which the Asia-Pacific information superhighway could be particularly beneficial.

(b) *Undertaking further analytical work that will deepen cost-benefit considerations for pan-regional connectivity*. The secretariat will continue to improve and update its maps of the Asia-Pacific information superhighway, in cooperation with ITU. The secretariat is also exploring potential cooperation opportunities. Among them are discussions on a possible policy toolkit on facilitating fibre co-deployment on an open access basis with the OECD secretariat, and a study with the Internet Society and the World Bank on a value-chain analysis of the cost of broadband in Central Asia to elicit the main policy and regulatory hurdles to cheaper broadband connectivity.

VI. Issues for consideration by the Commission

43. The Commission may wish to endorse the recommendations made by the Committee on Information and Communications Technology at its fourth session, as outlined in its report (E/ESCAP/CICT(4)/9).

44. The Commission may wish to support the activities of the working group on the Asia-Pacific information superhighway, and call on member States and other partners to actively engage in its deliberations and activities. It may also call on member States to provide resources to support the working group's programme of work. This could include specific support directed at least developed countries and other vulnerable economies.

45. The Commission may also wish to provide guidance to the secretariat with regard to fact-finding initiatives and analysis on the Asia-Pacific information superhighway, including the possibility of enhancing the maps of the Asia-Pacific information superhighway, through partnerships with ITU and regional policy research institutions. It may also wish to provide guidance to the secretariat with regard to the exchange of best practices and experiences and knowledge related to the development of ICT infrastructure,

including in-depth analysis of the policy and regulatory barriers that may impede efforts to synchronize the deployment of infrastructure across the region in a seamless manner.

46. The Commission may also wish to extend guidance to the secretariat on the analysis of network performance, international connectivity and backbone networks on a subregional basis, starting with South-East Asia. Such analysis could include current measurements of the speed and quality of Internet traffic in the subregion as well as projections under different scenarios, with a view towards developing potential network topologies, funding arrangements and implementation models for the Asia-Pacific information superhighway.

VII. Conclusion

47. In Asia and the Pacific, as in other regions of the world, broadband Internet is accelerating the process of regional integration. It has been recognized as a key means of implementation in the United Nations development agenda beyond 2015. However, despite this, the digital divide both within and among countries persists. Drawing on cross-regional experiences, a regional network that contributes to more cost-effective access to international Internet bandwidth, as well as reduced latency and improved network quality has assumed urgency. Towards this end, with guidance from members and associate members, and with the generous funding support of development partners, the secretariat stands ready to continue to put in place the building blocks for an Asia-Pacific information superhighway.