United Nations E/ESCAP/CICT(4)/1

Economic and Social Council

Distr.: General
26 August 2014

Original: English

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

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Note by the secretariat**

Summary

Despite the substantial gains reaped from broadband Internet across all sectors, progress has been spread unevenly 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.

Targeted investments and policy reforms that enhance the seamlessness of current configurations of Internet infrastructure, 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. 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. Developing such a pan-Asian network will require close collaboration between members and associate members, as well as with private sector partners, international organizations, public funding agencies and development banks. Members and associate members may wish to consider the issues and policy recommendations raised and provide the secretariat with guidance on the future direction of this work.

* E/ESCAP/CICT(4)/L.1.

** The late submission of the present document to conference services is due to the need to incorporate material that had been deliberated by the Commission at its seventieth session from 4 to 8 August 2014.

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. 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 risk of natural disasters and exogenous shocks, broadband Internet is increasingly recognized as critical infrastructure for strengthening e-resilience. This issue is explored in detail in the document E/ESCAP/CICT(4)/5. 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 information and communications technology (ICT), transport and energy sectors, as a means of saving costs and increasing 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.[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 – 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. This note will also provide an update on progress achieved on the Asia-Pacific information superhighway initiative since the third session of the Committee.

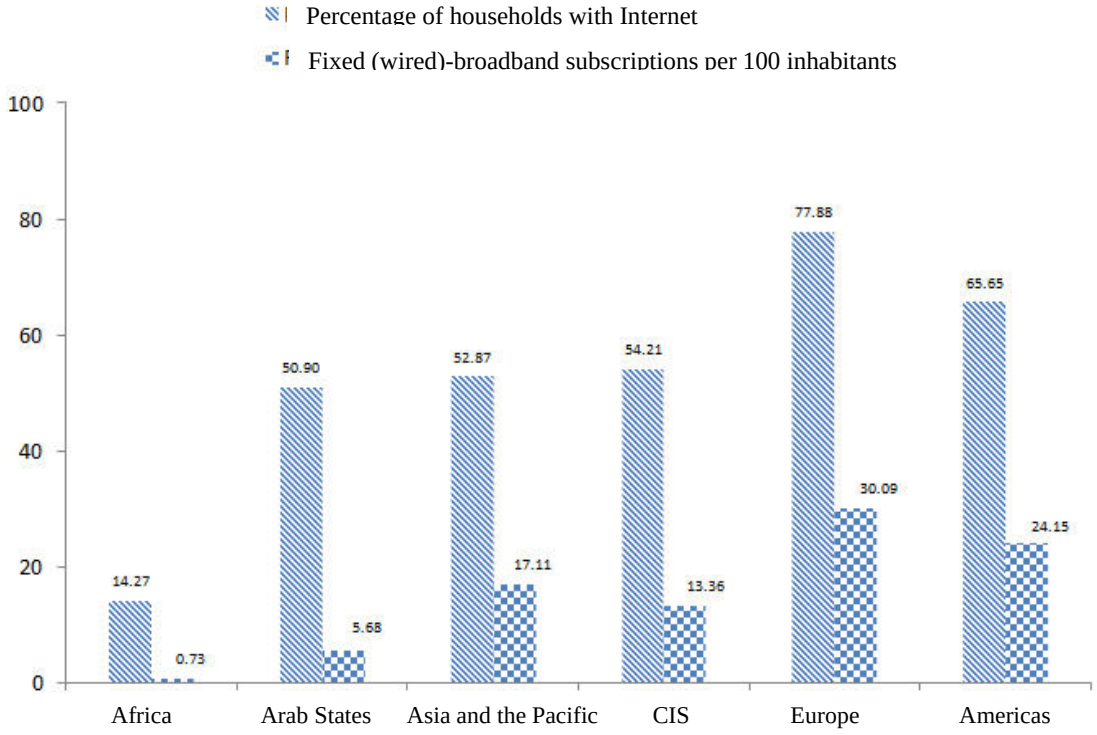
II. Broadband Internet

3. Recent data from the International Telecommunication Union (ITU) show 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 (figure 1). 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 between universities and scientific institutions, for example, requires high-speed connections. Governments and businesses require broadband Internet for essential tasks such as executing financial

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

transactions, meeting via videoconference and conducting online training, and even day-to-day use of widespread Internet applications, 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) would takes more than 10 minutes, compared to two seconds at a connection speed of 100 megabits per second (Mbit/s).

Figure 1
Internet access in world regions and the Commonwealth of Independent States as a percentage of households and per 100 inhabitants



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

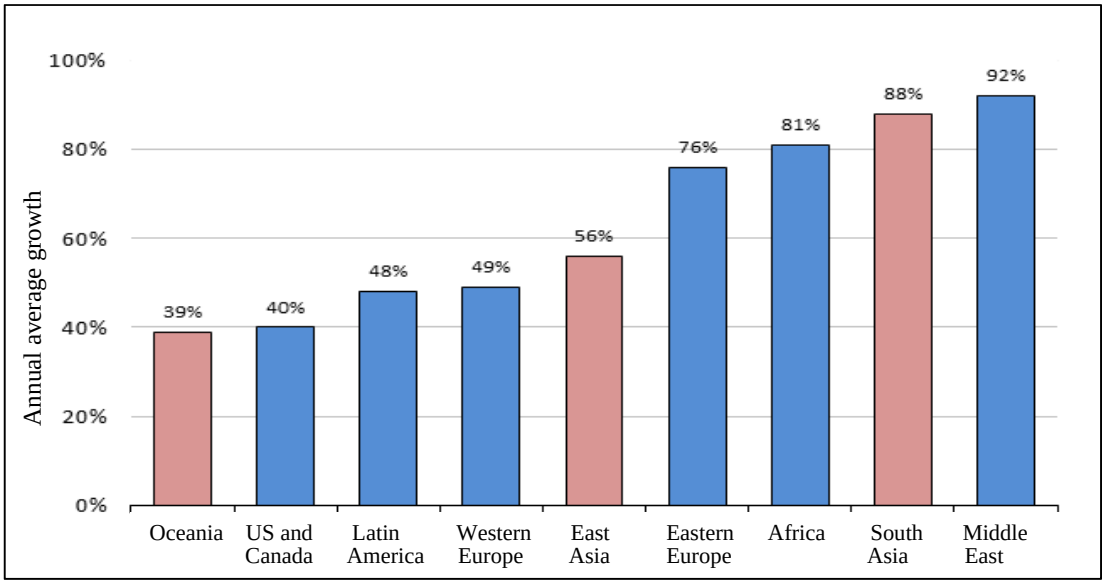
Note: Data are weighted by country GDP in current United States dollars.

4. 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. There are 17.11 fixed broadband subscriptions per 100 inhabitants in the region, compared to 24.15 in the Americas and 30.09 in Europe. In some ESCAP subregions, 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 least developed countries (LDCs) and Pacific island developing countries, there is on average less than 1 subscription per 100 inhabitants.

5. 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

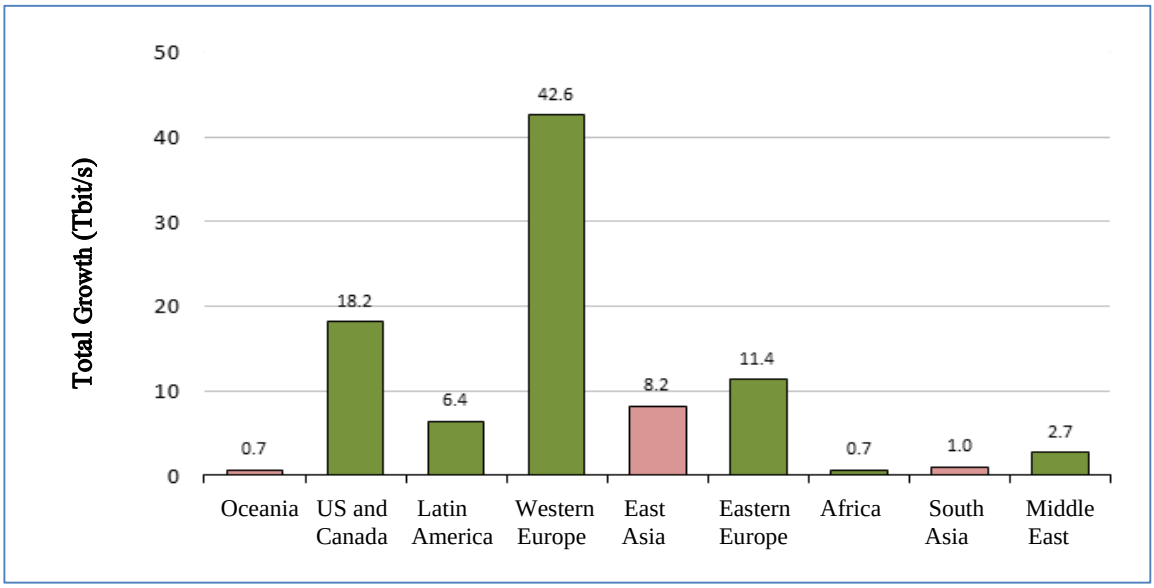
total amount of available international Internet bandwidth (measured in Mbit/s). This indicator measures the volume of Internet traffic that can travel from one country to another, akin to the width of highways in road transport, and provides a general view of the capacity to deliver affordable and reliable broadband Internet. Although the region has achieved impressive growth rates for international bandwidth over the past five years (figure 2), the total amount of bandwidth added during the period remains much less than in North America and Europe (figure 3).

Figure 2
Annual average growth in bandwidth by region (2008-2012)



Source: "2013 TeleGeography Landscape", presentation at the Pacific Telecommunications Council Annual Conference, Honolulu, Hawaii, 20-23 January 2013.

Figure 3
Distribution of growth in bandwidth by region (2008-2012)



Source: "2013 TeleGeography Landscape", presentation at the Pacific Telecommunications Council Annual Conference, Honolulu, Hawaii, 20-23 January 2013.

6. 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, 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 Asia-Pacific LDCs and Pacific island developing countries (table 1).

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

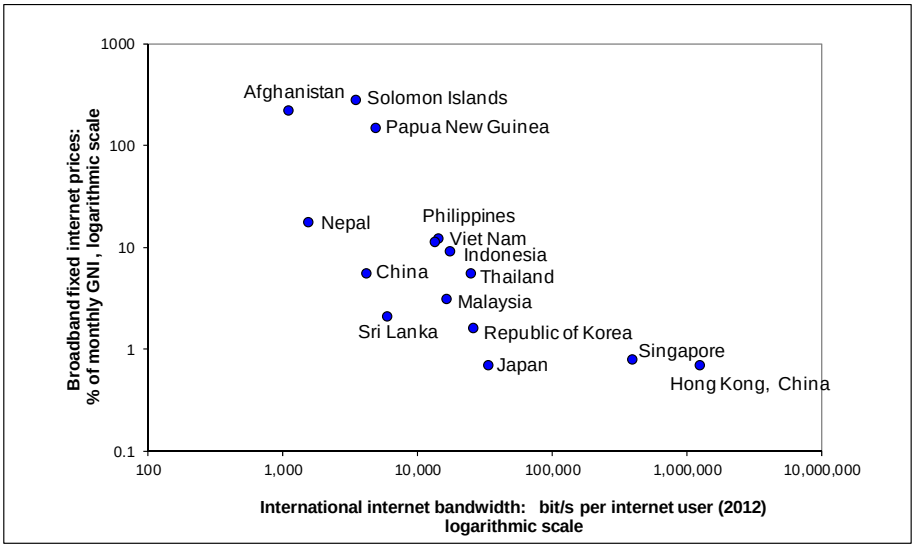
Region or country grouping	Bit/s per Internet user	Total Mbit/s
Africa	3 396	558 618
Arab States	23 453	1 640 792
Asia and the Pacific	22 612	13 147 825
CIS	30 362	4 442 981
Europe	144 315	54 787 540
The Americas	58 900	26 976 467
LDC Asia and the Pacific	4 113	67 926
LLDC Asia and the Pacific	24 932	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 excludes CIS. Data for bit/s per Internet user are weighted averages of country GDP in current United States dollars.

7. 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 LDCs and landlocked developing countries (LLDCs) 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 gross national income (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 LDCs and LLDCs 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.

Figure 4
Broadband indicators, selected economies



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

8. 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 2020 will number over two billion and three billion, respectively,[2] 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 towers and servers to the global Internet. The rapidly increasing demand for data over wireless networks, therefore, will put increased pressure on backbone networks[3] in the region.

III. Regional Internet infrastructure challenges

9. 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

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

[3] 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.

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 interregional and intraregional Internet traffic in Asia and the Pacific is routed through submarine cables, with heavy reliance on IXPs located in the United States of America 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-WE 4 undersea cable in 2013.

11. *Infrastructure choke points*: In addition to the risk of network outages, the 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 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 LLDCs, to effectively tap into the global Internet. Much of the fibre infrastructure in the region has 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 are heavily reliant on the international connectivity offered by these hubs, which are mainly located in developed economies. The region is heavily dependent on the reliability and capacity of the connecting undersea cables.