

November 2014

**Improving connectivity in SPECA subregion:
challenges, opportunities and solutions**

Background paper by ESCAP secretariat

A Background document for the 2014 SPECA Economic Forum and Ninth Session of the SPECA Governing Council to be held in Ashgabat on 4-5 December 2014. The document has been prepared by the secretariat of ESCAP. The opinions in the document do not necessarily reflect the views of UN, ESCAP or its member countries and the Central Asian economies. The document was issued without formal editing.

I. INTRODUCTION

In recent years, the term “connectivity” has broadened and entered into mainstream development discourse as it plays an important role in enabling countries to expand their markets, optimize exchanges and strengthen collaboration in support of sustainable development and shared prosperity.

ESCAP promotes connectivity as a necessary and integral aspect of regional integration and defines it to encompass a number of key regional networks at the core of regional connectivity, namely transport, trade, energy and ICT infrastructure. Development of regional connectivity serves as a means of enhancing the effectiveness of regional networks that facilitate the efficient flows of goods, services, people, data and ideas both within and between countries in the region, taking into account not only the physical existence of the individual networks, but also the policy and regulatory frameworks under which they operate, and the synergies which can be achieved through improved cooperation and coordination.

The connectivity contributes to:

Regional Economic Integration

Regional economic integration depends critically on the development of infrastructure that will provide connectivity both within and between countries. Quality infrastructure, particularly in transport, energy, and ICT sectors, has been positively contributing to and influencing growth. Investment in infrastructure increases an economy’s capital stock, broadens the reach of trade and economic activities, creating opportunities for the realization of economies of scale, optimize the use of natural resources and lowers production and logistics costs. In addition, infrastructure development also generates, though more difficult to quantify, network externalities, which contribute further to growth by allowing economies of specialization, encouraging the clustering of businesses and facilitating information exchanges.

While the SPECA countries is experiencing expansion of its infrastructure networks, there are still clearly wide disparities in the breadth and quality of infrastructure within and between countries. Such gap is hindering the full participation of countries in the region’s economic dynamism. An underdeveloped transport networks result in higher costs for economics actors and hamper their activities. For instance, the ease of access to sea ports is of a great importance given the significant role of maritime transport in international trade. Most of developing countries in SPECA countries are landlocked and have in this respect a natural competitive disadvantage due to their geographical location which often results in long distances to the nearest major international maritime ports. Improving connectivity with SPECA countries and beyond will, therefore, foster regional economic integration as well as allow countries to take full advantage of the region’s diverse natural endowments and productive capacities for a more equitable distribution of rising prosperities.

Sustainable and Inclusive Development

Despite SPECA countries's noteworthy economic dynamism, there are deep-rooted domestic structural weaknesses which are holding back its growth potential. Thus, there is a need to exploit more of complementarities and diversity in order to raise the bar on both levels and quality of growth. Enhanced connectivity within and between regions provides access to economic and social opportunities, and narrows the development gaps. It also increases trading opportunities with expanded and diversified trade markets. Furthermore, ICT connectivity has emerged as an accelerator of exchanges of information, ideas and technologies, and thus constitutes the base upon which national and regional innovation systems can develop. As such, stronger connectivity is an essential ingredient of sustainable and inclusive development. To address this wider development concerns, connectivity offers a basis for higher, better quality growth and shared prosperity.

Enhancing regional connectivity is particularly important as a means for landlocked developing countries (LLDCs) in SPECA countries to connect to other part of the world. By developing all of the key networks such as transport, energy infrastructure and ICT infrastructure, in a coordinated and integrated manner, the benefits from improved connectivity with the rest of the world can be spread more evenly across and between countries, particularly to least developed and landlocked SPECA countries. Consequently, it, can contribute to the process of graduation for least developed countries like Afghanistan.

The region's continued economic growth are calling for countries to go beyond the mere development of transport infrastructure and look at how the many individual transport solutions offered by road, rail, inland waterways and airports, can be effectively linked to increase efficiency so that each mode can play on its specific strengths while complementing others to offer seamless transport solutions along international intermodal transport corridors. While an important tool for the region as a whole these corridors are an essential lifeline to LLDCs, including those in SPECA countries.

II. CURRENT STATUS AND KEY CHALLENGES

a. Transport

ESCAP promotes a vision of international integrated intermodal transport and logistics system covering the whole region. This has led to the development and use of three fundamental networks, namely the Asian Highway, Trans-Asian Railway and dry ports, as building blocks in planning and upgrading regional transport networks, and enhancing regional connectivity.

Transport infrastructure connectivity

The Global Economic Forum provides useful information as regards the quality of transport infrastructure by modes across 148 economies as assessed by 15,000 surveys of business leaders representing the main sectors of the economy (agriculture, manufacturing industry, non-manufacturing industry, and services). Table 1 below presents results from the 2013-2014 report

which by and large confirms the overall difficulties of transport infrastructure in SPECA countries.

Table 1. Infrastructure ratings by modes¹

Countries	Road infrastructure		Rail infrastructure		Port infrastructure (1)		Air infrastructure	
	Score	Rank	Score	Rank	Score	Rank	Score	Rank
Afghanistan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Azerbaijan	4.0	74	3.9	36	4.5	60	5.1	48
Kazakhstan	2.8	117	4.4	27	2.7	135	4.1	89
Kyrgyzstan	2.5	133	2.5	76	1.3	148	3.1	128
Tajikistan (3)	3.18	98	3.49	43	1.68	143	4.21	88
Turkmenistan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Uzbekistan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Average	3.3		2.94		2.64		3.89	
Mean value	4		3.2		4.2		4.4	

(On a scale of 1 to 7 where 1 = extremely underdeveloped—among the worst in the world; and 7 = extensive and efficient—among the best in the world)

Table 1 shows that, on average, infrastructure ratings in SPECA countries are below the world's mean value although many countries do better on an individual basis in one sector or another. Of note is the fact that of all the LLDCs for which values are available, only one, i.e. Azerbaijan fares at or above the mean value for land transport infrastructure. Furthermore, the low rating received by rail is of particular concern as the distances to maritime ports of the region are of a scale on which the rail mode should find its full economic justification.

Focusing on infrastructure, progress achieved and remaining challenges can be illustrated through cross-country comparisons such as the World Bank 2014 survey of logistic professionals (Table 2 below). The latest 2014 edition, which covers 160 countries worldwide, show that LLDCs in SPECA countries continue to rank relatively low in international comparison - the survey participants marked the quality of infrastructure around 2 (low) and 3 (average) while the maximum grade is 5 (very high).

Table 2. Ranking of infrastructure components of the logistics performance indicator²

Countries	2007	2010	2012	2014	Ranking Infrastructure (2014)
Afghanistan	1.10	1.87	2.00	1.82	158
Azerbaijan		2.23	2.42	2.71	68
Kazakhstan	1.86	2.66	2.6	2.38	106
Kyrgyzstan	2.06	2.09	2.49	2.05	147
Tajikistan	2.00	2.00	2.03	2.36	108
Turkmenistan		2.24		2.06	146
Uzbekistan		2.54	2.25	2.01	148

According to the World Bank, the cost of exporting via maritime routes from the LLDCs, including SPECA participating countries is reported to be twice as high as the world's average

¹ World Economic Forum, "The Global Competitiveness Report", 2013-2014

² World Bank, "Connecting to Compete – Trade Logistics in the Global Economy", 2014, Appendix 1, pp. 34 to37.

and although progress in business facilitation has undeniably been made since the adoption of the Almaty programme of Action, this “cost gap” has not been bridged. It is also worth noting that infrastructure is only one part of the equation as administrative procedures (e.g. customs clearance) have a significant role to play for achieving an efficient transport network. The latter is, however, outside the scope of this paper.

Asian Highway and Trans-Asian Railway

The notion of developing region-wide road and rail networks can be traced back to the late 1950s for the Asian Highway and the early 1960s for the Trans-Asian Railway. In the late 1980s and early 1990s, sweeping changes in the political and economic environment in the ESCAP region led to a revival of the two projects. The ESCAP secretariat, in close collaboration with member countries, carried out a number of corridor studies aimed at identifying the routes of the two networks based on the criteria that the selected routes had to be:

- (a) Capital-to-capital links;
- (b) Connections to main industrial and agricultural centers;
- (c) Connections to major sea and river ports; and
- (d) Connections to major container terminals and depots.³

To reinforce project ownership by the member States, the secretariat also involved existing sub-regional groupings as partners in the implementation process, as well as governmental and non-governmental technical organizations. To date, the Asian Highway network includes 143,000 km of roads passing through 32 member states, while the Trans-Asian Railway network covers 117,500 km of railway lines serving 28 member states.

The Commission mandated the secretariat to formalize the above networks through two intergovernmental agreements. The Intergovernmental Agreement on the Asian Highway Network⁴ came into force in July 2005, while the Intergovernmental Agreement on the Trans-Asian Railway Network⁵ entered into force in June 2009. To date, there are 29 parties to the Intergovernmental Agreement on the Asian Highway Network and 18 parties to the Intergovernmental Agreement on the Trans-Asian Railway Network. The Asian Highway and Trans-Asian Railway play a catalytic role in the coordinated planning and construction of international roads and railway lines in the region.

Table 3. Status of Asian Highway network in SPECA countries (km)

Countries	Primary	Class I	Class II	Class III	Below Class III	Total	Status year
Afghanistan	0	10	2,519	0	1,718	4,247	2008
Azerbaijan	0	291	1,174	0	0	1,465	2013
Kazakhstan	0	557	5,407	6,389	475	12,828	2010
Kyrgyzstan	0	0	303	1,324	136	1,763	2013
Tajikistan	0	20	978	0	914	1,912	2013
Turkmenistan	0	60	0	2,120	24	2,204	2008

³ Connection to major tourist attractions was later added to the Asian Highway route selection criteria.

⁴ United Nations, *Treaty Series*, vol. 2323, No. 41607.

⁵ United Nations, *Treaty Series*, vol. 2596, No. 46171.

Uzbekistan	0	1,195	1,101	670	0	2,966	2008
Total		2,295	14,483	14,108	6,123	37,009	
Percentage		6%	39%	38%	17%	100%	
2004 percentage		1%	14%	53%	32%		

SPECA countries have taken active part in the identification of the Trans-Asian Railway (TAR) network which now comprises 117,500 km of railway line of international importance serving 28 member countries.

Table 4. Distances from capital cities of SPECA countries to main maritime ports (km) using identified Trans-Asian Railway routes

	Lianyungang (China)	Saint Petersburg (Russian Federation)	Vostochny (Russian Federation)
Ashgabat	7,300	4,800	10,100
Astana	5,550	3,350	8,300
Bishkek	5,600	4,650	8,350
Dushanbe	7,300	4,450	10,100
Tashkent	6,000	5,550	8,700

Afghanistan never actually developed a rail network of any significance although some planning was made as early as in the 19th century. A rail track was built in Kabul in the early 20th century (1920s) but was nearly as quickly dismantled. In the days of the Soviet Union, two feeder lines (one from Turkmenistan and one from Uzbekistan) crossed the northern borders but did not extend beyond the Afghan border post. This situation explains why Afghanistan was not among the countries that negotiated and adopted the Intergovernmental Agreement on the Trans-Asian Railway Network. However, the situation is gradually changing and planned railway development could have a significant impact not only on Afghanistan but also on all the LLDCs in Central Asia. In 2010, with ADB funding, a 75-km single-track rail link was completed from Khairaton at the border with Uzbekistan to Mazar-i-Sharif. In addition to the above, the Islamic Republic of Iran has now been working on the construction of a 205-km rail link from Sangan (eastern part of Iran) to Herat (western part of Afghanistan).

Further, plans are also under way to link the main cities located in the north and south of Afghanistan with their neighboring countries, i.e. Islamic Republic of Iran and Pakistan. The network being considered will comprise two main corridors, namely:

- i) an eastern north-south corridor with a distance of about 720 km from Mazar-i-Sharif to Jalalabad via Kabul with a branch line to the copper mine at Logar;
- ii) a northern east-west corridor with a distance of about 1,250 km from Kundus to Herat via Mazar-i-Sharif. Branches will connect this main line to rail border points in Tajikistan and Turkmenistan⁶. These corridor and branch lines would offer rapid transit for Central Asian republics to Iranian ports on the Persian Gulf;
- iii) Meanwhile, branch lines have been discussed from Chaman and Torkham in Pakistan to Kandahar and Jalalabad, respectively. These links could give access to the ports of

⁶ Feasibility studies have started on sections of the proposed Herat - Kundus corridor with ADB providing assistance for the 225-km section from Mazar-i-Sharif to Aqina at the border with Turkmenistan

Karachi (Pakistan) and Mumbai (India), and later to the port of Gwadar when Pakistan Railways complete the 900-km to link the port facilities to the country's main rail network at Mastung.

Besides these developments in Afghanistan, other rail development projects are planned or being implemented which could change the picture of transport for SPECA countries. In particular, on the eastern side of the Caspian Sea, a 677 km rail link from Uzen (Kazakhstan) to Bereket-Etrek (Turkmenistan) and Gorgan (Iran) is being built. About 137 km of the link will be in Kazakhstan, 470 km in Turkmenistan and 70 km in the Islamic Republic of Iran where it will link with the country's main rail routes going all the way to sea ports on the Persian Gulf, i.e. the existing port at Bandar Abbas and the future port being developed at Chabahar. In May 2013, Kazakhstan and Turkmenistan celebrated the completion of a 146km line from Uzen (Kazakhstan) to Serhetyaka (Turkmenistan) as part of the project. The related section in the Islamic Republic of Iran was also inaugurated in May 2013. Meanwhile, bogie changing facilities are being built at the border between Turkmenistan (which operates on a 1.520mm gauge) and the Islamic Republic of Iran which operates on a 1.435mm gauge.

In March 2012, the Governments of China and Kyrgyzstan signed a memorandum of understanding to study the possibility of rail-connecting the two countries. While investment needs are high, i.e. in excess of US\$ 4 billion, the project would offer an additional routing option between China and SPECA countries compared with the only current option via Kazakhstan.

Dry Ports

Recognizing the need to integrate modes as well as to facilitate the emergence of efficient logistics in the region, the Ministerial Conference on Transport, which was held in Bangkok from 12 to 16 March 2012, reaffirmed the mandate given to the secretariat under Commission resolution 48/11 to work toward realizing the vision of an international integrated intermodal transport and logistics system.⁷ Acting on the mandate, the secretariat is actively collaborating with member countries to develop a network of dry ports that would enable greater integration between infrastructure networks and increase the efficiency of transport in the region. In a signing ceremony for the Agreement during the Forum of Asian Ministers of Transport at its second session (Bangkok, 4 to 8 November 2013), 14 member States signed the Agreement⁸, including one (Thailand) which deposited an instrument of ratification. Since then, one more country has become a Party to the Agreement through ratification, i.e. Republic of Korea, and one more has become a signatory to it, i.e. Sri Lanka. In parallel, the secretariat is implementing activities to enhance the capacity of member countries to plan, develop and operate dry ports of international importance and to implement the Intergovernmental Agreement on Dry Ports. To date 16 member States have signed the Intergovernmental Agreement on Dry Ports and 3 have

⁷ See E/ESCAP/MCT.2/12.

⁸ Armenia, Cambodia, China, Indonesia, Islamic Republic of Iran, Lao People's Democratic Republic, Mongolia, Myanmar, Nepal, Republic of Korea, Russian Federation, Tajikistan, Thailand and Viet Nam.

deposited their instrument of ratification/acceptance/approval/accession with the Secretary-General of the United Nations in New York.⁹

Table 5. Number of dry ports of international importance earmarked for development by SPECA countries

Countries	Number of dry ports
Afghanistan	8
Azerbaijan	21
Kazakhstan	5
Kyrgyzstan	2
Tajikistan	7
Turkmenistan	n.a.
Uzbekistan	n.a.

A number of SPECA countries have started to implement projects to develop modern facilities or upgrade existing ones. Recognizing that an important factor in unlocking trade is the availability of adequate logistics facilities and services, the Governments of China and Kazakhstan have been cooperating on the development of the “Khorgos-East Gate” free economic area located in the south-east of Kazakhstan and just a kilometer away from Kazakhstan’s border with China

The Government of Uzbekistan has also taken a number of initiatives to develop intermodal corridors and dry ports in the country, in particular at Angren in the Tashkent region to serve the Andijan, Namangan and Ferghana regions of eastern Uzbekistan, and Navoi, 350 kilometres south-west of Tashkent. The Navoi dry port has been developed in connection with the Navoi Free Industrial Zone (FIZ) close to the international intermodal hub at Navoi airport which began operation in 2009 under management from Korean Air.

Supporting progresses in dry ports is particularly timely as the capacities of existing infrastructure are, in many cases, limited and new facilities are urgently required. Building such facilities, however, is no easy task due to the number and variety of stakeholders and to the difficulties in securing the necessary financing. Coordination among different government ministries/departments and the private sector is important to create an environment that is conducive to the development of dry ports.

Transport operational connectivity

Transport connectivity in Asia and the Pacific has two main aspects- the infrastructure connectivity or the hardware and the operational connectivity or the software, while physical infrastructure in the region is being gradually built; simultaneously there is a need to develop operational connectivity to operationalize the regional transport networks. In this direction, ESCAP had developed a transport facilitation assistance system and an integrated assistance system for transport logistics. The key elements of transport facilitation assistance system include the Regional Strategic Framework for facilitation of international road transport, the

⁹ The Intergovernmental Agreement on Dry Ports will enter into force on the thirtieth day following the date on which the eighth instrument of ratification, acceptance, approval of or accession to the Agreement is deposited with the Secretary-General of the United Nations.

Regional Cooperation Framework for facilitation of international railway transport, transport facilitation tools and the Regional Network of Legal and Technical Experts for transport facilitation.

Countries in SPECA countries may benefit from the following elements which provide complete range of solutions to address non-physical barriers to cross-border and transit transport for seamless transport connectivity.

Regional Strategic Framework for facilitation of international road transport

The framework was adopted at the second session of the Ministerial Conference on Transport held in March 2012 in Bangkok and serves as a primary policy document on transport facilitation initiatives for member countries and their development partners to increase coordination among different facilitation agreements, projects and measures in order to avoid inconsistency and conflicts in planning, formulation and implementation, thereby increasing the effectiveness of facilitation efforts. The synergistic effect of such facilitation measures will benefit member countries and their development partners.

Regional Cooperation Framework for facilitation of international railway transport

The emphasis on importance to promote environment-friendly modes of transport and in order to further develop international railway transport in the region, a number of issues need to be addressed such as break of gauge, simplification of border-crossing procedures, including the streamlining of documents, standardization of technical and operational requirements, and harmonization of legal regimes.

Apart from documenting the existing organizations and initiatives, as well as extant legal instruments, to promote cooperation among countries for the facilitation of international railway transport, various approaches to further promote railway transport in the region have been identified, some of which were: participation in international railway organizations; harmonization of consignment notes; use of advanced passenger and cargo information systems; coordination of regulatory controls and inspections at interchange stations; use of new technologies in train operations; and development of human resources for international railway transport operations.

Transport facilitation tools

These tools comprise of four mutually complementary models to deal with operational challenges in cross-border and transit transport, namely ESCAP Time/Cost-Distance Methodology, Secure Cross-Border Transport Model, Efficient Cross-Border Transport Models and Model on Integrated Controls at Border Crossings.

Regional Network for Legal and Technical Experts on Transport Facilitation

The Regional Network of Legal and Technical Experts on Transport Facilitation was established to assist member countries in building a more efficient legal regime for international transport in the region. It is aimed at assisting member countries in upgrading the professional level of their officials and experts involved in transport facilitation, providing legal support for accession to international conventions, the formulation of relevant agreements, measures and projects, and promoting the harmonization and coordination of different legal instruments on transport facilitation.

Through the network, legal and technical experts can exchange information, share experiences and good practices, coordinate with each other, suggest solutions for legal conflicts between different agreements in geographically overlapping countries, suggest ways to connect countries in different subregions under different subregional agreements, study emerging issues in the field of transport facilitation and explore ways for bringing about regional harmonization of legal instruments.

Integrated Assistance System for Transport Logistics

The integrated support system for transport logistics comprises technical standards for logistics information system and guidelines on comprehensive logistics policy, a regional training system, regional forum/conference of service providers and associated technical assistance, policy support and capacity-building. Two examples of the system are briefly discussed below.

Technical standards for logistics information system

The use of ICT is key to efficient and effective logistics systems, together with a solid legal framework, reliable infrastructure and well-developed human resources. While private logistics information systems and public logistics information platforms exist, member countries are at very different stages of development in this regard. At the same time, there is limited consistency in approaches to the development of logistics information systems, both nationally and internationally, as is particularly the case for logistics information systems developed by the private sector.

Regional training standards and certification

Human capacity development is vital to strengthen industries to be able to meet the challenges of modern logistics, and therefore has been incorporated into the national logistics strategies and plans of many countries in the region. The secretariat has been working on the development of syllabuses for a regional, accredited, training system for logistics service providers to support the establishment of sustainable and regionally recognized training programmes in member countries. A regional programme may also support the development of a regional pool of trainers, which may help overcome the shortage of qualified instructors in some countries in the region.

Sustainable Transport Development

As indicated in the outcome document of the Rio+20 Conference, transport and mobility are central to sustainable development. Sustainable transport systems contribute to increased economic competitiveness and assist safe, clean and affordable mobility.

The transport sector is a major consumer of energy resources – particularly petroleum products and also one of the major emitters of carbon dioxide. The bulk of the energy in the region is consumed by and most of the emissions in the region come from the road sector. The negative externalities of existing transportation systems, such as the costs associated with congestion, consumption of fossil fuels, road accidents, emissions and air pollution, are a significant burden on economies. The issue of road safety has been on the global agenda for quite some time, as casualties from road crashes continue to rise at an alarming rate. More than half of the world's total road traffic deaths occur on roads in the ESCAP region. The economic cost of road crashes has been estimated at between 1 and 3 per cent of gross domestic product on average.

Policy options for sustainable transport development includes:

- a) Evidence-based policies for addressing energy and emissions in transport;
- b) Sustainable urban transport;
- c) Making transportation resilient;
- d) Improving road safety;
- e) Sustainable maintenance of roads;
- f) Intelligent transport systems; and
- g) Long-haul intermodal freight transport.

Those issues need to be well addressed in development of seamless connectivity to ensure connectivity sustainable.

b. Energy

Regional connectivity to enhance energy security

In Asia, the energy demand is expected to double by 2050, of which the demand for electric power will increase significantly during the same period. Meanwhile, access to energy varies widely from country to country, and even within countries. As of 2010, there were still 628 million people without access to electricity and 1.8 billion people using traditional biomass – a distinctive characteristic of poverty. Populations with low electricity access are concentrated in South Asia and the Pacific, where more than 70 per cent of the population still lack access to on-grid electricity. Meeting energy demand is a top energy security priority and a push factor for policy makers in countries relying on energy imports. Traditionally, meeting such demand would be planned and implemented within the boundaries of national borders. Regional cooperation is a complementary measure to the national efforts in meeting such a rapidly increasing demand.

While a number of countries in the region are net energy exporters, only a few countries satisfy their energy needs from their own resources. The region as a whole is a net importer of primary energy. Notably, some countries are both major importers and exporters of energy, suggesting that even energy-rich countries are dependent on others for the energy security. Many countries, particularly in the Pacific, heavily depend on the import of fossil fuels to meet their energy needs. This uneven distribution of energy supplies results in significant differences in power generation costs and energy supply as a whole.

Thus, there are numerous opportunities for oil, gas and electricity trade in Asia and the Pacific. They can be divided into three main groups – infrastructure projects of regional or subregional significance, infrastructure projects of bilateral significance and maritime energy trade projects. For hydrocarbon infrastructure, the region already has a number of existing and planned pipeline projects.

Greater energy connectivity such as transboundary power grid and pipeline connectivity at the regional level, along with measures to improve energy efficiency and adopt cleaner fuels, could greatly benefit countries. Adopting measures that could balance supply and demand by transferring energy from energy-rich or lower-cost energy production countries to energy-poor or high-cost energy production countries should be favored, as they will help bridge the growing energy divide and ensure energy security for the region.

Regional cooperation for an Asian Energy Highway

A natural desire by member states to maintain energy independence from a broader regional energy system is an obvious and potentially limiting obstacle to full integration of energy trading. A regional energy arrangement could also explore the most effective way to improve the efficiency of energy systems and take greater advantage of renewable resources. In addition, it could develop deep, liquid and transparent markets for crude oil, petroleum products and gas while giving a higher priority to pipeline security and safety.

In 2012, member States adopted a resolution¹⁰ requesting the secretariat to identify options on connectivity for energy security, including an integrated regional power grid called "Asian Energy Highway"¹¹. The Asian Energy Highway is about optimizing the use of all energy resources, i.e. sustainable use of energy. It is more than promoting trade, investment and physical infrastructure to connect a region with imbalances in energy resources. AEH is envisioned as a necessary system for sustainable development because the huge growing demand in the region for electricity cannot be met in an optimal and equitable way unless there is an integrated regional power grid and electricity market.

A number of multi-country initiatives have focused on electricity and power grid integration such as ASEAN Power Grid – An intergovernmental programme that has been optimizing energy trading opportunities within the region since the 1990s; CASA-1000 – for the Central Asia-South Asia Regional Electricity Market by using the surplus hydropower from Kyrgyzstan

¹⁰ ESCAP resolution 68/11 on connectivity for energy security.

¹¹ The secretariat has been requested by member States to identify specific ways the Pacific can benefit from the Asian Energy Highway or alternatively develop an initiative on connectivity that addresses the particular energy challenges in the Pacific.

and Tajikistan to meet power deficits in Afghanistan and Pakistan; Greater Mekong Subregion Power Market ; SAARC Market for Electricity – main component of the South Asian Association for Regional Cooperation (SAARC) Energy Ring; Gobitec and an Asian super grid for renewable energies in North-East Asia; Unified Energy System of Central Asia –the Unified Energy System network is a synchronous grid extending across the Russian Federation and Central Asian countries.

Under the framework of the Asian Energy Highway, the secretariat can play a valuable role in promoting the exchange of knowledge and wider application on good practices, which, importantly, will Improve performance of each subregional initiative; Build trust among countries, subregions and organizations, and establish a better foundation (relationships, standards, institutions, etc.) for future integration.

An Asian Energy Highway would not only connect physical infrastructures but also involve integrated market mechanisms to dynamically and efficiently move power more sustainably and reliably across the region, as well as optimize the allocation between supply and demand centers. Such a regionally integrated market would enhance energy security since greater diversification of national energy supplies would reduce exposure to potentially volatile markets, and thus help to reduce the potential for geopolitical conflicts.

The secretariat is now in a position to conduct a more in-depth analysis of the socioeconomic and environmental benefits of a regional power grid and electricity market in order to develop a methodology to measure the costs and benefits. Based on such in depth analysis and further consultations, the establishment of AEH through technical studies including lessons learned from other integrated markets and continuous policy dialogue will contribute to the preparation of a comprehensive framework for an Asian Energy Highway. More importantly, political commitments have to be mobilized to enhance the cooperation between subregional initiatives on power integration and developing consortium to undertake cost-benefit analysis on Asia regional scale.

c. ICT

Mobile telephony is now largely available for all, with a penetration rate of 88.8 per cent for the region as a whole. However, the digital divide remains vivid in terms of access to the Internet, with ESCAP developing countries enjoying a third of the internet usage level as compared to the more advanced ESCAP countries (25.8 per cent and 76 per cent respectively). When one considers broadband availability and bandwidth per capita the divide is even bigger. While in ESCAP ICT-advanced countries the cost of broadband is equivalent to less than 1 per cent of average gross national income per capita, people in the Pacific island developing states (PIDS) pay over 127 per cent of average gross national income, which is clearly unaffordable. The digital divide concern remains very acute for broadband, particularly in vulnerable countries (LDCs, LLDCs and SIDS). This limits the potential development impact of ICT, as broadband is key to a number of development enhancing applications and opportunities. Not surprisingly therefore, the need to “provide universal and affordable access to internet in LDCs by 2020” is a key element of proposed Sustainable Development goal 9. ICT is increasingly embedded in other infrastructures, allowing for instantaneous exchange of data and instructions across infrastructure

networks such as intelligent transport systems, smart grids and smart cities. The advent of the internet of things will propose new avenues to reach sustainable development objectives. However this will require extensive and ubiquitous communications facilities that are still to be deployed in many ESCAP countries.

The physical infrastructure of the Internet plays an important role in determining the supply and price of international bandwidth. In Asia and the Pacific, the low levels of international bandwidth can be attributed to a number of factors related to the configuration and efficiency of this infrastructure. A large portion of inter- and intra-regional Internet traffic in the region is routed through submarine cables and exchanged outside of the region. The role played by point-to-point intraregional connectivity utilizing land-based infrastructure remains very limited, making it more expensive for inland markets to effectively tap into the global Internet. As a result of the limited terrestrial connectivity, much of the fiber infrastructure in the region has developed in a hub-and-spoke configuration around submarine cable hubs. The terrestrial networks that do exist in the region provide variable quality, cost and service conditions. This leads to market inefficiencies and operational complications, and domestic backbones are unable to effectively compete with submarine cables for international connectivity. As terrestrial connectivity in the region currently functions as a patchwork of domestic networks that rely on submarine cables for international connectivity, the quality and utility of land-based fiber infrastructure is restrained by the weakest terrestrial segment.

This reliance on sea-based cables also puts the region at risk in the event of a disruption caused by natural disasters, marine vessel accidents or sabotage. In addition, the reliance on submarine cables has also resulted in geographic choke points for international bandwidth.

In this context, ESCAP is working towards the establishment of a pan-regional Asia-Pacific Information Superhighway, which would develop a seamless meshed transmission network across the region, coupling submarine and terrestrial fiber transmission capacity with satellite and microwave linkages. The development of such a network would require intensive government and private sector cooperation at a regional level, for which ESCAP can provide a platform. Moreover, Synergies can be exploited in deploying fiber-optic along other infrastructures as they are being built or maintained, including transport infrastructure (roads, railways), and energy infrastructure (high voltage transmission lines and pipelines). This however, requires coordination of policies across a large range of actors and issues; ESCAP is well placed to advance the research on these questions.

III. SEAMLESS AND INTEGRATED CONNECTIVITY IN SUPPORT OF INCLUSIVE AND SUSTAINABLE DEVELOPMENT

The SPECA countries has strong potential for developing seamless and integrated connectivity in support of inclusive and sustainable development. This section discusses key options and strategies towards the realization of seamless and integrated connectivity.

Further developing infrastructure networks

The Asian Highway and Trans-Asian Railway networks cover only main trunk land transport routes in Asia. The two backbone transport networks for regional connectivity need to be further extended and expanded to enhance regional connectivity. In response to the need of sustainable development and with signing of the Intergovernmental Agreement on Dry Ports, intermodal transport network with inclusion of waterways, roads and railways needs to be developed to achieve optimized economic, social and environmental benefits.

As is demonstrated by the multiple initiatives already under development within the Asia-Pacific concerning integrated electricity trading (e.g. ASEAN, SAARC, CASAREM, etc.), recognition already exists at smaller scales of the benefits of energy cooperation between neighboring countries. The Asian Energy Highway concept is however, asking member states to conceptualize and work towards a higher level of integration than that which is already being proposed. Building the Asian Energy Highway from the ‘bottom up’ in terms of capacity building, and further more detailed quantification and analysis of its associated benefits, is therefore the critical initial step in generating the necessary momentum to obtain member state ‘buy in’ of the concept.

Likewise, the data transmission networks that carry broadband within and between countries in Asia Pacific often rely excessively on a few cable routes. The SPECA could thus analyze these transmission networks¹², and consider ways of enhancing connections and cohesiveness, for example, by identifying opportunities for the co-habitation of ICT infrastructure with transport and energy infrastructure. The SPECA could take actions to promote intergovernmental cooperation to eliminate missing cross-border links, and the opportunities for synchronized cross-sectorial deployment of infrastructure. The secretariat’s ongoing research and repository of information which includes the ESCAP/ITU maps of the Asia-Pacific Information Superhighway can greatly assist in this regard¹³.

Transport networks are also largely used for carriage of energy supplies, such as coal, crude oil and oil products. Coordination of the transport networks and the energy network can avoid duplication of infrastructure and increase effectiveness of investment. It may also reduce lead time for construction of routes. Colocation of optical fiber with transport infrastructure, such as railway and highway, may significantly reduce amount of investment for fiber network¹⁴ and accelerate the development of the Asia-Pacific Information Superhighway. Meanwhile it can provide an opportunity for the transport sector to acquire additional benefits from infrastructure and easier access to ICT facilities.

Closing infrastructure gap

Achieving seamless connectivity requires substantive financial support. Financing connectivity largely relies on public investments. SPECA countries could strengthen public finance and

¹² These links are mostly constituted of terrestrial and submarine fibercables, as well as satellite and microwave transmission links.

¹³ <http://www.unescap.org/idd/maps/asia-pacific-superhighway/>

¹⁴ It is usually estimated that up to 80% of fiber deployment costs are associated with civil-engineering work.

meanwhile enhance role of public-private institutional funds and formulate policies and regulations to encourage private investments. Efficient use of official development assistance (ODA) is an important complementary for such shortage.

Public-private partnerships (PPPs) have significant potential for financing connectivity. It was estimated that private investments to finance infrastructure in developing countries of the region reached US\$120 billion in 2010. Its average annual growth rate was about 25.4 per cent. Improved policy and legal environment will further attract private investments in connectivity in the form of PPPs.

The UN secretariat has supported these actions and some important activities have notably been undertaken over the past decade within the framework of a project entitled “Public-Private Alliance Programme for Capacity Building in Infrastructure Development and Provision of Basic Services”¹⁵, which has benefited to seven Asian LLDCs, including SPECA countries . The Project was set out to enhance the sustainable capacity of Governments at the national, sub-national and municipal/local levels to promote, develop, operate and manage PPP projects for infrastructure development and the provision of basic services.

The role of international development banks is significant in developing seamless connectivity. With the existing development banks and newly emerged development banks, a neutral forum with ESCAP may bring recipient countries and their development partners together to promote coordination and cooperation of all stakeholders. Such forum may be high-level PPP conference or high-level infrastructure investment forum.

An overall policy approach may also be used to mobilize and allocate financial resources in connection with specific goals and targets of the post-2015 development agenda, including adjustments of strategies, policies, lending and granting frameworks, action plans, programmes and projects.

Enhancing coordination and cooperation: institutional and policy issues

To enhance coordination and cooperation between governments and between public and private sectors, there is a need for appropriate institutional framework. In transport sector, there are already regional and subregional transport strategies and intergovernmental agreements being implemented. Similarly for energy infrastructure, the development is progressing under various subregional and other multi-country frameworks. For ICT infrastructure, there are few formal intergovernmental mechanisms at the regional level for policy coordination.

This would also entail cooperating on regulatory frameworks and facilitating cross-country PPP projects. For example, where there is co-habitation of ICT with transport or energy infrastructure, the working group could for example explore ways to promote open access on non-discriminatory basis to private sector service suppliers. Open access, coupled with fair pricing policies can greatly enhance competition diversify revenues for utilities and enhance efficiencies in service delivery.

¹⁵ This UN Development Account (UNDA) project was jointly implemented by the ESCAP, ECE and Economic Commission for Africa (ECA) secretariats

Coordination and cooperation within each sector are needed to make connectivity seamless. For example, transport connectivity needs integrated networks of road, railway, maritime, air, inland waterways and pipelines. Each mode of transport is managed by a technical department in a country. Cross-departmental coordination and cooperation can ensure the optimized use of resources and efficiency of transport operations.

Regarding to energy connectivity, the challenge within the region lies within developing an institutional framework that can support the necessary intergovernmental cooperation in a progressive manner, and which can also overcome the hesitations which some nations may have in engaging in a regional development agenda. The development of this management framework is therefore the first and most critical phase towards implementation of the Asian Energy Highway.

While each sector is progressing toward fulfilling its objectives, the coordinated use of energy and ICT networks will help achieve synergies of different sectors. It requires governments to reach across sectorial boundaries to enhance cross-sectorial cooperation at national and regional levels. The cross-sectorial Expert Working Group on Seamless Connectivity at ESCAP is helpful model in bringing different sectors together to set shared vision and coordinated actions.

The SPECA could therefore suggest institutional setups, policy and regulatory reforms that would be needed to promote co-habitation of infrastructure across the three sectors, and that would improve connectivity, including that in international internet transit, for landlocked countries in particular.

Strengthening partnerships

Building and integrating key infrastructure networks is long-term and involves substantial capital cost. Governments should work together as well as seek partnership to plan and implement regional infrastructure initiatives. Partnership may include governments, development banks, global/regional/ subregional organizations, private sector, academia and civil society.

Encouraging people to people connectivity

Governments of SPECA countries could help their people access the region's vast knowledge resources, as well as foster better understanding about the region's diverse cultures and value systems. Greater transport and ICT connectivity would facilitate people to people connectivity and, as a result, open up vast new opportunities including international labor migration, the transition to knowledge-based economies, strengthened business networks, and association and better understanding about region's diverse culture and value system. Such exchange would help implement physical and institutional connectivity in the region.

IV. LOOKING FORWARD: CHALLENGES AND OPPORTUNITIES

The previous sections have provided a broad overview of all the progresses and efforts made related to strengthening connectivity in SPECA countries but they have also highlighted the fact

that some infrastructure gaps persist. The following paragraphs will present some of the challenges and opportunities linked to the objective of bridging the remaining gaps.

Institutional challenges and opportunities

Having an adequate regional coordination framework is essential for a coherent infrastructure development. It is actually even more important for landlocked countries as by definition they cannot regulate on their own the entire transport process up to the sea ports. Effective cooperation with transit countries is therefore fundamental and we have seen throughout the paper the importance of some ongoing initiatives led by these transit countries that are improving regional connections.

Maintaining efficient regional coordination platforms should thus remain a priority to be able to achieve the desired infrastructure connectivity. For that purpose, the different intergovernmental agreements on infrastructure (AH, TARN and Dry Ports) as well as other cooperation mechanisms such as the SPECA PWG-TBC offer the necessary tools for consistent planning and identification of priority investments.

Once networks have been identified and formalized, they still need to be developed and upgraded, which is widely recognized as a very demanding process necessitating significant technical expertise. Building sustainable internal capacity is hence critical for the future of transport infrastructure networks.

Finally operating intermodal corridors requires a high degree of coordination and cooperation across all stakeholders, including government agencies and institutions, shippers, modal carriers and various interest groups. Only for the public entities, the responsibilities for the development and implementation of intermodal policies and projects are very often distributed over many ministries or agencies, each of them dealing with one specific aspect (e.g. rail or roads). Consequently, investment decisions might be based primarily on the needs of each subsector with little coordination between the different modes. Standards, rules or documentation might also be developed separately making interoperability more complicated.

Financial challenges and opportunities

Financing is another obvious challenge given the considerable amount required to expand and maintain the transport infrastructures of the region. The Asian Development Bank Institute actually calculated that these countries will have to spend more than \$400 billion in the period 2010-2020 to satisfy their infrastructure needs, out of which we estimated that around \$125 billion should be for national transport infrastructure (mainly roads), representing a yearly investment need of more than \$12 billion. In addition to these national investments, regional projects should further inflate the amount of financing required.

For some countries (e.g. Afghanistan), annual investment costs would then exceed 5% of their estimated GDP which represent a significant outlay that they are in no measure able to finance through standard budgetary allocations.

Against this backdrop, developing innovative financing solutions might be necessary to complement investments funded on national budgets. One of the innovative financing solutions might be to further develop PPP opportunities in the region through for instance the

implementation of adequate regulatory, legislative and governance measures but other financial mechanisms might also be possible.

Experience in other countries/regions could at least suggest three different options:

- Creating dedicated national institutions for financing infrastructure (e.g. the Infrastructure Development Company Limited (IDCOL) in Bangladesh or the Infrastructure Finance Company (IDFC) and the India Infrastructure Finance Company Limited (IIFCL) in India);
- Setting-up sub-regional infrastructure funds that could ultimately cover all the landlocked countries like the SAARC Development Fund (SDF) and the ASEAN Infrastructure Fund;
- Establishing a regional investment facility to mobilize additional funding by using donors grant resources to leverage loans from several international financial institutions. Thanks to the grant money provided, public and private funding could be attracted as the hurdle rate for financial feasibility would be lowered or the risk associated with a specific project could be reduced. Such types of facilities already exist in some regions and have been showing impressive results both in terms in financial leverage and as regards the increased level of collaboration among international institutions involved in infrastructure financing.¹⁶

Independently of the option considered, the availability of grant resources seem to be critical for future infrastructure development especially in the countries having limited borrowing capacity. In addition to mobilize the necessary resources to develop and upgrade transport networks, there is a need to maintain existing assets. Failure to do so will impose additional costs which can significantly exceed the costs of timely maintenance.

In an attempt to obtain adequate funding for road maintenance, a number of countries have established dedicated road funds (e.g. Lao People's Democratic Republic and Nepal). The principal sources of revenue for these funds are: levies on consumables, mainly fuel; tolls; annual vehicle licence fees; supplementary fees for heavy vehicles; and fines for overloading.

Commercial challenges and opportunities

Opportunities for SPECA countries to capture an increasing part of freight traffic are significant as international trade is expected to continue to grow and most of these countries are at the crossroads between major trading blocs in Asia or even between Asia and Europe¹⁷.

Despite the existing potential, current levels of transit are actually relatively low. Competing with maritime transport is obviously challenging given the economies of scale than can be achieved due to the large volume transported but it has been demonstrated that under some circumstances inland transport can be less costly and faster (even when the cost is higher it can

¹⁶ For instance, the European Commission created in 2008 the Neighborhood Investment Facility (NIF) to leverage infrastructure investments in North Africa, Eastern Europe and the Caucasus. This instrument has been widely recognized as a great success and it was decided to extend it in other regions as well as to considerably increase the resources allocated to these instruments in the coming years. To date, the NIF contributes €17.7 million to infrastructure and private sector projects, leveraging a total project volume of more than €14 billion (i.e. 1 euro of grant generates more than 30 euro of investment).

¹⁷ According to ICOMOD (Intercontinental Combined Traffic) study coordinated by UIC, the total container traffic potential between Europe and Asia is forecasted to reach 17.4 m TEU in 2020 and 22.7 m TEU in 2030 (from 10.7 m TEU in 2007). For 2030, a total rail potential of around 1 m TEU is forecasted out of which 75% is a shift from the sea.

still be the best option especially for time sensitive products or high value goods (e.g. automotive parts or computers).

Technical progresses are also triggering more opportunities such as the surge in containerization which can reduce considerably the physical barriers created by break of gauge in international rail network.

To be able to capitalize on this tremendous potential, several challenges remain however to be addressed. **First**, non-physical barriers should be eliminated as they are drastically curtailing infrastructure efficiency. **Second**, missing links should be completed and roads should be upgraded to a level that can guarantee seamless transport infrastructure networks. **Third**, the necessary transport and logistic services should be available and reliable in order to make optimum use of existing infrastructure. Railways should for instance have sufficient capacity to handle future increase in freight transport (e.g. rolling stock) which implies that they are sufficiently profitable or subsidized to make the necessary investments. Efficient logistics services should be provided. This implies the availability of trained professional in the sector. In this regard, the secretariat has assisted member countries by developing training programmes and training capacity for freight forwarders, multimodal transport operators and logistics services providers. **Fourth**, inland transport links should be satisfactorily marketed to shippers in order to create the necessary demand that would justify the continued provision of infrastructure. Several initiatives have been taken by ESCAP in that respect (e.g. the promotion of demonstration runs of container block trains or the organization of meetings of railway managers and shippers to increase the commercial attractiveness of rail).

Transport related challenges and opportunities in the SPECA countries

Developing countries in the SPECA countries, with the support of their development partners, have made substantial progress in the priority area of transport connectivity. Many sections of the Asian Highway network in SPECA participating countries and their neighbouring transit countries have been upgraded to higher class standards and some portion of missing links in the Trans-Asian Railway network have been constructed while others are at an advanced stage of planning. Progress has also been made to better integrate these networks at key intermodal facilities such as Inland Container Depots or dry ports.

Yet, bridging infrastructure gaps remains a complex and expensive medium to long-term challenge for SPECA countries and one that will continue to require a strong political commitment and the involvement of a range of multi-sectorial stakeholders in both the public and private sectors.

Based on the review of the progresses achieved and of the challenges and opportunities linked to future infrastructure development presented throughout this paper, the following recommendations may be considered:

- make the most of existing institutional frameworks promoting a coordinated approach to the development of transport and logistics in the region by, for instance, becoming parties to the three existing intergovernmental agreements developed under the aegis of ESCAP, i.e. Intergovernmental Agreement on the Asian Highway Network, Intergovernmental

Agreement on the Trans-Asian Railway Network and Intergovernmental Agreement on Dry Ports;

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- build sufficient internal capacity for the efficient evaluation, planning and implementation of transport infrastructure projects with a specific focus on those that will contribute to the development of an international integrated inter-modal transport and logistic system;
- explore the possibility to plan the joint and coordinated development and operationalization of international intermodal transport corridors;
- develop a conducive institutional and legal environment best able to facilitate (i) the emergence of an efficient logistics industry and (ii) participation of the private sector in the financing of infrastructure projects and provision of services;
- consider whether innovative financial mechanisms - such as the establishment of a regional investment facility - could assist in closing the funding gaps and attract more financing for the necessary investments;
- assess and share best regional practices in terms of infrastructure maintenance in order to capitalize on existing assets and reduce the financial burden caused by poor maintenance;
- support the development of new technologies smoothing the operationalization of transport infrastructure networks such as Intelligent Transport Systems (ITS);
- support commercial initiatives to promote the use of inland transport services for international trade as a competitive alternative to maritime transport.

The SPECA countries could be on the threshold of a new era of economic development if they accept to reform and coordinate their initiatives. In addressing the many challenges that they confront, they may be better served by looking at each other not as competitors for markets or foreign investment but as long-term partners whose economic growth and dynamism are essential to their own.