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Policy issues for information and communications technology:
towards the Asia-Pacific information superhighway

Master Plan for the Asia-Pacific Information Superhighway

Note by the secretariat[**]

Summary

        In accordance with resolution 71/10 of the Economic and Social Commission
for Asia and the Pacific (ESCAP), the 1st meeting of the Working Group on the
Asia-Pacific Information Superhighway was held in Incheon, Republic of Korea, in
September 2015. At that meeting, it was agreed that a master plan on the Asia-Pacific
information superhighway and a regional cooperation framework document would be
developed and that they would be mutually reinforcing. The Asia-Pacific Information
Superhighway Steering Group was formed to carry out that task. The Master Plan for
the Asia-Pacific Information Superhighway was developed based on studies and
analyses carried out by ESCAP in the region, consultations with various
stakeholders, including representatives of the private sector in April 2016, and
discussions at a technical meeting organized in March 2016. The Master Plan
contains key strategic initiatives, targeted goals and a timeline in line with the four
pillars of the Asia-Pacific information superhighway initiative: strengthening the
regional broadband infrastructure; establishing regional Internet traffic and network
management systems and policies; enhancing information and communications
technology infrastructure resilience; and providing inclusive access to broadband
Internet. The Master Plan was considered for endorsement at the 2nd meeting of the
Working Group on the Asia-Pacific Information Superhighway, which was held in
Guangzhou, China, on 29 and 30 August 2016.

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[*]   E/ESCAP/CICTSTI(1)/L.1.

[**]   The present document was submitted late owing to the need to incorporate the
outcomes of the 2nd meeting of the Working Group on the Asia-Pacific Information
Superhighway, held in Guangzhou, China, on 29 and 30 August 2016."

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I. Introduction

1.   In the developing region of Asia and the Pacific, less than 15 per cent of the population has access to high-speed Internet, and the situation in the least developed countries has not improved during the last 15 years according to the latest report of the Economic and Social Commission for Asia and the Pacific (ESCAP).[1] To address this issue, ESCAP, in its resolution 71/10, endorsed continued work on the Asia-Pacific information superhighway initiative. The initiative aims to improve regional broadband connectivity through a dense web of open access cross-border infrastructure that will be integrated into a cohesive land- and sea-based fibre network with the ultimate aims of increasing international bandwidth for developing countries in the region, lowering broadband Internet prices and bridging the digital divide in the region.

2.   The Asia-Pacific information superhighway initiative complements the commitment of ESCAP member countries to General Assembly resolution 70/125 on the outcome document of the high-level meeting of the General Assembly on the overall review of the implementation of the outcomes of the World Summit on the Information Society, in which the Assembly recognized the urgent need to harness the potential of knowledge and technology for the promotion of the Sustainable Development Goals and the need to find ways to use this potential for development. In 2015, the Commission, in its resolution 71/10, requested the secretariat to promote the sharing of experiences, good practices and lessons learned in information and communications technology (ICT) for disaster risk reduction, management and response and building e-resilience and endorsed the establishment of the Working Group on the Asia-Pacific Information Superhighway. Its 1st meeting was held in Incheon, Republic of Korea, on 1 and 2 September, 2015. It decided to:

(a)   Draft a master plan encompassing a long-term vision, targeted goals, specific activities and milestones with regard to the four pillars of the Asia-Pacific information superhighway initiative;[2]

(b)   Draft a regional cooperation framework for the Asia-Pacific information superhighway initiative consisting of the four pillars.

3.   The Working Group on the Asia-Pacific Information Superhighway also established the Asia-Pacific Information Superhighway Steering Group, consisting of the members of the Bureau of the Working Group and multi-stakeholder representatives with policy and technical expertise. The primary objective of the Steering Group was to draft a master plan for the Asia-Pacific information superhighway and a regional cooperation framework document.

4.   In support of the Asia-Pacific information superhighway initiative, and to create the Master Plan for the Asia-Pacific Information Superhighway, ESCAP carried out a number of analyses and feasibility studies on the existing and missing terrestrial links and estimated demand for broadband services,

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[1]   United Nations, Economic and Social Commission for Asia and the Pacific, "State of ICT in Asia and the Pacific 2016", Working Paper (forthcoming).

[2]   Strengthening the regional broadband infrastructure; establishing regional internet traffic and network management systems and policies; enhancing ICT infrastructure resilience; and providing inclusive access to broadband internet.

e-resilience and Internet traffic management in South and West Asia, Central Asia and countries of the Association of Southeast Asian Nations (ASEAN).[3] The studies and analyses were carried out in collaboration with other agencies, such as the National Information Society Agency of the Republic of Korea, the Asian Development Bank, LIRNEasia and the Internet Society. These studies were primarily focused on, but not limited to, the status of broadband adoption, fixed and mobile broadband infrastructure, pricing, domestic fibre-optic networks (terrestrial and interregional terrestrial) and international connectivity. With the International Telecommunication Union, ESCAP updates their collaborative broadband network maps.[4]

5.   As drafted, the Master Plan requires the institutionalization of an Asia-Pacific information superhighway governance structure to ensure its effective implementation. The secretariat of the Commission, through intergovernmental processes, will ensure coordination, reporting and support. The Master Plan is intended to add value to the subregional initiatives, such as the ASEAN ICT Master Plan, and other initiatives, including member States' national ICT plans and initiatives.

6.   The Master Plan for the Asia-Pacific Information Superhighway proposes the establishment of network corridors with the aim of achieving an efficient and effective physical network consisting of both terrestrial cross-border connections and submarine cable landing stations to realize a seamless Asia-Pacific regional information and communication network.

II.   Highlights of the Commission's findings

7.   Access to international connectivity or transit is largely dominated by submarine cable landings in the Asia-Pacific region. The Commission's analysis of the terrestrial network has shown that many countries in the region have backhaul domestic infrastructure networks that are poorly meshed and follow a "river system" pattern. Furthermore, the limited number of fibre interconnections across countries also limits the availability of total and per capita international bandwidth. This has affected the landlocked countries in particular, which do not have direct access to submarine cable landing stations and have to rely on limited terrestrial cross-border connections.

8.   To date, ESCAP has conducted a number of studies in three subregions: South and West Asia, Central Asia and the ASEAN region. The findings are summarized below.

A.   The state of information and communications technology in the Asia-Pacific region

9.   More than 52 per cent of global fixed broadband subscriptions come from ESCAP member countries, followed by European countries (21.9 per cent) and North American countries (14.1 per cent). Seventy-four per cent of fixed broadband subscriptions in the ESCAP region are in East and North-East Asia, and more than half of the region's fixed broadband subscriptions are driven by

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[3] See www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway/publications?page=1.

[4] www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway/asia-pacific-information-superhighway-maps.

China alone. High-income ESCAP countries are more digitally inclusive, while low-income ESCAP members show signs of the digital divide. Fixed broadband growth is spreading to emerging countries, albeit slowly and unevenly.

10.   In addition, in the working paper, State of ICT in Asia and the Pacific 2016, a strong correlation between the quality of regulation and fixed broadband penetration was identified. Regarding total mobile broadband subscriptions, phenomenal growth has been observed across emerging economies, which are overtaking advanced countries. However, if weighted by population, it is clear that advanced countries have much higher penetration rates. Researchers analysed the broadband digital divide in ESCAP member countries and found that unless targeted policies are implemented, the digital divide will widen in the coming years.

B.   Central Asian countries

11.   Central Asia[5] has done relatively well in mobile communications due to improved coverage and the availability of affordable devices. However, there is significant variation in Internet adoption across these 10 countries, with varying penetration rates. This has been attributed primarily to the high cost of Internet services. While most countries in the subregion remain significantly below the global average (10 per cent), Azerbaijan, Georgia and Kazakhstan all have fixed broadband penetration rates above the global average, with Armenia only slightly below. In mobile broadband, Armenia, Azerbaijan, Kazakhstan and Kyrgyzstan all perform well against the global average.

12.   However, the Central Asian countries, even taken together as a whole, lack adequate international bandwidth. This is in stark contrast to other subregions, such as the ASEAN region, which has sufficient bandwidth. Furthermore, most of these countries are heavily dependent on their neighbours for access to international bandwidth.

13.   The infrastructure connections of these 10 economies with the rest of the world mostly comprise terrestrial landing cables although Pakistan and Georgia have access to submarine cables. These 10 countries are surrounded by the Russian Federation in the north, China in the east, the Islamic Republic of Iran and Pakistan in the south, and Turkey in the west. These neighbouring countries could provide additional international bandwidth terrestrially as well as through submarine cables to the landlocked countries. Furthermore, Central Asia has a number of interconnected terrestrial cable networks running through the subregion, such as the Trans-Asia-Europe line, the Europe-Persian Express Gateway and the Trans-Eurasian Information Superhighway. These cable systems could be tapped for international bandwidth by the landlocked countries. Furthermore, these cable systems present an opportunity for alternative redundant routes to the existing choke points in the current undersea cable system.

14.   While broadband penetration is generally low, consumers and businesses across the 10 countries are increasingly accessing the Internet through wireless broadband rather than fixed broadband. This trend is prevalent due to lack of or insufficient fixed line infrastructure, revealing major weaknesses in the

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[5]   For the purposes of the Asia-Pacific information superhighway initiative: Afghanistan, Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan and Uzbekistan.

Central Asian countries. It has also been noted that most of these countries in particular lack the necessary fixed backbone infrastructure required to support the emerging demand for wireless communications.

C. Association of Southeast Asian Nations countries

15.   ASEAN countries have made extensive investments in fibre and other broadband infrastructure (domestic as well as international). However, a wide gap in the level of access and services exists among the ASEAN countries. The average Internet speed in ASEAN countries falls below the world average, except in Singapore and Thailand. Cambodia, Indonesia, the Lao People's Democratic Republic, Myanmar and Viet Nam would require additional investments to expand their domestic networks.

16.   Observations of the quality of the backbone network and Internet traffic exchange connectivity among ASEAN countries indicate noticeable differences within the subregion. In the worst case, the assessment showed an international backbone trunk line download speed of 0.15 megabits per second, a latency of 230 milliseconds and a tromboning index[6] of 35. In the best case, the assessment showed a download speed of 50.1 megabits, a latency of 7.5 milliseconds and tromboning index of 1. This indicates that the backbone network connectivity and the Internet traffic exchange and management systems in the subregion are significantly inefficient. Broadband penetration in ASEAN is also still very low, with large gaps between countries. It was also noted that there is relatively weak land-based interconnectivity and a high cost or high price structure. The regional Internet transit prices in some countries, such as Cambodia, the Lao People's Democratic Republic, Myanmar and the Philippines, were 10 times more expensive than those in Singapore.

17.   International connectivity in most ASEAN countries is relatively weak, except in Malaysia, the Philippines and Singapore. Cambodia relies on backhaul agreements with other neighbouring countries for international connectivity. Indonesia has weak and limited interregional connectivity and strongly depends on Singapore for its transit capacity. The only landlocked country in the ASEAN subregion, the Lao People's Democratic Republic, has no direct connectivity to submarine cable networks.

D. South and West Asian countries

18.   An analysis of telecommunications, Internet markets and broadband infrastructure in nine countries in the subregion (Bangladesh, Bhutan, India, the Islamic Republic of Iran, Maldives, Nepal, Pakistan, Sri Lanka and Turkey) revealed a sharp disparity among the countries in terms of bandwidth availability. Such a disparity is detrimental to economic growth, social development and inclusiveness. This weak terrestrial fibre-optic connectivity has been the root cause of the subregion's bandwidth inequality and low capacity, high cost and unreliability.[7] It has led to expensive consumer and

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[6]   A tromboning index is defined as Internet routing distance/straight line distance from the source to the destination of a packet.

[7]   United Nations, Economic and Social Commission for Asia and the Pacific, "An in-depth study on the broadband infrastructure in South and West Asia". Available from www.unescap.org/sites/default/files/Broadband_Infrastructure_South%26West_Asia.pdf.

wholesale pricing of bandwidth and the limited availability and penetration of advanced ICT services and applications, including broadband.[8]

19.　　Both fixed and mobile broadband infrastructure in the subregion could be significantly expanded. The price of Internet transit varies from very reasonable (Turkey), to moderate (India), to expensive for the rest of the countries in the subregion. With the exception of India and the Islamic Republic of Iran, which enjoy excellent submarine cable-based international connectivity, the international connectivity of the rest of the countries in the subregion varies from sufficient, somewhat weak to weak. Bhutan and Nepal, the two landlocked countries in the subregion, are entirely dependent on India for international submarine connectivity. The competition in the subregion's markets is competitive (India), somewhat competitive (Bangladesh and Pakistan) and less competitive (Bhutan, the Islamic Republic of Iran, Maldives, Nepal, Sri Lanka and Turkey).

E.　Status of information and communications technology in the Pacific

20.　　ESCAP has yet to carry out studies in the Pacific subregion. However, reforms in the telecommunications sector of the Pacific islands have resulted in a major expansion in terms of connectivity through submarine cables. The impact of mobile phones and Internet access has been widespread, with benefits that include better access to health, education, market information, financial services and information at times of natural disasters.[9]

III.　Vision and the four pillars

21.　　As a pillar of regional connectivity, the Asia-Pacific information superhighway initiative shall be a catalyst to develop seamless regional broadband networks which improve affordability, reliance, resilience and coverage and thereby address the causes of digital divides, develop the Internet ecosystem to support the implementation of the Sustainable Development Goals, and stimulate the digital economy in Asia and the Pacific.

22.　　Despite the substantial gains reaped from broadband Internet across all sectors, progress has been uneven across Asia and the Pacific, which remains one of the most digitally divided regions in world. The widening digital divide is a legitimate source of concern. To address this concern, the Asia-Pacific information superhighway concept was defined at the

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[8]　Turkey's per capita international Internet bandwidth was more than 30 kilobytes per second, while Bangladesh's was only 0.3 kilobyte per second, a ratio of 100 to 1. Countries such as Bangladesh, India and Nepal (which together account for one fifth of the world's population) have per capita international Internet bandwidth at less than 1 kilobyte per second; bandwidth in the Islamic Republic of Iran, Pakistan and Sri Lanka is also extremely weak, at 2.2 kilobytes per second or less, while, in comparison, the average in Western Europe is approximately 100 kilobytes per second. The annual 1 megabit per second broadband subscription plus installation as a percentage of nominal gross domestic product per capita varies from extremely affordable (Turkey), affordable (Sri Lanka), reasonable (Bhutan, India, the Islamic Republic of Iran and Maldives), somewhat expensive (Pakistan) to very expensive (Bangladesh and Nepal).

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

1st meeting of the Working Group on the Asia-Pacific Information Superhighway based on the above-mentioned research and analysis that identified gaps, opportunities and the need for regional cooperation on topics related to the four pillars (figure I):

(a)   Physical infrastructure upgrade and interconnection;

(b)   Internet traffic management;

(c)   Building regional network resilience;

(d)   Promoting broadband access in underserved areas.

Figure I
Four pillars of the Asia-Pacific information superhighway
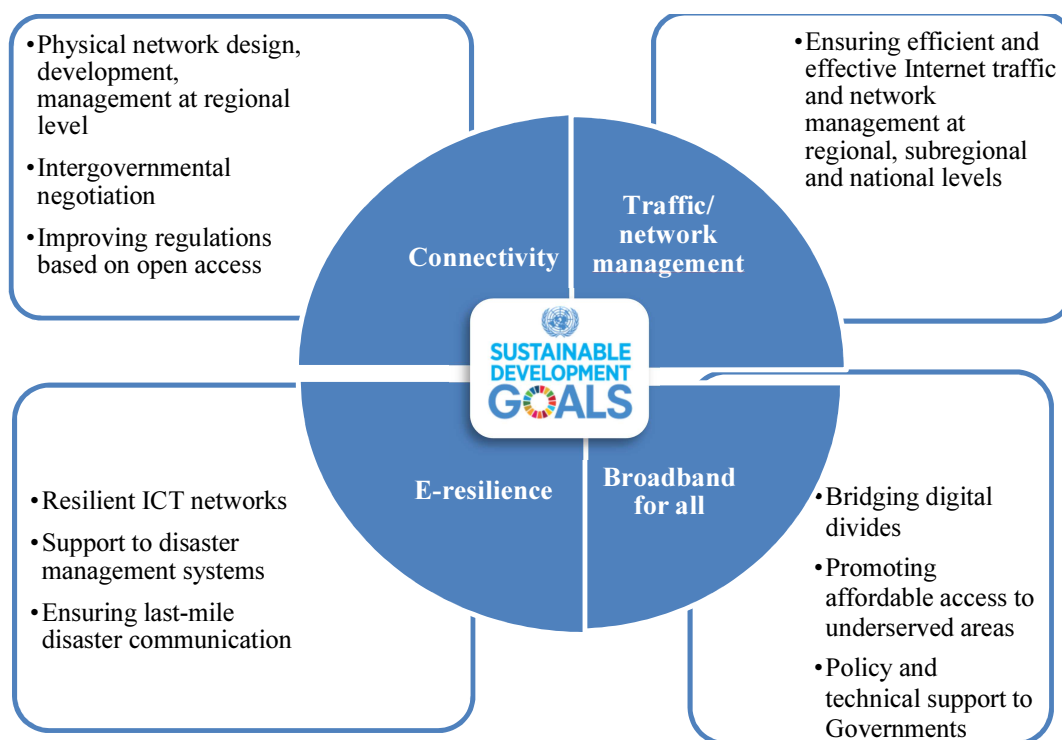
23.   ESCAP and the International Telecommunication Union collaborated on an interactive map of the information superhighway.[10] The interactive map has been used to identify a number of missing terrestrial fibre-optic links as well as submarine cable choke points.

A.   Connectivity

24.   The Asia-Pacific information superhighway initiative advocates enhancing seamless regional broadband fibre-optic backbone connectivity by upgrading and increasing the resilience of and integrating cross-border intra- and interregional broadband backbone networks, which will lead to open access and better balanced undersea and terrestrial networks. In addition,

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[10]   www.unescap.org/our-work/ict-disaster-risk-reduction/asia-pacific-information-superhighway/asia-pacific-information-superhighway-maps.

the initiative advocates leveraging existing regional connectivity opportunities offered by the Asian Highway and the Trans-Asian Railway networks, as well as other trans-border infrastructure, to utilize the rights of way of existing and planned transport networks and to achieve rapid, cost-effective deployment of optical fibre across and within countries. Besides developing regional terrestrial fibre-optic cables, the Asia-Pacific information superhighway initiative also seeks to establish operation models of terrestrial cables, facilitate the formation of trans-border terrestrial cable networks and enhance the quality and efficiency of transition, so as to put the completed terrestrial cable resources to more efficient use and to promote regional interconnectivity. These aspects are highlighted in the Asia-Pacific Information Superhighway Regional Cooperation Framework Document.[11]

B. Traffic and network management

25.   The Asia-Pacific information superhighway initiative also promotes enhancing Internet traffic exchange and management systems and harmonizing related policies in a more efficient and effective manner, domestically as well as at the subregional and regional levels, which will lead to better quality of service. This pillar aims to establish sufficient Internet exchange points within the region, harmonize Internet traffic management practices, principles and related policy and regulatory frameworks in more open, neutral and non-discriminatory ways, and set out general principles on Internet exchange points.

C. E-resilience

26.   The Asia-Pacific information superhighway initiative aims to enhance the resilience of existing/planned ICT infrastructure through methods such as enhanced network diversity, while recognizing the importance of resilient infrastructure to sustainable development and the critical role played by ICT in disaster risk reduction and management.

D. Broadband for all

27.   The Asia-Pacific information superhighway initiative supports an environment that will lead to the promotion of inclusive access for all, acknowledging the special needs and challenges faced by least developed and landlocked developing countries. In addition to enhancing international fibre-optic backbone connectivity, the initiative also drives the development of domestic ICT infrastructure in related countries, including domestic backbone and backhaul networks, access network and internet data centres,