

**Economic and Social Commission for Asia and the Pacific**

Second Ministerial Conference on Regional Economic Cooperation and  
Integration in Asia and the Pacific

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Item 3 (b) of the provisional agenda\*

**Review of the region's progress in the four areas of  
regional economic cooperation and integration, keeping  
in view the 2030 Agenda for Sustainable Development:  
towards region-wide seamless connectivity**

**Towards region-wide seamless connectivity in Asia and  
the Pacific****Note by the secretariat***Summary*

Seamless connectivity aims to facilitate the movement of people, goods, energy and information through investments and improvements in hard and soft infrastructure. The present document includes a discussion on the current state of transport, energy and information and communication infrastructure, including regional and subregional connectivity initiatives, how transport, energy and information and communication infrastructure connectivity contribute to the implementation of the 2030 Agenda for Sustainable Development, and the main challenges faced in achieving region-wide seamless connectivity. It concludes with suggested regional actions to address those challenges.

The Ministerial Conference on Regional Economic Cooperation and Integration in Asia and the Pacific may wish to consider the recommendations contained in this document and provide guidance towards achieving seamless connectivity to enable the free movement of people, goods, energy and information in the region and for the secretariat in supporting these efforts.

**I. Introduction**

1. The first Ministerial Conference on Regional Economic Cooperation and Integration in Asia and the Pacific, held in Bangkok from 17 to 20 December 2013, adopted the Bangkok Declaration on Regional Economic Cooperation and Integration in Asia and the Pacific. In the Declaration, an agenda for economic cooperation and integration in the region was set. It consists of four main elements, which include development of seamless connectivity across the region.

2. Regional connectivity in the context of the present report is defined as a network of regional infrastructure that facilitates the flow of goods, services, people and knowledge in a cost and time-effective way. It therefore plays

\* E/ESCAP/MCREI(2)/L.1.

an important role in market integration and rural-urban transitions in the region as well as in the effort to achieve the Sustainable Development Goals, both directly and indirectly. However, careful guidance is required to ensure that the potential negative impacts are minimized.<sup>1</sup>

3. Promoting seamless connectivity, comprising transport, energy and information and communications technology (ICT) connectivity, is a central pillar of regional economic cooperation and integration. Seamless connectivity across these three sectors plays an important role in enabling countries to expand their markets, optimize exchanges and strengthen collaboration in support of sustainable development and shared prosperity.

4. The network of regional infrastructure involved in developing seamless connectivity encompasses both soft and hard infrastructure. Soft infrastructure refers to legal, regulatory, procedural and other supporting policy frameworks, as well as human and institutional capacities, while hard infrastructure relates to physical networks, such as roads, railways, ports, undersea cables and cell phone masts, and transmission lines and power plants.

5. The present document contains a discussion on the current state of transport, energy and information and communication infrastructure, including regional and subregional connectivity initiatives, along with the main challenges faced in achieving region-wide seamless connectivity. It also contains a review on national connectivity in terms of availability and quality and challenges that policymakers and the private sector face in providing regional hard and soft infrastructure, and lessons for a regional strategy for seamless connectivity encompassing transport and logistics, energy and ICT. The discussion, which is based on the analyses and recommendations of the Working Group on the Development of Seamless Connectivity, which met in Bangkok in December 2014 and March 2015, also takes into account the outcomes of deliberations at the following events: the seventy-second session of the Commission, held in May 2016; the High-level Dialogue on Regional Economic Cooperation and Integration for Enhancing Sustainable Development in Asia and the Pacific, held in Bangkok in April 2017; and a ministerial panel discussion on regional economic cooperation and integration in support of the 2030 Agenda, held in May 2017 during the seventy-third session of the Commission.

## **II. Transport connectivity**

6. Transport connectivity is important for development because it connects individuals to opportunities, enlarges markets for goods and services and strengthens people-to-people contact. Efficient transport and logistics connectivity can play an important role in achieving sustainable development. In addition to opening up trade- and service-related opportunities in underdeveloped areas, particularly those that are closer to the core areas of a neighbouring country than their own domestic core areas, integrated intermodal transport systems play an integral role in the effort to achieve many of the Sustainable Development Goals targets. The realization of sustainable integrated intermodal transport connectivity will contribute directly to target 2.a, to increase investment, including through enhanced international cooperation in rural infrastructure; target 3.6, by 2020, halve the number of road traffic deaths; target 7.3, by 2030, double the rate of improvement in

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<sup>1</sup> This includes the development of climate friendly infrastructure, minimizing the environmental and social disruption of infrastructure connectivity projects and mitigating risks from enhanced transport connectivity, such as the spread of infectious diseases.

energy efficiency; target 9.a, facilitate sustainable and resilient infrastructure; and target 11.2, by 2030, provide access to safe, affordable, accessible and sustainable transport systems for all. It will also contribute indirectly to Goal 1, reducing poverty, and Goal 13, mitigating climate change through the use of environmentally friendly modes of transport, and support and enhance global partnerships, enabling the overall achievement of Goal 17. Physical connectivity and operational connectivity are required to achieve seamless transport connectivity that allows goods and people to travel efficiently across modes and national borders. Some of the actions required include: filling infrastructure gaps; harmonizing technical standards; synchronizing operational procedures; developing and deploying information and communications systems; and aligning cross-border legislation.

7. In general, investment in transport infrastructure connectivity at the national level to support regional and global production networks has increased significantly in recent decades in the Asia-Pacific region, to the extent that China, India and the Russian Federation are among the five countries with the largest rail networks in the world. Railway freight in the region has expanded from 4.3 trillion ton-kilometres to 5.8 trillion ton-kilometres during the period 1990-2012, with the largest increase being in the East and North-East Asia subregion, where it has more than doubled from 1.1 to 2.5 trillion ton-kilometres. Similarly, in line with the significant increase in the number of vehicles in the region, the overall road density has increased over the last two decades, as has the proportion of paved roads.<sup>2</sup>

8. While proxy variables, such as the density of a road network or percentage of paved roads, provide indicative information on the state of transport development, they are not sufficient for conducting assessments on, for example, the quality of road networks and the competitiveness of the transport operations. The World Economic Forum has found that while the road and rail network of India is among the largest in the world, its ranks sixty-first in terms of road quality and twenty-ninth in terms of the quality of its rail network (figures I and II). The overall quality and quantity of national transport networks also have an important bearing on the cost of logistics. Such costs are relatively high in many countries of the region. In the United States of America, logistics costs account for 8.3 per cent of gross domestic product (GDP), as compared with 18 per cent in China and Thailand, 19 per cent in Viet Nam and 24 per cent in Indonesia. Because transport cost is a substantial part of these high logistics costs,<sup>3</sup> greater efforts to improve the quality of existing infrastructure would help boost the competitiveness of national economies.

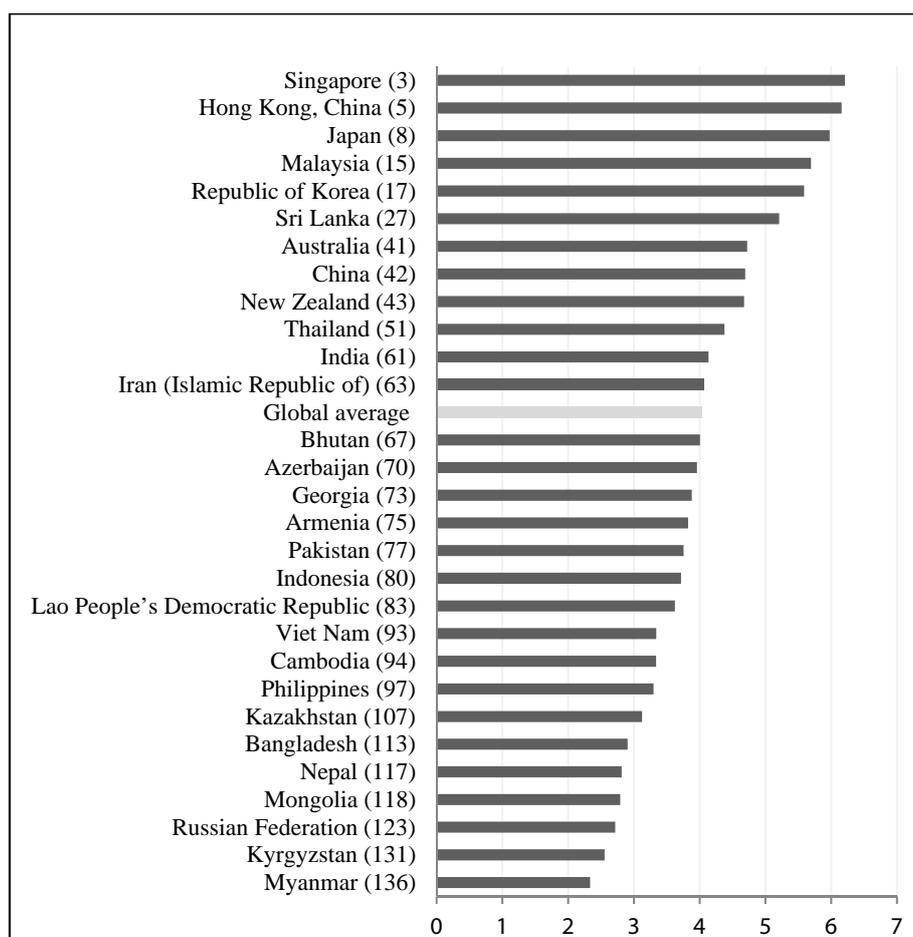
9. At the regional level, the Asian Highway network, the Trans-Asian Railway network and the network of dry ports of international importance have laid the foundations for creating international integrated intermodal transport and logistics systems that enhance regional connectivity. The initiatives of the Economic and Social Commission for Asia and the Pacific (ESCAP) for the Asian Highway and the Trans-Asian Railway networks can be traced back to the late 1950s and early 1960s. With regard to the Asian Highway, to date, only 32.8 per cent of the network, which spans 142,781 km of roads passing through 32 member States, reaches the two highest categories of road class. A total of 9,176 km, or 7.3 per cent, still needs to be upgraded to meet minimum

<sup>2</sup> ESCAP Statistical database. Available from [http://data.unescap.org/escap\\_stat](http://data.unescap.org/escap_stat) (accessed 15 June 2016).

<sup>3</sup> For a recent study on logistics cost in Thailand, see Liu Xianghui, "The impact of logistics costs on the economic development: the case of Thailand", *Business and Public Administration Studies*, vol. 10, No. 1 (n.p., 2016). Available from [www.bpastudies.org/bpastudies/article/view/204](http://www.bpastudies.org/bpastudies/article/view/204).

standards, and the poor quality of several segments is affecting usability. Similarly, the Trans-Asian Railway network comprises 118,000 km of railway tracks, of which 12,400 km are missing. This gap is preventing the network from being a solid basis for the development of international intermodal corridors reaching all corners of the region. While these missing links can be bridged by transshipments to trucks or by developing inland container depots and dry ports with rail connections, shippers are often resistant to using rail because of longer times and higher transshipment costs. The region has yet to realize its full potential. Governments and financing institutions need to be encouraged to increase investment in the sector.

Figure I  
Quality of roads

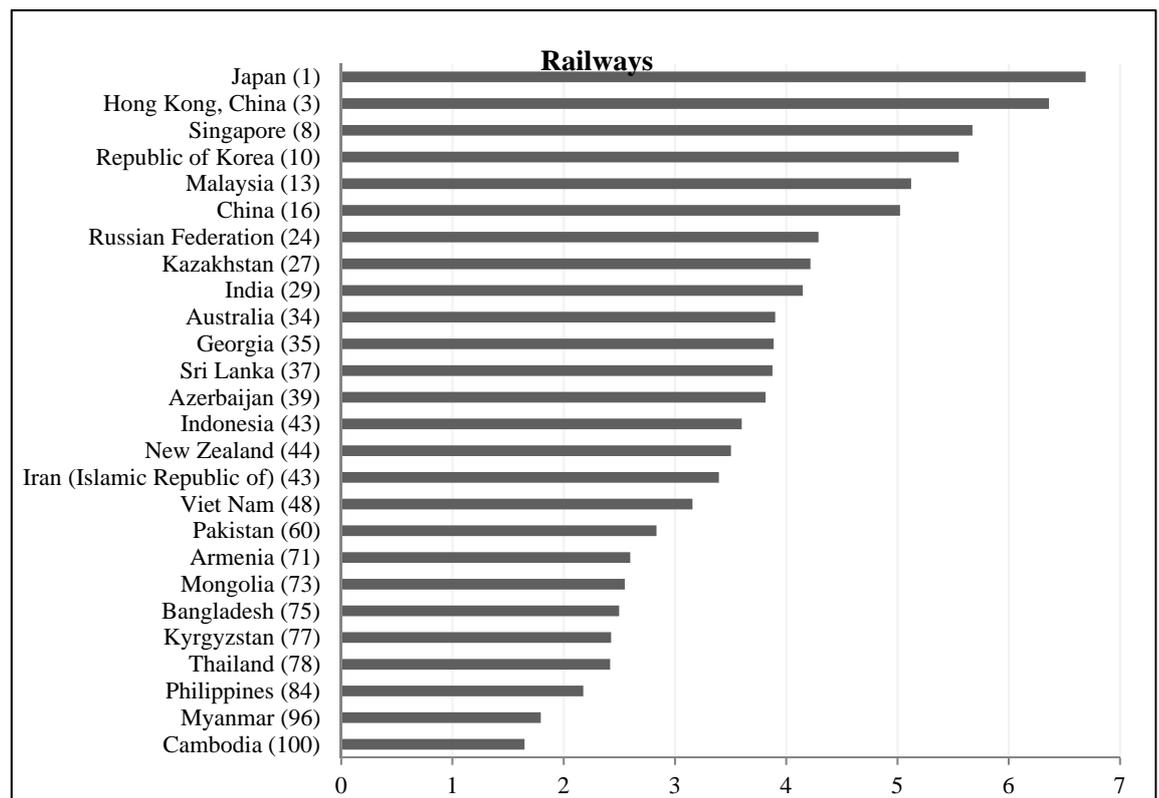


Source: ESCAP calculations based on World Economic Forum (2017).

Notes: Quality assessed on a scale from 1=poor to 7=excellent. Numbers in parentheses represent the country position in the world's ranking.

10. Maritime transport is another backbone of the international trading system. Nine out of the top 10 container ports are in the Asia-Pacific region, of which seven are in China. Maritime transport is especially important for the Pacific islands, as it is the mode of transport for more than 90 per cent of trade in the subregion, as well as for provision of crucial services, such as health care, employment and education, to outer island dwellers.

Figure II  
Quality of railways



Source: Ibid.

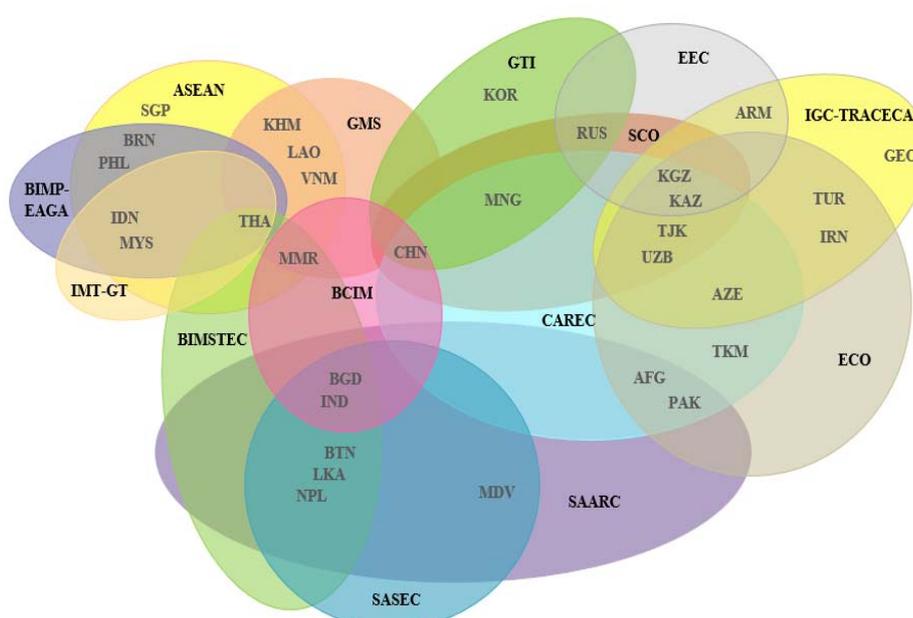
Notes: Quality assessed on a scale from 1=poor to 7=excellent. Numbers in parentheses represent the country position in the world's ranking.

11. Within the region, numerous initiatives are directed towards realizing not just physical transport but also the operational connectivity for seamless transport connectivity. A recent one of note is the Belt and Road Initiative of China, which has the potential to provide impetus to regional transport connectivity. The initiative supports transport connectivity in a vast area. Its most important value is to bridge the gaps between various subregional initiatives on connectivity and support intra- and interregional transport connectivity. It is hoped that the initiative will help to accelerate the connecting of the missing physical, operational, institutional and people-to-people links as promoted by ESCAP.

12. Transport connectivity is the theme of other initiatives in Asia and the Pacific (figure III). In South and South-West Asia, examples are corridors identified under the SAARC Regional Multimodal Transport Study, the Bangladesh-China-India-Myanmar Forum for Regional Cooperation Economic Corridors and the International North-South Transport Corridor, connecting India with the Islamic Republic of Iran, Central Asian countries and the Russian Federation. Examples in South-East Asia are, in the Greater Mekong Subregion, several East-West and North-South corridors have improved connectivity, while the Association of Southeast Asian Nations (ASEAN) has included connectivity as an integral part of its strategy. The Master Plan on ASEAN Connectivity is aimed at connecting physical infrastructure, institutions and people primarily through building physical transport networks, including ports and waterways and railway links to China, but also through institutional agreements covering transport and trade facilitation, agreements on multimodal transport, single shipping and aviation markets. In the East and North-East Asia and Central Asia subregions,

the Shanghai Cooperation Organization member States have signed an agreement to enhance facilitation of international road transport within its member countries, with its longest route extending from China to the Russian Federation. For the Pacific subregion, the Central Pacific Shipping Commission, an intergovernmental commission comprised of Kiribati, the Marshall Islands, Nauru and Tuvalu, was set up to promote cooperation and coordination and monitor international shipping services. It specifically addresses the challenges of irregular and costly shipping services, which hinder the smaller and more isolated islands in the Pacific to integrate their markets with neighbouring archipelagos. Also, to improve air transport connectivity, the Pacific Island Countries adopted the Pacific Islands Air Services Agreement in 2003, which provides a multilateral basis for liberalizing their air services.

Figure III  
Transport connectivity initiatives



Source: ESCAP.

Notes: Transport connectivity initiatives. Countries are represented by their ISO Alpha-3 code. AFG: Afghanistan, ARM: Armenia, AZE: Azerbaijan, BGD: Bangladesh, BRN: Brunei Darussalam, KHM: Cambodia, CHN: China, GEO: Georgia, IND: India, IDN: Indonesia, IRN: Islamic Republic of Iran, KAZ: Kazakhstan, KGZ: Kyrgyzstan, LAO: Lao People's Democratic Republic, MYS: Malaysia, MDV: Maldives, MNG: Mongolia, MMR: Myanmar, NPL: Nepal, PAK: Pakistan, PHL: Philippines, KOR: Republic of Korea, RUS: Russian Federation, SGP: Singapore, LKA: Sri Lanka, TJK: Tajikistan, THA: Thailand, TUR: Turkey, TKM: Turkmenistan, UZB: Uzbekistan, VNM: Viet Nam.

The following are the abbreviations for organizations; ASEAN: Association of Southeast Asian Nations; BCIM; Bangladesh-China-India-Myanmar Forum for Regional Cooperation; BIMP-EAGA: Brunei Darussalam Indonesia Malaysia the Philippines - East ASEAN Growth Area; BIMSTEC: Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation; CAREC: Central Asia Regional Economic Cooperation Programme; ECO: Economic Cooperation Organization; EEC: Eurasian Economic Commission; GMS: Greater Mekong Subregion; GTI: Greater Tumen Initiative; IGC-TRACECA: Intergovernmental Commission Transport Corridor Europe Caucasus Asia; IMT-GT: Indonesia-Malaysia-Thailand Growth Triangle; SAARC: South Asian Association for Regional Cooperation; SASEC: South Asia Subregional Economic Cooperation; SCO: Shanghai Cooperation Organization.

13. Despite those initiatives, challenges remain in all the subregions to provide seamless transport connectivity. There are many overlapping arrangements, including more than 400 bilateral agreements and more than 30 subregional agreements on international land transport, mostly on road transport. Unfortunately, most of these agreements provide different legal conditions and operational regimes for intercountry transport, to the extent that these agreements are resulting in increased fragmentation throughout the region. Complicating matters is that some countries in the region are contracting parties to different legal instruments covering geographically overlapping territories, and these legal instruments are often not uniform. These challenges need to be overcome to enable efficient and effective connectivity within the Asia-Pacific region.

14. The principal challenges faced in achieving region-wide seamless transport connectivity are summarized as follows:

- Missing railway links between subregions are obstacles for the expansion of an energy-efficient and environmentally friendly mode of transport and its integration into an intermodal transport system.
- There are many substandard roads in the regional transport network, which impede intercountry movements.
- High logistics cost and costly and time-consuming transloading of goods at border crossings caused by a lack of common legal frameworks and different technical standards, operational rules and regulatory measures.
- Road transport is the least formalized and regulated sector. Enormous challenges stem from a lack of facilitated visa issuance for different vehicle weight and dimension norms, emission controls, traffic rules and regulations, and regulatory control measures. Lengthy repeated inspections and complicated formalities result in significant delays at border crossings.
- The wide range of agreements is increasing regional fragmentation in operational connectivity. Most of these agreements set different legal conditions and operational regimes for intercountry transport.
- Asia and the Pacific is facing soaring demand for transport infrastructure to support its burgeoning population and economic development. As the region continues to grow, the public sector, which in many cases is in dire financial conditions, needs to find viable solutions to ensure the freedom of movement of the people and goods through other means of financing, such as public good pricing and private investment.
- There is a lack of public-private and private-private interaction in the formulation and implementation of transport connectivity.

### **III. Energy connectivity**

15. The region accounts for almost half of the world's energy consumption, which is largely derived from fossil fuels, such as coal, oil and gas. Energy use is projected to nearly double from 2010 to 2035 on the back of the increasing global population and strong growth in GDP. At the same time, many economies are hampered by the underprovision of energy, with insufficient supplies and interruptions in the power sector being a challenge for many developing countries. More than 400 million inhabitants in the region, most of

which live in South Asia, are still not connected to electricity. As the region seeks to ensure energy security, the Paris Agreement also requires continuous efforts to reduce energy sector greenhouse gas emissions by switching to low or zero carbon sources and enhancing energy efficiency.

16. Sustainable Development Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all is particularly significant because of its links to the achievement of other Goals, as the provision of energy and addressing sustainability concerns from energy use affect efforts to tackle poverty, climate change, health, education and environmental damage. Some of these links are direct; for example, energy is a key input into industrial development, transportation and communication networks, while others are indirect, as in the case of the delivery of effective health care and other services.

17. The differences in the distribution of energy among the countries in Asia and the Pacific varies widely for both fossil and renewable energy resources. Some countries have surpluses, while others must deal with deficits. The region as a whole has adequate energy resources to meet its large and growing demand, but most of its conventional energy resources are highly concentrated; total energy resources in five countries account for more than 85 per cent of the total energy resources in the region.

18. Connecting resources, such as gas, hydropower, solar and wind, to centres of population requires energy connectivity infrastructure, principally electricity transmission lines and gas pipelines. To further integrate energy processes, it would be useful to establish region-wide energy frameworks. Examples of such frameworks could be for promoting the integration of transmission lines, developing a common power grid for the electric power sector or setting up a regional grid for natural gas. Advances in renewable energy technology are unlocking new power generation opportunities in the solar and wind resource-rich areas of the region, while improvements in transmission technology, such as high-voltage direct current, are reducing the cost of transmitting electricity across large distances, thus enhancing the technical and economic feasibility of cross-border power trading. Establishing cross-border energy connections in electricity and gas infrastructure, which yields high net benefits for the parties involved, has long been pursued in the region but has often been too politically complex for an agreement to be reached and therefore has proceeded at a slow rate.<sup>4</sup>

19. Enhancing regional energy connectivity, if properly guided, can support the implementation of the 2030 Agenda and offer solutions to many national energy challenges, in particular the transition to a low-carbon energy system. In addition to linking dispersed supply and demand centres, power grid integration can play a role in raising the contribution of renewables to electricity generation. Renewable energy technologies, given their variable and only partly controllable output, need to be connected to larger or multi-country grids to achieve high penetration rates and fully harness their benefits. Cross-border grid interconnections can effectively provide energy markets with spatial arbitrage, bringing electricity with low marginal costs to meet demand in an adjoining country or area.

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<sup>4</sup> The Central Asia South Asia Electricity Transmission and Trade Project (CASA-1000) electricity grid connection between Central Asia and South Asia has been under development since the 1990s. The Turkmenistan-Afghanistan-Pakistan-India gas pipeline has had a similarly long gestation period.

20. As newly installed generation capacity is increasingly geared towards low-carbon energy, power grid interconnection can play a long-term role in developing the required infrastructure for low-carbon electricity, serving diverse loads, including the nascent electric transportation sector. The ability to transport gas through cross-border pipelines can help to generate export revenue for supplier countries in addition to diversifying the energy mix, improving local air quality and supporting decarbonization efforts in destination countries.<sup>5</sup>

21. Unlike the transport sector, efforts to build energy infrastructure have remained confined to national economies, partly because self-reliance rather than connectivity was commonly viewed as the main way to ensure energy security. However, in the light of rapidly rising energy demand and with climate concerns on the rise, governments are starting to see regional connectivity and integration as the most appropriate framework to enhance energy security.

22. Although several energy connectivity initiatives in the Asia-Pacific region are being implemented, most of them are cross-border projects that are being carried out bilaterally. The Greater Mekong Subregion Programme is perhaps the most advanced of all subregional programmes in terms of harmonization of power policies and technical standards. Thus, in terms of creating subregional markets, Asia and the Pacific lags behind other developing regions, including Africa or Central America, where power pools and market integration are at a more advanced stage.

23. In terms of subregional energy connectivity, the ASEAN and Greater Mekong Subregion programmes are among the most advanced in the region. For instance, the ASEAN Plan of Action for Energy Cooperation 2010-2015 is promoting greater cooperation in energy security, with 6 of the 16 planned interconnections under the ASEAN Power Grid and 12 bilateral gas pipeline interconnections that have been commissioned. The ASEAN region has also progressed well with regard to institutional development for energy connectivity through the work of the Forum of Heads of ASEAN Power Utilities/Authorities, the ASEAN Council on Petroleum, the ASEAN Forum on Coal, the Energy Efficiency and Conservation Sub-Sector Network and the New and Renewable Sources of Energy Subsector Network.<sup>6</sup>

24. The Greater Mekong Subregion has been successful in promoting energy trade among its economies and in creating a harmonized policy and institutional mechanisms for the power sector. It is in the process of selecting the host country for the regional Power Coordination Centre, a permanent institution owned by the Greater Mekong Subregion countries for enhancing regional power trade and implementing regional power interconnection initiatives.

25. In Central Asia, the Central Asia Regional Economic Cooperation Programme has developed and is administrating an energy work plan for regional energy trade initiatives. In the plan, five main regional energy corridors for broader regional energy integration are set: (a) Central Asia-East

<sup>5</sup> This is applicable only in cases in which a coal-to-gas shift is possible and fugitive emissions from gas infrastructure are well managed.

<sup>6</sup> Yanfei Li and Youngho Chang, "Infrastructure investments for power trade and transmission in ASEAN+2: costs, benefits, long-term contracts, and prioritised development", *ERIA Discussion Paper Series*, No. DP-2014-2 1 (Jakarta, Economic Research Institute for ASEAN and East Asia, 2014). Available from [www.eria.org/ERIA-DP-2014-21.pdf](http://www.eria.org/ERIA-DP-2014-21.pdf).

Asia; (b) Central Asia-South Asia; (c) Intra-Central Asia; (d) Central Asia-Russian Federation; and (e) Central Asia-European Union. Additional projects are also in the works. Armenia is planning to synchronize its national power grid with that of Georgia through the development of transmission lines with the goal to triple electricity trade between the two countries by 2018. The Central Asia Regional Economic Cooperation Programme has also endorsed a strategic framework for energy cooperation, primarily to ensure energy security through the balanced development of the region's infrastructure and institutions and increased integration of the energy markets. In the same vein, the treaty to establish the Eurasian Economic Union explicitly mandates the gradual creation of common markets for oil and petroleum products, gas and electricity.

26. In South and South-West Asia, the ultimate objective with regard to energy connectivity is to create a South Asian Association for Regional Cooperation (SAARC) market for electricity. This market could build on other projects, such as the CASA-1000 power line project, which is expected to take a leading role in the establishment of the Central Asia-South Asia Regional Electricity Market.<sup>7</sup> SAARC interconnections exist among some of its member States, such as Bhutan, India and Nepal, which have an arrangement that includes importing hydropower. There are also proposals for electricity interconnections between Bangladesh and India and between India and Sri Lanka, while the Islamic Republic of Iran currently trades electricity with Pakistan.

27. In contrast, intergovernmental frameworks for an integrated energy network are somewhat limited in East and North-East Asia, as most initiatives to promote cooperation in the subregion are bilateral and limited to small-scale projects linking China, the Democratic People's Republic of Korea, Mongolia and the Russian Federation. However, various ideas for additional energy connectivity have been proposed, including the Gobitec and the Asia Super Grid proposals, which are supported by the Japan Renewable Energy Foundation. Other proposals are aimed at harnessing the potential for renewable energy in Mongolia and the Russian Federation to supply electricity to the entire subregion.

28. While the Russian Federation has been a major exporter of oil and gas to Europe, the country has only recently started to develop infrastructure to transport gas to China and to the entire East and North-East Asia subregion. China has also been expanding its access to hydrocarbon by tapping reserves in Myanmar in recent years and through operations in Turkmenistan, which began in 2002.

29. In the Pacific, access to energy is low, while reliance on imported petroleum is high, which makes the subregion vulnerable to oil price volatility and fiscal management complicated. Given their small size and geographical dispersion, Pacific island countries could benefit from joint procurement of petroleum products. To reduce reliance on imported fuel, these countries plan to develop low-carbon and renewable sources of energy, especially for electricity generation. While hydropower and small-scale biofuels are emerging as attractive alternatives, solar is the most practical option, especially

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<sup>7</sup> The Central Asia-South Asia Regional Electricity Market will initially include Kyrgyzstan and Tajikistan in Central Asia (exporters) and Afghanistan and Pakistan in South Asia (importers), but other countries would be able to join the initiative as energy trade expands.

for meeting the energy and electrification needs of the rural and outer island communities.<sup>8</sup>

30. Inter-subregional energy connectivity has also been progressing in the Asia-Pacific region through various initiatives, including the Turkmenistan-Afghanistan-Pakistan-India gas pipeline, the Central Asia-South Asia Regional Electricity Market, and natural gas pipelines connecting the Russian Federation and Tajikistan with China. Proposals have been made to enhance gas trading in the region, especially among South Asia, Central Asia and the Islamic Republic of Iran. With the rising prominence of liquefied natural gas in global gas trade, several liquefied natural gas import terminal hubs have been proposed to serve as regional re-export facilities.

31. In 2013, the Government of China proposed the ambitious Belt and Road Initiative, which represents a long-term transcontinental plan for enhanced global economic cooperation and integration. This initiative is unprecedented in its scale and its vision. It seeks to underpin future growth, prosperity and sustainable development by promoting seamless connectivity and industrial and trade development to better integrate regional markets and people across Asia, Africa and Europe. It aims to link 65 countries that represent one third of global output, 40 per cent of global trade and 62 per cent of the world's population. The Belt and Road Initiative provides a good opportunity to strengthen energy connectivity along its six proposed economic corridors, spanning from China to Europe, and from the Russian Federation to Indonesia. In addition, the State Grid Corporation of China and the Global Energy Interconnection Development and Cooperation Organization are promoting local energy interconnection initiatives based on low emissions and renewable energy. The Belt and Road and the Global Energy initiatives and the transboundary power trade initiatives mentioned above offer great potential to reinforce each other in efforts to develop the region's renewable energy.

32. Importantly, the Belt and Road Initiative offers an opportunity to reflect on and contribute to the development of a more standardized approach towards transboundary energy trade and connectivity. This would result in a significant improvement over the current framework in which infrastructure development projects for transboundary energy trade and connectivity are developed and negotiated independently. For optimum and swift action, the development of energy networks should be an integral part of the overall regional cooperation strategy and be backed by an effective institutional coordination mechanism in which the region moves from an ad hoc approach to tapping ESCAP to play an effective role in dealing with bilateral concerns in a multilateral platform.<sup>9</sup>

33. The principal challenges to achieving region-wide seamless energy connectivity are summarized as follows:

- Policymakers and private sector experts cite as a key barrier the issue of political trust among potential or current energy trading countries. Energy security issues are of prime importance to the political leadership, and efforts for building energy infrastructure

<sup>8</sup> Pacific Disaster Net, "Report on the summary of outcomes and proceedings from the Niue Pacific Climate Change Roundtable Meeting, 14 to 17 March 2011", 27 April 2011. Available from [http://www.pacificdisaster.net/pdnadmin/data/original/PCCR\\_NIU\\_2011\\_Report\\_summary.pdf](http://www.pacificdisaster.net/pdnadmin/data/original/PCCR_NIU_2011_Report_summary.pdf).

<sup>9</sup> At the time of writing, 13 memorandums of understanding, two cooperation protocols, and 19 bilateral agreements have been signed under the Belt and Road Initiative in energy.

have remained confined to national borders. This is partly because for more than fifty years, energy development was harnessed to conserve and safeguard a country's own energy resources rather than examine competitive options of regional connectivity on the view that this would foster national energy security. It was assumed that regional energy trade would compromise national energy security as it entails import dependency on neighbouring countries. The view that the national energy transition should be linked with the regional and global energy transition that factors in cross-border consequences of national decisions of sources and uses of energy has gained prominence only in recent years. There is need for a change in the political and policy mindset in order to build awareness about the gains and benefits of regional energy connectivity, which has been underexploited because of national biases.

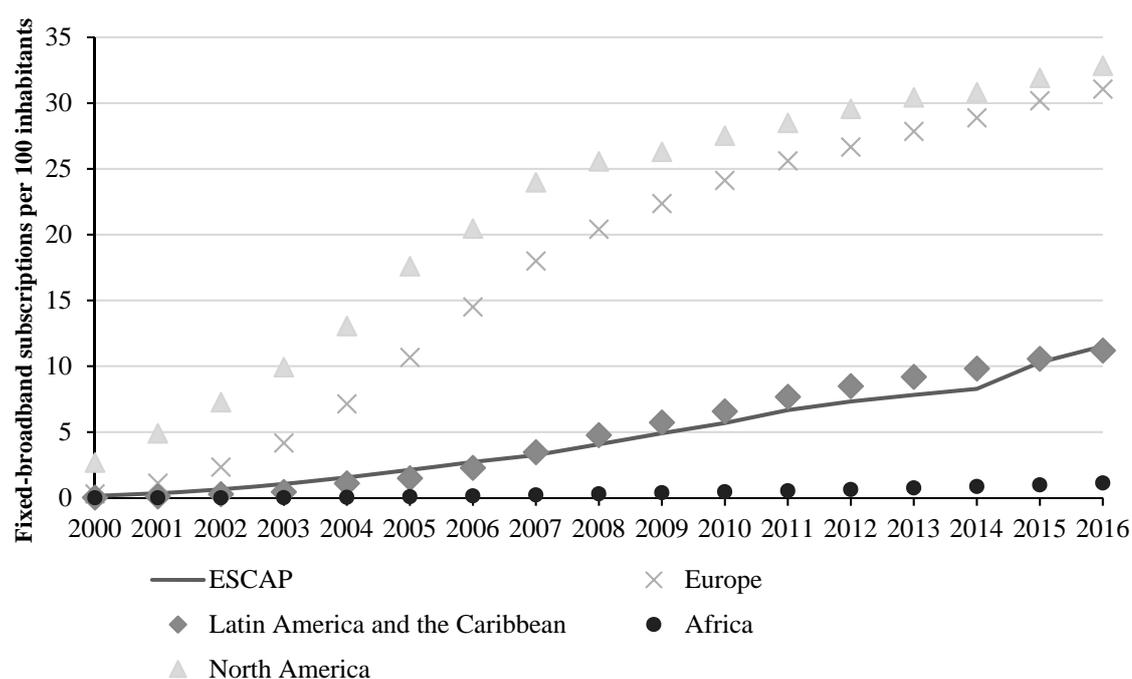
- Enhancing national and regional energy security through energy interdependence, as opposed to energy independence, must become an objective. Technology, regulatory, and financial barriers can be effectively overcome through consensus-building. However, for this collaboration to evolve, there is need to promote an effective, results-oriented and innovative regional energy cooperation mechanism, which also involves different stakeholders, including government, the private sector, industry and financing institutions. With climate concerns increasing along with the adoption of the Paris Agreement and the rapidly rising energy demand, governments in the Asia-Pacific region are now viewing regional connectivity and integration as the appropriate framework to enhance energy security.
- Over the last four decades, the Asia-Pacific region has transformed itself into a global manufacturing hub; this has been made possible because of success in connecting to global production networks and supply chains largely driven by advances in information technology, declining transport costs and the lifting of trade barriers across countries. As with the global production networks that created a positive force for reinforcing the bottom-up market integration process, greater efforts are needed to connect the energy markets of the region. Trade and investment in regional energy networks remain low, aside from some cross-border investments, even though there appears to be many opportunities waiting to be tapped.
- Many factors can be attributed to this disconnect. Energy networks are capital-intensive and, because of the large sunk costs incurred by them, there are major challenges associated with financing and maintenance, especially when they are subject to different legal and regulatory regimes. In the current situation, even with subregional support, cross-border projects incur large transaction costs, and it takes an extended period for a project idea to move from the drawing board to secure multiple approvals and be implemented.
- Finally, large positive and negative externalities are inherent in energy connectivity. Invariably, there are problems in the measurement of the costs and benefits, and in designing policy regimes that fully deal with those externalities. Balancing the gains with overall costs among different groups of stakeholders requires a robust institutional mechanism. The energy integration process is not limited to the creation of physical links across borders; also required are a series of policies and regulations for facilitating different types of flows inherent in the process.

## IV. Information and communications technology

34. In addition to enabling better communications, ICT is playing a vital role as an accelerator of sustainable development: it is critical in efforts to enhance economic efficiencies, expand the delivery of social services, strengthen disaster risk management and use resources in such areas as agricultural production, smart grid and intelligent transport systems in a more sustainable manner. The successful roll-out of mobile telephony in the region, which reached a penetration rate of 101 mobile phone subscriptions per 100 inhabitants in 2016, has been made possible by rapid technological progress. This, in turn, has resulted in affordable devices and services, which, in most cases, are accompanied by a reasonably favourable regulatory environment.

35. However, tapping the full potential of ICT in Asia and the Pacific is being held back by the availability and affordability of broadband Internet (figure IV). The region has one of the widest gaps in fixed broadband connectivity, with some countries being world leaders in broadband adoption and others recording the lowest broadband penetration globally.<sup>10</sup>

Figure IV  
Fixed broadband subscriptions per 100 inhabitants (average) by region, 2000-2016



Source: ESCAP calculations based on International Telecommunication Union, World Communication/ICT Indicators database (accessed 31 July 2017).

36. In terms of bandwidth availability per user, the digital divide has increased significantly between 2009 and 2013, with bandwidth availability rising sharply in advanced countries and growing slowly in poorer economies. Analysis conducted by ESCAP reveals that in 2016, 76 per cent of the fixed broadband subscriptions were registered in East and North-East Asia alone, even though the subregion accounts for only 37 per cent of the total population of the Asia-Pacific region. Of even more concern is that 19 economies in the

<sup>10</sup> ESCAP, “Harnessing cross-sectoral infrastructure synergies”, Working Paper (2014).

region have a fixed broadband penetration rate of less than 2 per cent, while the rate for leading economies, such as Japan, the Republic of Korea and Hong Kong, China, exceeds 30 per cent, amid signs of a widening gulf between low-income and high-income countries over subsequent years.

37. Based on ESCAP analyses, the main causes of the digital divide originate from lack of investment in resilient ICT infrastructure, limited availability of international bandwidth, ineffective Internet traffic and network management, lack of conducive and enabling regulations for investment, and lack of capacity and awareness among policymakers and regulators.<sup>11</sup>

38. The current terrestrial networks of fibre-optic cables in developing countries in Asia and the Pacific are typically constrained by limited access to international transit. Furthermore, the backhaul networks of developing countries are usually poorly meshed and follow a “river system” pattern in which networks spread from submarine landing stations and thin out into countries’ hinterlands.<sup>12</sup> Landlocked countries are particularly affected as they rely on a few outdated terrestrial connections and on neighbouring countries to connect to regional and global cable systems. The availability and affordability of bandwidth could be improved through efforts to interconnect national fibre-optic backbone networks with those of neighbouring countries and with regional and global fibre-optic networks.

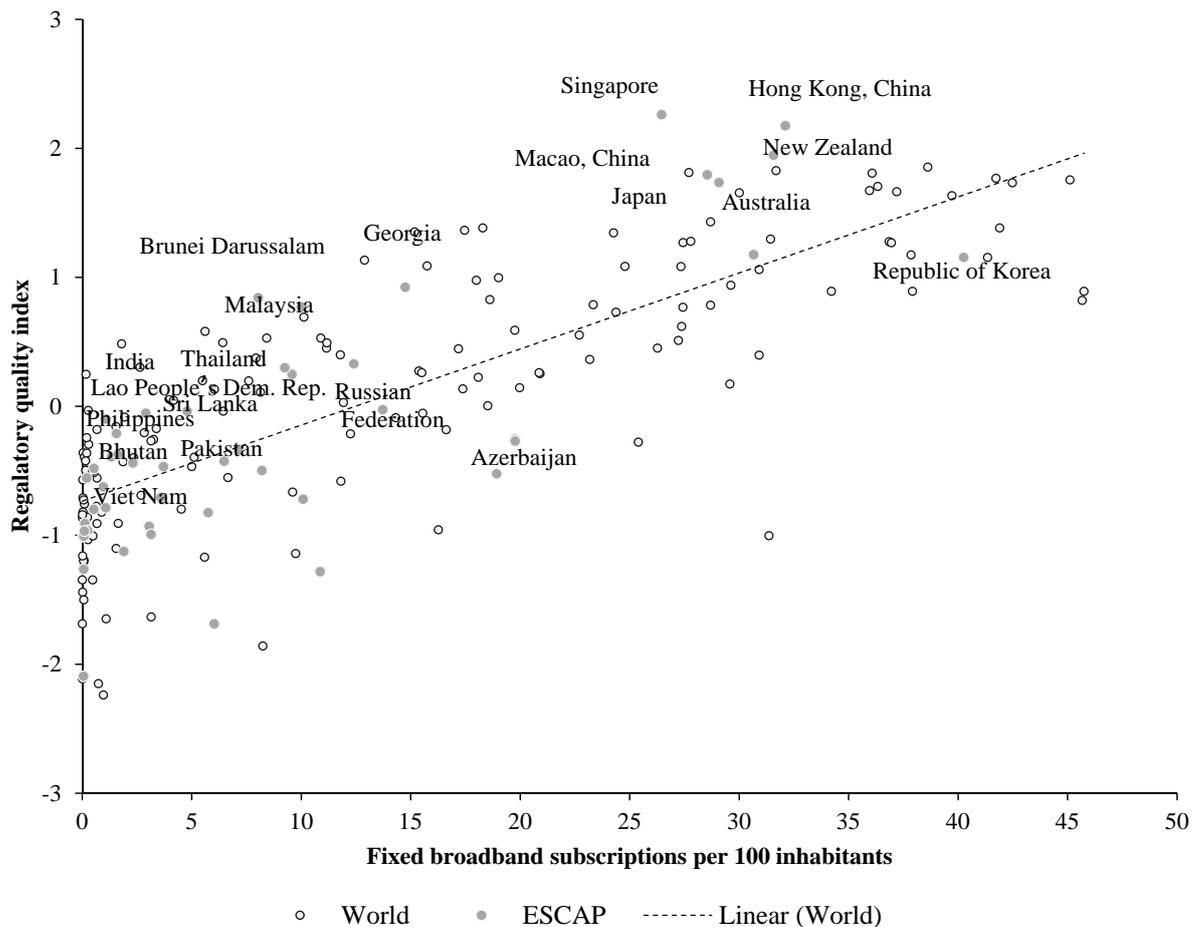
39. The regulatory environment is another element that affects broadband expansion. Governments need to establish stable, supportive and predictable regulatory policies that encourage private sector investment in bankable ICT infrastructure projects. Effective regulation and fixed broadband growth have been found to be correlated in an ESCAP study, in addition to e-commerce development (see figures V and VI). Using a cross-section of averages between 2000 and 2015 for countries in the world with available data on investment and access, a study by the United Nations Conference on Trade and Development also shows a positive relationship between investments and fixed broadband and mobile broadband subscriptions, demonstrating the critical role that investments play in increasing access to ICT. The positive correlation coefficient (0.87) is statistically significant ( $p < 0.01$ ) for fixed broadband subscriptions.

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<sup>11</sup> ESCAP, “State of ICT in Asia and the Pacific 2016: uncovering the widening broadband divide” (2016). Available from [www.unescap.org/sites/default/files/State%20of%20ICT%20in%20Asia%20and%20the%20Pacific%202016.pdf](http://www.unescap.org/sites/default/files/State%20of%20ICT%20in%20Asia%20and%20the%20Pacific%202016.pdf).

<sup>12</sup> Organization for Economic Cooperation and Development, “International cables, gateways, backhaul and international exchange points”, OECD Digital Economy Papers, No. 232 (Paris, 2014). Available from [www.oecd-ilibrary.org/content/workingpaper/5jz8m9jf3wkl-en](http://www.oecd-ilibrary.org/content/workingpaper/5jz8m9jf3wkl-en).

Figure V  
**Perception on quality of regulation and fixed broadband connectivity, 2015**

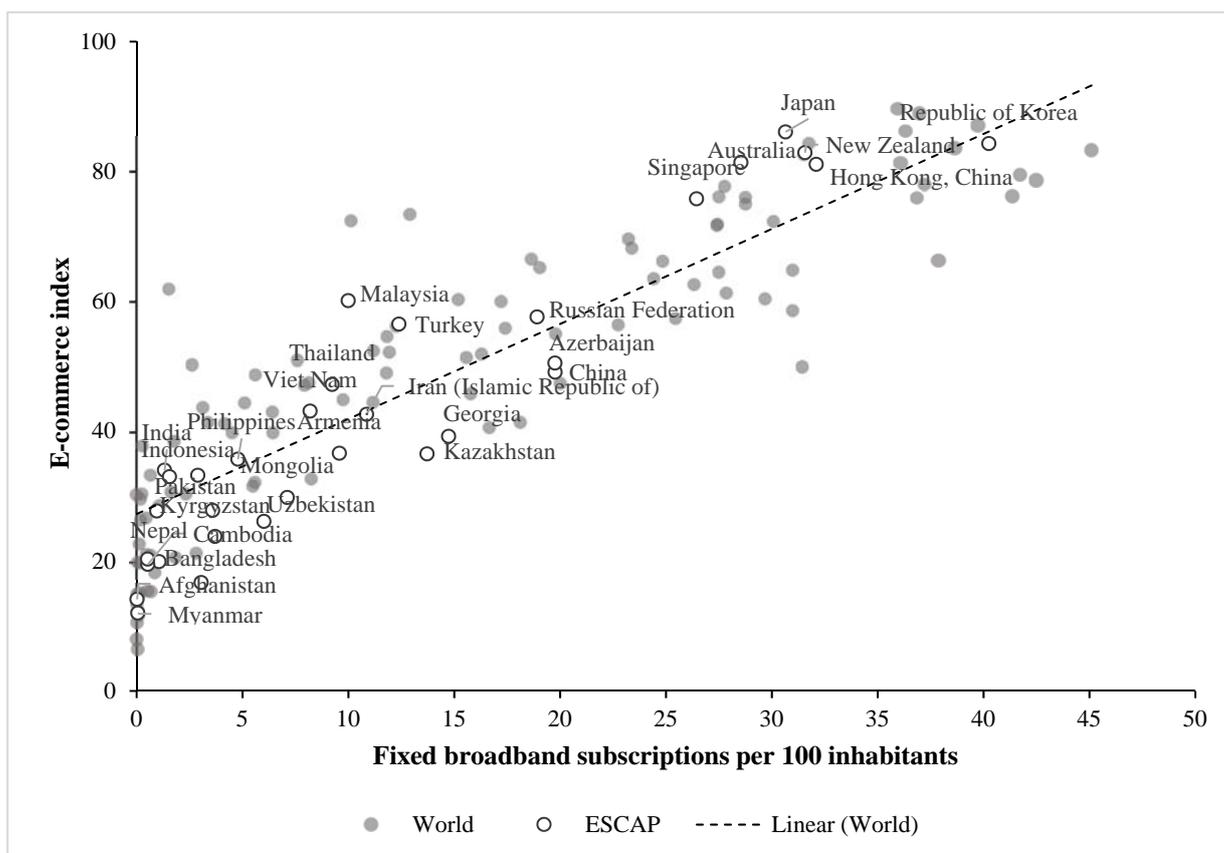


*Source:* ESCAP calculations based on World Bank, Worldwide Governance Indicators (accessed 31 July 2017).

*Note:* Estimates for regulatory quality ranges between -2 and +2 (-2=poor, +2=best).

40. One of the key underlying components of access and affordability to broadband Internet is the total amount of available international Internet bandwidth (measured in Mbit/s), which measures the volume of Internet traffic that can travel from one country to another (akin to the width of highways in road transport). High prices for wholesale capacity can also be attributed to suboptimal regulatory frameworks, which result in the following: control of key transmission facilities by incumbent operators; lack of appropriate Internet exchange points; and lack of alternative transit routes to enhance competition at the regional level and improve network efficiency.

Figure VI  
E-commerce versus fixed broadband access, 2015



Sources: ESCAP calculations based on fixed broadband subscriptions per 100 inhabitants sourced from International Telecommunication Union, World Communication/ICT Indicators database (accessed 31 July 2017) and United Nations Conference on Trade and Development, “UNCTAD B2C e-commerce index 2016”, UNCTAD technical notes on ICT for development No. 7 (Geneva, 2016), available from [http://unctad.org/en/PublicationsLibrary/tn\\_unctad\\_ict4d07\\_en.pdf](http://unctad.org/en/PublicationsLibrary/tn_unctad_ict4d07_en.pdf).

41. As the Asia-Pacific region is reputed to be the most disaster-affected region in the world, a critical element for advancing cross-border seamless ICT connectivity is infrastructure that can withstand system-wide shocks and quickly recover and continue to provide a minimum level of operational services. Because ICT underpins the functioning of effective information management systems and resilience building at all stages of the disaster cycle, e-resilience must therefore become an integral part of seamless regional connectivity.

42. Strengthening ICT connectivity could bring multiple socioeconomic benefits, including through enabling entrepreneurship, innovation and economic growth, and facilitating the provision of services in an efficient and effective manner. Indeed, ICT as meta-infrastructure is applied in education, finance, commerce, governance and welfare, among other sectors, and serves as a vehicle to accelerate sustainable development while supporting other infrastructure, such as trade, transport and energy connectivity.

43. In this regard, the Asia-Pacific Information Superhighway is expected to increase the availability and affordability of broadband Internet across the region by strengthening its underlying infrastructure and developing an enabling Internet ecosystem.

44. The principal challenges faced in achieving region-wide seamless ICT connectivity are summarized as follows:

- There is an expanding and accelerating digital divide, both among and within countries, especially in access to fixed broadband. As ICT supports all sectors as a development accelerator, a widening broadband divide, if not dealt with, will have extensive negative impacts on the development of the digital society and economy and the attainment of inclusive and sustainable development in the coming years.
- Infrastructure gaps, particularly transboundary connectivity between neighbouring countries, a limited enabling policy and regulatory environment, and lack of financing mechanisms are major hindrances to expanding national and regional connectivity, which is required to close the broadband divide and expand opportunities for inclusive and sustainable development. Building resilience is a development imperative in the region because of its disproportionate share of economic damage and losses resulting from disasters.<sup>13</sup> As disasters roll back development gains, any repeated reconstruction of ICT infrastructure adds significant financial strain, especially on least developed countries, landlocked developing countries and small island developing States. Enhancing disaster preparedness and resilience in ICT networks and applications would not only protect ICT assets, but it would also ensure uninterrupted ICT services for disaster response and recovery.
- It is important to take advantage of the interlinkages, interdependencies and synergies across different types of infrastructure. For instance, about 80 per cent of the costs for deploying terrestrial fibre networks is associated with digging, trenching and laying down the conduits through which fibre is subsequently threaded. Deploying fibre optics during planned major works to other infrastructure, such as roads and pipelines, can significantly reduce cumulative costs, while revenue is augmented and diversified from the resulting digital traffic.<sup>14</sup>

## V. Common challenges

45. Despite the diversity of issues facing each of the three connectivity areas, there are a series of common challenges experienced by all. These are summarized below:

- Bottom-up process. Most of the cross-border connectivity projects in the region have been negotiated bilaterally between parties. Although such projects are effective in meeting bilateral objectives, their fragmented nature is not conducive to achieving the seamless connectivity that the region needs to successfully implement the

<sup>13</sup> Network diversity opens up options for alternative mediums of communication traffic through meshed architecture, namely that there is more than one route to take from a source to its destination. This is essentially the same principle behind the Internet, creating a highly networked environment with multiple routes for communications traffic. Redundancy provides fail-safe options such that if one critical infrastructure point failed, there would be “backup” options or an identified way to quickly bring such infrastructure back online.

<sup>14</sup> E/ESCAP/CICT(4)/2–E/ESCAP/CTR(4)/2.

2030 Agenda. In addition, the plethora of agreements and frameworks that have been finalized under various bilateral and subregional initiatives has increased regulatory burdens and transaction costs.

- Asymmetric costs and benefits, externalities and compensation mechanisms. Regional infrastructure projects invariably involve asymmetric costs and benefits across countries and groups of people. For example, transit countries tend to bear disproportionately larger costs, while the benefits of lower trade and transport costs accrue to consumers and manufacturers of products. Similarly, most infrastructure networks are space-specific and involve large externalities. Such issues pose a challenge in implementing infrastructure projects. Therefore, regionally accepted, transparent and fair rules and regulations need to be put in place for internalizing and monetizing asymmetric costs and to ensure the fair distribution of costs and benefits among stakeholders. Moreover, to suitably compensate affected groups and countries, an effective and credible compensation mechanism, supported by a robust institutional arrangement, needs to be developed.
- Planning, coordination, and cross-sectoral infrastructure synergies. As part of the effort to expand the existing physical networks of transport, energy and ICT, and ensure seamless connectivity, it would be beneficial to consider them as a system, as this would result in significant cost and time savings. For instance, the costs to deploy terrestrial fibre networks, most of which are associated with digging, trenching and laying down conduits, can be significantly reduced if the work takes place along major roads, railways, power transmission lines, pipelines or waterways. In general, building connectivity networks requires careful planning and coordination, which are often absent because of a lack of resources and appropriate institutional mechanisms. The challenges associated with planning and coordination are more pronounced when the countries involved have different legal and regulatory regimes.
- Regional vision and political will. Most infrastructure networks require lumpy government investments that are capital intensive and are of little use unless their construction is completed and well maintained. They are thus domestically driven, with cost-benefit analysis typically assessed from a domestic return-on-investment perspective, and the regional public good value heavily discounted or left out. For example, prior to the creation of the Asia-Pacific Information Superhighway, there was no regional cooperation framework for seamless ICT connectivity. Therefore, along with careful planning and coordination, strong political will at the regional level and a shared vision of governments are critical for setting up effective, region-wide coordination mechanisms for infrastructure development.
- Financing. The building blocks of regional seamless connectivity are supported by the national infrastructure development in each country of the region. Thus, lack of adequate financing resources to undertake needed infrastructure projects at the national level in different sectors is a major challenge.

## **VI. Recommendations**

46. Below are recommendations to further move towards the objective of seamless connectivity.

### **A. Transport connectivity**

47. Intergovernmental agreements must be used to enhance the delivery capability of the region's infrastructure networks and services. This calls for integrated planning, development and operation of transport and logistics networks that are well connected within national boundaries, and simultaneously linked across borders, and steps to improve productivity and efficiency of transport systems in terms of cost, convenience, load factor and transit time demand. There is need to implement existing common regional strategies and frameworks and action-oriented and priority-based intergovernmental development programmes. Proposed amendments to the Asian Highway and Trans-Asian Railway network agreements that encourage co-deployment of fibre-optic cables with transport infrastructure would enhance the cost effectiveness of infrastructure projects.

48. Technical standards and operational rules need to be harmonized. As with corridors, connectivity would benefit from harmonization of technical standards and operational rules. As a first step, systems and common technical standards to facilitate interoperability need to be developed. In the absence of international standards, regional harmonization is required in order to set regional standards and operational rules.

49. In advancing regional connectivity, it is important to take advantage of new possibilities arising from modern technologies, such as intelligent transport systems. For this purpose, it is necessary to establish an enabling cooperative framework to improve the quality and ease the delivery of services, clearances at border crossings, usage-based maintenance of assets, traffic monitoring and public safety.

50. Cooperation should be reinforced by focusing on solution-oriented policies and actions. Support is needed in creating a broad partnership platform on seamless and sustainable transport connectivity between the public and private sectors. This would facilitate the development of approaches to better integrate the three dimensions of sustainable development (economic, environmental and social) to promote regional transport connectivity in a more sustainable manner.

### **B. Energy**

51. Barriers to energy trade need to be addressed through the removal of legal, regulatory and technical hurdles. Despite the many benefits from energy-resource sharing, a number of countries have explicit and implicit restrictions on exports and imports of energy goods and services; these must be lifted.

52. It is important to promote sufficient levels of technical and regulatory standardization to facilitate greater interconnectivity and the eventual development of an integrated power grid.

53. To promote competitive energy market structures, it is necessary to rationalize the State's role and implement measures to improve the investment climate to attract new investment, improve efficiency and adopt new technologies.

54. To facilitate transboundary power trade, a regional mechanism can be developed to streamline contracts, increase the availability of financing, reduce risk, and accelerate project development through the building of mutual trust among parties. A broad regional agreement and strong institutional arrangements are critical for monitoring and ensuring that benefits are realized and creating neutral institutions to regulate project implementation.

55. Finally, it is important to build on existing political support to promote further regional energy connectivity. In that regard, there is need to formalize and consolidate declarations and intentions at the subregional level in the form of an Asia-Pacific energy charter. This would help to nurture long-term commitments from member States and provide increased comfort and confidence to the private sector and institutional investors.

### **C. Information and communications technology**

56. Recognizing the above-mentioned connectivity deficits, ESCAP member States initiated the Asia-Pacific Information Superhighway in 2015. This initiative aims to increase the availability, resilience and affordability of broadband Internet across Asia and the Pacific by strengthening the underlying Internet infrastructure through four pillars: (a) physical infrastructure development; (b) Internet traffic and network management; (c) promoting e-resilience; and (d) broadband for all.

57. Under the Asia-Pacific Information Superhighway initiative, it is recognized that investment in ICT infrastructure is critical to improving ICT connectivity and lessening the digital divide. Towards this end, the ESCAP Committee on Information and Communications Technology, Science, Technology and Innovation, at its first session, endorsed the implementation of the Master Plan for the Asia-Pacific Information Superhighway and the Asia-Pacific Information Superhighway Regional Cooperation Framework Document, including the financing mechanisms, as a regional platform for narrowing the digital divide, achieving the Sustainable Development Goals and promoting integrated infrastructure development in other sectors, such as trade, transport and energy, and recommended expanded support for the initiative.

58. In addition, at the policy level, there is need to ensure that national, subregional and regional policies and regulations on ICT are aligned with the goals of the 2030 Agenda and implemented so that ICT can contribute meaningfully and to its full potential in the achievement of the Goals. Within this policy framework, given the disaster-prone nature of the region, there is also need to give the integration of e-resilience principles much higher priority in existing and future ICT infrastructure investment projects.

59. Development and implementation of regional connectivity projects requires a significant amount of time and cost, which are typically spent on negotiations and the acquisition of rights of way and other administrative work. While a similar national project, whether it be in transport, energy or ICT, may face similar challenges, a regional project poses additional challenges as multiple countries are involved, and a delay and disagreement in one country might affect the other countries. Co-deployment of infrastructure can reduce the bottlenecks and accelerate the pace of planning and deployment, particularly in landlocked developing countries. Leveraging existing regional connectivity agreements in which cross-border connectivity has already been agreed to, such as the Intergovernmental Agreement on the Asian Highway Network, the Intergovernmental Agreement on the Trans-Asian Railway Network or the Intergovernmental Agreement on Dry Ports, can be an efficient way to deploy cables and networks more rapidly in a cost-efficient manner that would also bring diversified and augmented sources of revenue-generation.

Box

### Examples of cross-sectoral co-deployment

Fibre-optic cable, the infrastructure for data and voice travel, is often deployed along highways, roads, railways, high-voltage transmission lines and pipelines. It allows for more affordable data transmission services and improved access to broadband. Most examples of co-deployment can be found at the national level. For example, Railtel of India leases fibre-optic cables to telecom operators that serve urban and rural communities, while the Bangladesh Railway<sup>a</sup> has leased its line to Grameen phone and commissioned 1,800 km of fibre-optic cables along the country's rails, providing Internet access to 90 per cent of the population.

Increasingly, such initiatives are also to be found in transboundary infrastructure projects. For example, the Baku-Tbilisi-Kars railway project involves a plan for the co-deployment of fibre-optic cables along the railway connecting Azerbaijan, Georgia and Turkey.<sup>b</sup> Meanwhile, the Trans-Asian Railway is an intergovernmental agreement to facilitate cross-border connectivity in 28 ESCAP member countries. ESCAP member countries have recommended an amendment to this agreement to consider co-deployment of fibre-optic cables.<sup>c</sup>

<sup>a</sup> Manisa Pipattanasomporn and Saifur Rahman, "Information and communication technology infrastructure and its distributed generation solutions in remote areas", Proc. 2002 the International Conference on Electrical and Computer Engineering (ICECE) (December 2002).

<sup>b</sup> Hajizadeh Elshan Mahmud, Great Silk Road and the "Baku-Tbilisi-Kars" project, September 2015. Available from [www.researchgate.net/publication/318589145\\_BAKU-TBILISI-KARS\\_PROJECT](http://www.researchgate.net/publication/318589145_BAKU-TBILISI-KARS_PROJECT).

<sup>c</sup> See E/ESCAP/CTR(4)/7.

60. A regional connectivity initiative could benefit from a regional agreement, framework and consensus that sets out principles, objectives, cooperation and implementation modalities. Such a regional template would reduce the time and cost associated with negotiations and consultations for a regional, subregional and bilateral connectivity initiative. It would also help to harmonize policies and regulations. For example, in the Master Plan for the Asia-Pacific Information Superhighway and the Asia-Pacific Information Superhighway Regional Cooperation Framework Document, open access and competition are promoted as principles to narrow the digital divide and achieve inclusive and sustainable development in the region. They also provide implementation modalities, a governance structure and options for financing mechanisms.

61. Despite the challenges, bottlenecks and additional complexities of regional connectivity initiatives, certain actions and measures could increase the likelihood of securing investment and financing as part of successful implementation. As Asia and the Pacific is a disaster-prone region, integrating disaster risks and disaster risk mitigation into a regional connectivity initiative from the planning phase would build e-resilience and increase the quality and investment attractiveness of projects. The integration of resilience in infrastructure is a development objective articulated in the 2030 Agenda, the Sendai Framework and other internationally agreed development frameworks.

62. The Ministerial Conference may wish to consider the recommendations contained in this document and provide guidance for the region to achieve seamless connectivity to enable the free movement of people, goods, energy and information.