



Economic and Social Commission for Asia and the Pacific
Committee on Information and Communications Technology

Fourth session

Bangkok, 14-16 October 2014

Item 2 of the provisional agenda

**Asian Information Superhighway:
seamless connectivity for sustainable development
in Asia and the Pacific**

Summary

Despite the substantial gains reaped from broadband Internet across all sectors of the economy, 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. 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 (IXP), play an important role in determining the supply and price of international bandwidth in Asia and the Pacific.

Targeted investments and policy reforms that enhance the seamlessness of current configurations of Internet infrastructure in the region, as well as competitive markets that allow for the efficient use of this infrastructure, would help reduce regional inequities and increase the overall development impact of the Internet. Given the shortcomings of the existing fibre infrastructure in Asia and the Pacific, interest among members and associate members has grown regarding the development of pan-Asian terrestrial fibre. A transcontinental fibre network that provides seamless connectivity between land- and sea-based fibre infrastructure would lower consumer prices for broadband Internet and meet the growing need for international bandwidth in the region. In particular, an Asia-Pacific Information Superhighway would enhance the connectivity of landlocked developing countries, many of which currently lack direct links to submarine cables and major Internet Exchange Points. Developing such a pan-Asian network will require close collaboration between member and associate members, as well as with private sector partners, international organizations, public funding agencies, and development banks. Members and associate members are invited to consider the issues raised and policy recommendations contained in the note, with a view to providing the secretariat with guidance on the future direction of this work.

Asian Information Superhighway: seamless connectivity for sustainable development in Asia and the Pacific

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I. Introduction

1. As the international community intensifies discussions on a post-2015 development framework, broadband Internet is emerging as one of the key means of implementation. 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 between public administrations, citizens and businesses. Furthermore, in a region that faces heightened natural disasters and exogenous shocks, broadband Internet is increasingly recognized as a critical infrastructure for strengthening e-resilience. This issue is explored in detail in the Committee note for agenda item 6. There is also increasing focus across the region on unleashing infrastructure synergies across sectors for sustainable development. Governments have begun synchronizing the planning, construction and deployment of infrastructure in the ICT, transport, and energy sectors, as a means of saving costs and increasing efficiency. This issue is examined in detail in the Committee note for agenda item 3.
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.¹ 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. The central premise of this note, which has been prepared for agenda item 2, is that enhancing connectivity in Asia and the Pacific will require a set of policy actions aimed at strengthening the foundation of the Internet ecosystem – the hard infrastructure. Targeted investments and policy reforms that enhance the seamlessness of current configurations of Internet infrastructure in the region, as well as competitive markets that allow for the efficient use of this infrastructure, would help reduce regional inequities and increase the overall development impact of the Internet. If information and communication technologies are to support sustainable development as envisioned by world leaders at the Rio+20 United Nations Conference on Sustainable Development², seamless connectivity of the infrastructure component of the Internet will be essential. This note will also provide an update on progress achieved on the Asian Information Superhighway Initiative since the third session of the Committee on ICT.

II. Broadband Internet and international bandwidth in Asia and the Pacific

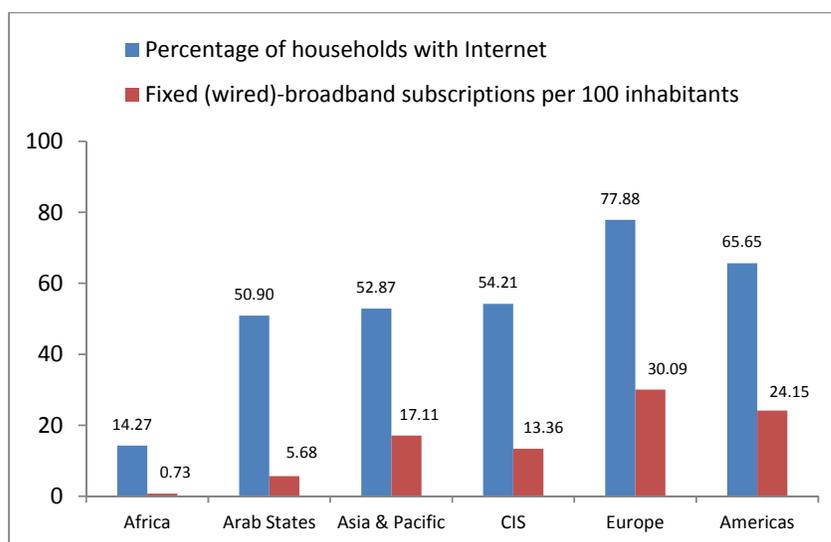
3. Recent data from the International Telecommunications Union shows that nearly 53 per cent of households in Asia and the Pacific have access to the Internet. This is higher than in Africa (14.27 per cent), but lower than in the Americas (65.65 per cent) and Europe (77.88 per cent). In the Commonwealth of Independent States (CIS), 54.21 per cent of households have access to the Internet. Although these 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 collaboration among universities and scientific institutions, for example, require high-speed connections. Governments and businesses require broadband Internet for essential tasks such as executing financial transactions, meeting via videoconference, and conducting online training, and even day-to-day use of widespread Internet

¹ ITU Measuring the Information Society 2013

² Resolution 66/288 The future we want: <http://daccess-dds-ny.un.org/doc/UNDOC/GEN/N11/476/10/PDF/N1147610.pdf?OpenElement>

applications, such as Skype and YouTube, require broadband Internet. Downloading a 20 megabit video clip at a connection speed of 256 kilobits per second would take more than 10 minutes, compared to two seconds at a connection speed of 100 megabits per second.

- 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 access – fixed (wired)-broadband subscriptions per 100 inhabitants - shows that access to broadband Internet in Asia and the Pacific remains relatively low. There are 17.11 fixed broadband subscriptions per 100 inhabitants in the region, compared to 24.15 and 30.09 in the Americas and Europe, respectively. In some ESCAP sub-regions, the disparities are even greater. In South and South-West Asia, and South-East Asia, for example, there are only 1.65 and 3.22 subscriptions per 100 inhabitants, respectively. And in Asia-Pacific least developed countries and Pacific island developing countries, there is less than 1 subscription per 100 inhabitants, on average.

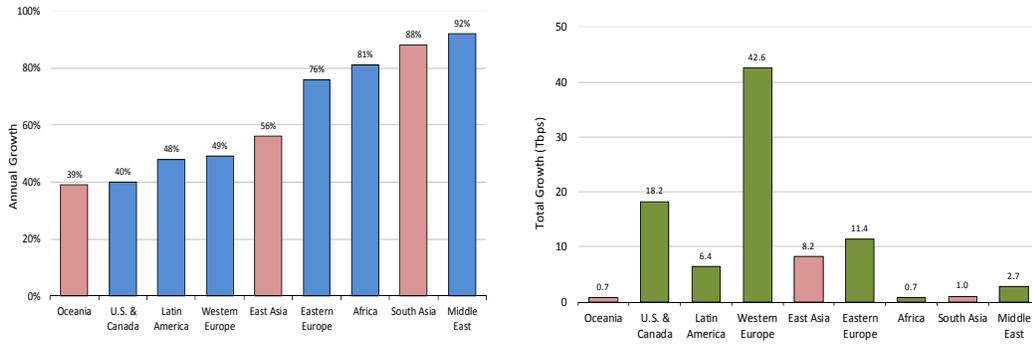


Note: Asia-Pacific excludes CIS

Source: ITU, World Telecommunications/ICT Indicators database 2014 (data is presented as a weighted average of country GDP in current US dollars)

- 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 international Internet bandwidth (measured in megabits per second) that is available in a particular country or region. 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. Although Asia and the Pacific has achieved impressive growth rates for international bandwidth over the past five (5) years, the total amount of bandwidth added during the period remains much less than in North America and Europe.

Annual average growth in bandwidth vs. distribution of bandwidth added, by region (2008-2012)



Source: Telegeography, “2013 Telegeography landscape”, presentation at the Pacific Telecommunications Council Annual Conference, Honolulu, Hawaii, 20-23 January, 2013.

- In addition to relatively low levels of total international bandwidth, the large population in Asia and the Pacific translates to much lower international bandwidth *per Internet user*, compared to other regions. According to data from the International Telecommunications Union, Europe has 144,315 bits per second of international bandwidth per Internet user, more than six times that of Asia and the Pacific, and more than 20 times that of Asia-Pacific least developed countries and Pacific island developing countries, respectively.

2012	International Internet Bandwidth	
	Bit/s per Internet user	In Mbit/s
Africa	3,396	558,618
Arab States	23,453	1,640,792
Asia & Pacific	22,612	13,147,825
CIS	30,362	4,442,981
Europe	144,315	54,787,540
The Americas	58,900	26,976,467
LDC Asia-Pacific	4,113	67,926
LLDC Asia-Pacific	24,932	597,373
Pacific island developing countries	6,118	7,430

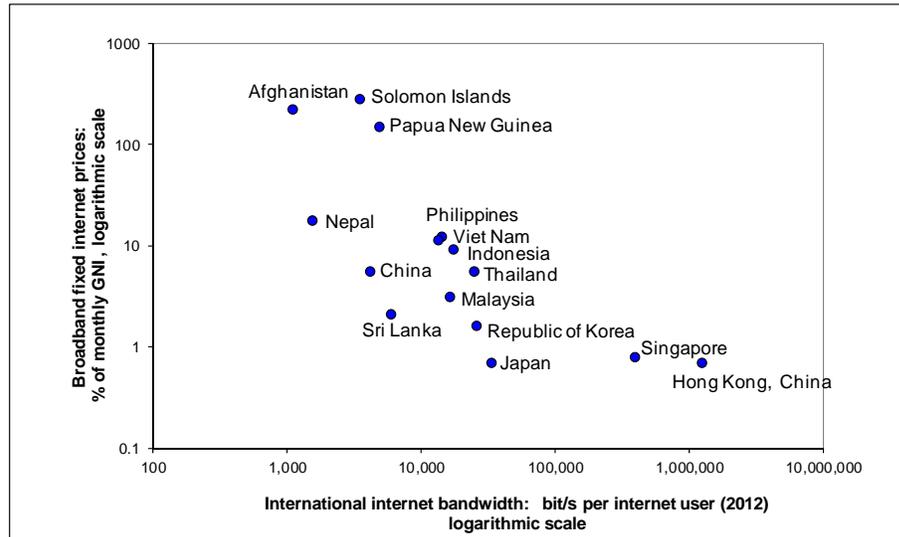
Note: Asia-Pacific excludes CIS

Source: ITU, World Telecommunications/ICT Indicators database 2014 (data for international Internet bandwidth per Internet user is presented as a weighted average of country GDP in current US dollars)

- In most developing economies of Asia and the Pacific, low levels of international bandwidth correlate to the high prices of 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 land-locked developing countries pay high prices for much lower quality connections. In Japan, Macao (China), Singapore, and Hong Kong, China, it costs less than 1 per cent of

monthly GNI per capita to purchase a monthly subscription for entry-level broadband Internet. In developing economies of the region, the costs rise to 8.8 per cent, while for least developed countries and landlocked developing countries the equivalent figures rises to 41.7 per cent and 63.5 per cent, respectively. In Pacific island developing states, a monthly subscription for an entry-level broadband plan would cost on average 126.0 per cent of monthly GNI per capita. These averages mask even higher rates in some countries, for example, Papua New Guinea (141.6 per cent) and Solomon Islands (218.3 per cent).

Broadband Indicators, Selected Economies, 2012



Source: ESCAP based on *Measuring the Information Society 2013*, ITU.

Note: GNI numbers are based on World Bank data.

<http://data.worldbank.org/indicator/NY.GNP.PCAP.CD>. GNI: gross national income.

- In the coming years, the demand for international bandwidth is expected to grow significantly in Asia and the Pacific. In addition to growing demand from higher economic growth and deeper regional integration, more people in Asia and the Pacific are transitioning to higher capability mobile devices. These devices, capable of hosting bandwidth-intensive applications for video streaming, social media, and cloud computing services, are becoming the norm at home and in the workplace. GSMA Intelligence forecasts global 4G and 3G connections in 2018 will number over one billion and three billion, respectively, with much of this growth coming from developing countries. This will lead to much higher levels of data transfer and will require an enormous increase in overall international bandwidth capacity. It is important to note that smart mobile devices, although receiving the last leg of data through a wireless network, still require backhaul networks to carry data from the towers and servers to the global Internet. The rapidly increasing demand for data over wireless networks, therefore, will put increased pressure on backbone networks in the region.

III. Regional Internet infrastructure challenges

- The physical infrastructure of the Internet, mainly submarine and terrestrial fibre optic networks and Internet Exchange Points (IXP), play 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 attributed to a number of factors related to the configuration and efficiency of this infrastructure.

10. Reliance on submarine cables: A large portion of inter- and intra-regional Internet traffic in the region is routed through submarine cables, with heavy reliance on Internet Exchange Points (IXP) located in the United States and Europe, as well as Singapore and Hong Kong, China. 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 Taiwan, Province of China, and sabotage has become a concern following the deliberate attempt to damage the SEA-ME-WE4 undersea cable in 2013.
11. Geographic choke points: In addition to the risk of network outages, the reliance on submarine cables has also resulted in geographic 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 Iran and the United Arab Emirates, and the Suez Canal in the Red Sea region. 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 these choke points and add critical redundancy to outgoing and incoming network traffic.
12. 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 land-locked developing countries, to effectively tap into the global Internet. As a result of the limited terrestrial connectivity, much of the fibre infrastructure in the region has developed in a hub-and-spoke configuration around submarine cable hubs. Developing and least developed economies are heavily reliant on the international connectivity offered by these hubs, which are mainly located in developed economies. By relying on a hub-and-spoke configuration centered around submarine cable hubs, rather than more direct terrestrial fibre in a mesh configuration, the region relies heavily on the reliability and capacity of the connecting undersea cables.
13. No uniformity across terrestrial networks: The terrestrial networks that do exist in the region provide variable quality, cost and service conditions. For example, operators in neighboring 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, and domestic backbones are unable to effectively compete 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.
14. High wholesale Internet bandwidth prices: Wholesale Internet bandwidth prices at major Internet Exchange Points 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 1 gigabit per second in Hong Kong, China, a major international gateway for international bandwidth in the region, has remained 3 to 5 times the price in London over the past three years. This means 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 of the region are even higher than those of advanced economies of the region, which are already high when compared to global prices.

Median wholesale Internet bandwidth prices per Mbps (GigE)						
	Q2 2010	Q2 2011	Q2 2012	Q2 2013	2012-13	CAGR 10~13
Advanced Asia						
Hong Kong,,						
China	\$28.00	\$22.00	\$16.00	\$16.49	3%	-16%
Seoul	\$49.16	\$37.00	\$25.00	\$20.00	-20%	-26%
Singapore	\$39.00	\$31.00	\$14.40	\$13.51	-6%	-30%
Taiwan, PoC ³	\$43.50	\$39.33	\$25.00	\$21.34	-15%	-21%
Tokyo	\$31.76	\$30.01	\$20.00	\$18.00	-10%	-17%
Developing Asia						
Jakarta	\$50.00	\$26.00	\$25.50	\$20.00	-22%	-26%
Kuala Lumpur	\$57.00	\$45.03	\$31.08	\$26.85	-14%	-22%
Manila	\$156.23	\$132.97	\$60.00	\$49.98	-17%	-32%
Mumbai	\$38.09	\$40.00	\$38.00	\$38.00	0%	0%

Source: TeleGeography

Note: Monthly US\$/Mbps prices for a full-port commitment, excluding local access and installation fees. Gigabit Ethernet (GigE) = 1,000 Mbps

15. **Incumbent operators:** 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 Internet Exchange Points in other countries and regions. For this reason, regional network traffic in Asia-Pacific often passes through multiple Internet Exchange Points located outside the region, with each intervening router, switch, or kilometer of network taking a toll on the performance, reliability and price of the connection. Furthermore, Internet service providers typically negotiate access agreements individually with incumbent operators, creating a market based on hundreds of bilateral agreements. In some cases, incumbent operators entering into multilateral agreements with various Internet service providers could lead to more efficient interconnection of bandwidth traffic.
16. **Lack of sufficient regional Internet Exchange Points:** Tromboning of Internet traffic remains an issue in the region due to the lack of sufficient Internet Exchange Points. It is commonplace to have short-haul Internet traffic traverse several countries,

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