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Major issues in transport**Sustainable Development Goals and transport****Note by the secretariat***Summary*

The extensive enabling role of transport in achieving the Sustainable Development Goals means that the three pillars of sustainable development – namely economic, social and environmental – need to be integrated into the transport connectivity agenda in a balanced manner, through an integrated intermodal transport and logistics system that optimizes the comparative advantages of each mode of transport.

The present note reviews the role of transport in the achievement of the Sustainable Development Goals. It highlights the key drivers of a more sustainable transport sector. It presents the concept of the integrated intermodal transport and logistics system, with cases from countries that have implemented this concept in their transport development. It also suggests ways forward to achieve integrated intermodal transport and logistics systems for sustainable transport connectivity.

I. The roles of transport in achieving the Sustainable Development Goals

1. It is widely recognized that transport plays a critical role in economic and social development by providing access to economic and social opportunities. Transport facilitates the movement of people, goods, labour, resources, products and ideas across the region, creating market opportunities for both consumers and producers. It enables manufacturers to take advantage of locational strengths, allowing the expansion of supply chains across the globe.
2. At the same time, the transport sector is one of the top consumers of fossil fuels and generates a variety of emissions. Increasing levels of motorization has also resulted in an increase in traffic fatalities and injuries.
3. In September 2015, the United Nations summit for the adoption of the post-2015 development agenda adopted 17 Sustainable Development Goals, which came into effect on 1 January 2016. Table 1 shows the targets under some of the Goals that relate to transport and infrastructure to which the transport sector can make a direct and indirect contribution.

* E/ESCAP/MCT(3)/L.1.

Table 1
Contribution of the transport sector to the Sustainable Development Goals and targets

<i>Sustainable Development Goal</i>		<i>Direct contribution</i>	<i>Indirect contribution</i>
Goal 1.	End poverty in all its forms everywhere		1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than \$1.25 a day 1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions
Goal 2.	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
Goal 3.	Ensure healthy lives and promote well-being for all at all ages	3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
Goal 7.	Ensure access to affordable, reliable, sustainable and modern energy for all	7.3 By 2030, double the global rate of improvement in energy efficiency	
Goal 9.	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	

<i>Sustainable Development Goal</i>	<i>Direct contribution</i>	<i>Indirect contribution</i>
	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	
	9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States	
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	11.6 By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management
Goal 13. Take urgent action to combat climate change and its impacts		13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels		16.2 End abuse, exploitation, trafficking and all forms of violence against and torture of children
Goal 17. Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development	Overall	Overall

Source: General Assembly resolution 70/1. Also available from <https://sustainable.development.un.org/>.

II. Transport and the three pillars of sustainable development

4. Given the 2030 Agenda for Sustainable Development, the three pillars of sustainable development – economic, social and environmental – need to be integrated into transport policies, planning and operation. It is important to identify the ways in which these three pillars link to transport and how they are interlinked to make transport more sustainable.

A. Economic aspect

5. At the global level, in 2014, the World Trade Organization reported that the monetary value of world merchandise export trade had reached \$18.95 trillion.¹ Maritime transport is the backbone of the international trading system, moving approximately 80 per cent of world trade when measured in volume, and 70 per cent when measured in value. The rest is carried by rail, road and air transport.

6. At the local level, the transport network is crucial for access to markets, social services and information, particularly in rural and remote areas. The more efficient transport services are, the greater the potential for improving productivity and market efficiency.²

7. Studies have shown that rural access helps to create economic opportunities, generate employment and reduce poverty by connecting farmers to markets and producers to consumers. There seems to be strong evidence that poor persons benefit from rural road improvements. A study carried out by the International Food Policy Research Institute on linkages between government expenditure and poverty in rural India revealed that an investment of 10 million rupees in roads lifted 1,650 poor persons above the poverty line.³ Another study showed that government spending on rural infrastructure (roads, electricity and telecommunications) resulted in better opportunities for non-farm employment and higher rural wages, which had a significant impact on reducing poverty and inequality.⁴

8. Transport is also essential for the development of tourism. The World Travel and Tourism Council estimated that in 2013, tourism contributed

¹ World Trade Organization, “Modest trade recovery to continue in 2015 and 2016 following three years of weak expansion”, 14 April 2015. Available from www.wto.org/english/news_e/pres15_e/pr739_e.htm.

² Studies in China indicated that investment in improving low-standard roads generated 1.57 yuan of agricultural gross domestic product for every yuan invested, but generated more than 5 yuan of non-farm gross domestic product (Shenggen Fan and Connie Chan-Kang, “Returns to investment in less-favored areas in developing countries: a synthesis of evidence and implications for Africa”, *Food Policy*, vol. 29 (August 2004), pp. 431-444. Available from www.sciencedirect.com/science/article/pii/S0306919204000429).

³ Shenggen Fan, Peter Hazell and Sukhadeo Thorat, *Linkages between Government Spending, Growth, and Poverty in Rural India*, International Food Policy Research Institute Research Report, No. 110 (Washington, D.C., International Food Policy Research Institute, 1999). Available from <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/125916>.

⁴ Shenggen Fan, Linxiu Zhang and Xiaobo Zhang, *Growth, Inequality, and Poverty in Rural China: The Role of Public Investments*, International Food Policy Research Institute Research Report, No. 125 (Washington, D.C., International Food Policy Research Institute, 2002). Available from <http://ebrary.ifpri.org/cdm/compoundobject/collection/p15738coll2/id/87927/rec/3>.

2.2 trillion dollars to world gross domestic product and directly generated 100 million jobs worldwide.⁵

9. Jobs and incomes are crucial for economic development. The transport sector creates many employment opportunities. Eurostat estimated that the sector employed 8.7 million persons in the European Union in 2005.⁶ In the United States of America, 4.4 million persons are directly engaged in transportation and warehousing according to the Bureau of Labor Statistics of the United States Department of Labor.⁷ This does not take into account the millions of indirect jobs created through transport-related activities.

10. Rapid motorization has resulted in serious congestion, which has been estimated to cost Asian economies 2 to 5 per cent of gross domestic product every year through lost time and higher transport costs.⁸

B. Social aspect

11. Transport is considered to contribute to social development by enabling labour mobility and facilitating access to health care, educational opportunities and other social services. Mobility connects human beings, encourages exchanges and enriches cultural development. Transport connectivity is particularly important in delivering essential supplies and services to populations living in rural and remote communities. According to the World Bank Rural Access Index, over one billion (31 per cent) of the world's rural population (98 per cent of them in developing countries) do not have adequate access to road transport systems.⁹ In most low-income countries in the Economic and Social Commission for Asia and the Pacific (ESCAP) region, many rural households lack access to all-season roads: for example, only 39 per cent and 30 per cent of rural households are believed to have access in Bangladesh and Nepal respectively, while about 40 per cent of villages in India are cut off from market centres and the main road network in wet seasons.¹⁰

12. Traffic injuries and fatalities result in both economic and social losses to society. Road traffic injuries, in particular, are the main cause of death globally, and the leading cause of death in young people (15- to 29-year-olds). Globally, 90 per cent of road traffic deaths occur in low-and middle-income countries, yet those countries have just 54 per cent of the world's vehicles.

⁵ World Travel and Tourism Council, "Travel & tourism: economic impact – world" (London, 2014).

⁶ Eurostat, *Panorama of Transport*, 2009 ed. (Luxembourg, 2009). Available from <http://ec.europa.eu/eurostat/documents/3217494/5711595/KS-DA-09-001-EN.PDF/9c90d489-5009-4acc-9810-ae39612897d3?version=1.0>.

⁷ Bureau of Labor Statistics, "Employment by major industry sector", last updated 8 December 2013. Available from www.bls.gov/.

⁸ See www.adb.org/sectors/transport/key-priorities/urban-transport.

⁹ The World Bank has developed the Rural Access Index to focus on the critical role of access and mobility in the reduction of poverty in developing countries. The index estimates the proportion of the rural population that has adequate access to road transport systems. See www.worldbank.org/transport/transportresults/headline/rural-access/rai-updated-modelbasedscores5-20070305.pdf (accessed 10 February 2015).

¹⁰ The World Bank, "Safe, clean, and affordable: transport for development – the World Bank Group's transport business strategy for 2008-2012" (Washington, D.C., 2008). Available from <http://documents.worldbank.org/curated/en/440361468175472897/pdf/467920WP0B0x331usiness1Strategy1web.pdf>.

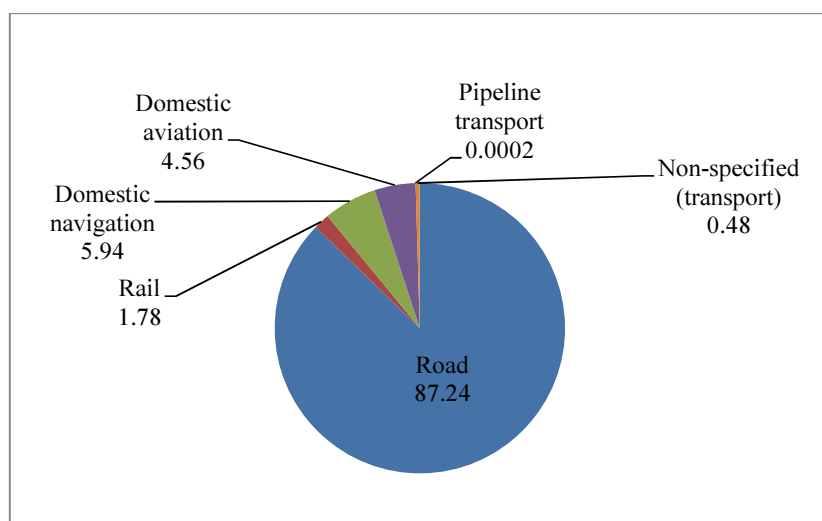
The findings from the *Global Status Report on Road Safety 2015* by the World Health Organization show that more than 733,000 people were killed on roads in the ESCAP region in 2013, more than half the worldwide total of 1.25 million road traffic deaths in that year.¹¹

C. Environmental aspect

13. According to the International Energy Agency, oil use is increasingly concentrated in just two sectors: transport and petrochemicals. This demand is set to keep oil use on an upward trend to 2035.¹² In 2013, the transport sector accounted for almost two thirds of global oil consumption and more than 27 per cent of total global energy consumption.¹³ The transport sector in the Asia-Pacific region consumed oil products amounting to more than 460 million tons of oil equivalent, of which 87.24 per cent were from road transport.¹⁴ The share of energy consumption by the road sector is expected to remain dominant (see figure I).¹⁵

Figure I

Consumption of oil products in the Asia-Pacific region by sector, 2013 (Percentage)



Source: Data from International Energy Agency, CO₂ emissions by product and flow, IEA CO₂ Emissions from Fuel Combustion Statistics database. Available from <http://dx.doi.org/10.1787/data-00430-en> (accessed on 14 March 2016).

14. Out of all sectors, the transport sector is the second largest producer of carbon dioxide emissions, accounting for almost a quarter of total global

¹¹ World Health Organizations, *Global Status Report on Road Safety 2015* (Geneva, 2015). Available from http://www.who.int/violence_injury_prevention/road_safety_status/2015/en/.

¹² International Energy Agency, "Executive summary: World Energy Outlook 2013" (Paris, 2013). Available from <http://www.iea.org/Textbase/npsum/WEO2013SUM.pdf>.

¹³ International Energy Agency, "Key world energy statistics 2015" (Paris, 2015).

¹⁴ ESCAP calculation, based on data from: International Energy Agency, World energy balances, IEA World Energy Statistics and Balances database; available from <http://dx.doi.org/10.1787/data-00512-en> (accessed on 14 March 2016).

¹⁵ International Energy Agency, *World Energy Outlook 2012* (Paris, 2012). Available from www.iea.org/publications/freepublications/publication/WEO2012_free.pdf.

carbon dioxide emissions in 2013.¹⁶ A total of 1,451 million tons of carbon dioxide was produced by the transport sector in the ESCAP region, of which 86.65 per cent was attributed to the road subsector.¹⁷ Six out of the ten countries that emit the most carbon dioxide were located in the ESCAP region.¹⁸ The transport sector also produces particulate matter, nitrogen oxides, sulphur oxide, ozone and volatile organic compounds, which cause damage not only to human health but also to ecosystems and buildings.¹⁹

III. Making transport more sustainable: fully benefiting from the comparative advantages

15. Every mode of transport has different comparative advantages and disadvantages. Each mode's comparative advantages and disadvantages have impacts on the three pillars of sustainable development. As a result, modal choice can contribute to sustainable development as well as to the achievement of transport-related Sustainable Development Goals. Key determining factors of modal choice include: in terms of the economic aspect, cost and speed, reliability and flexibility; in terms of the social aspect, access, congestion and safety; and in terms of the environmental aspect, energy intensity, carbon dioxide emission and air pollution.

16. **Cost and speed.** The costs of transporting freight by rail, inland waterways, short sea shipping or ocean shipping are generally lower. Transport time, punctuality and frequency are important factors considered by transport purchasers. Average delivery time and delivery time reliability are often listed as the most important transportation characteristics. However, the importance of transport time depends on the time cost of the freight that is being transported. Low-cost maritime and rail transport are ranked as the slowest of these transport modes, while high-cost air transport is the fastest.²⁰ Table 2 illustrates that for transport between China and the Netherlands, maritime transport is clearly the cheapest option measured by freight rate, but also has a long transit time. Air transport is the most expensive, and has much a shorter transit time. Rail transport lies between these extremes for both cost and transit time.

¹⁶ International Energy Agency, “*CO₂ Emissions from Fuel Combustion: Highlights – 2015 Edition*” (Paris, 2015). Available from <http://www.iea.org/publications/freepublications/>.

¹⁷ ESCAP calculation, based on data from: International Energy Agency, CO₂ emissions by product and flow, IEA CO₂ Emissions from Fuel Combustion Statistics database; available from <http://dx.doi.org/10.1787/data-00430-en> (accessed on 14 March 2016).

¹⁸ The six countries are China, India, the Islamic Republic of Iran, Japan, the Republic of Korea and the Russian Federation. Data from International Energy Agency, “*CO₂ Emissions from Fuel Combustion: Highlights – 2015 Edition*” (Paris, 2015). Available from www.iea.org/publications/freepublications/publication/CO2EmissionsFromFuelCombustionHighlights2015.pdf.

¹⁹ European Commission, “Handbook on estimation of external costs in the transport sector: internalisation measures and policies for all external cost of transport (IMPACT) – version 1.1” (Delft, 2008). Available from http://ec.europa.eu/transport/sites/transport/files/themes/sustainable/doc/2008_costs_handbook.pdf.

²⁰ Thor-Erik Sandberg Hanssen, Terje Andreas Mathisen, Finn Jørgensen, “Generalized transport costs in intermodal freight transport”, *Procedia – Social and Behavioral Sciences*, vol. 54: “Proceedings of the 15th meeting of the EURO Working Group on Transportation” (October 2012). Available from www.sciencedirect.com/science/article/pii/S1877042812042000.

Table 2
**Comparison of transport modes for a route between China and Europe
 (using the example of door-to-door transport of notebooks from central
 China to the Netherlands)**

	<i>Ocean</i>	<i>Rail (block train)</i>	<i>Sea-air</i>	<i>Air</i>
Time taken (days)	38	22	24	4
Price per notebook (United States dollars)	1.9	3.8	9	18

Source: DB Schenker, “Get your business rolling with innovative rail logistics solutions between China and Europe”. Presentation available from www.dbschenker.ch/file/log-ch-de/8643028/uiW_S_qnj5O_wipZV5SBw-V6dvw/8643030/data/China_Train.pdf.

17. **Flexibility.** The main advantage of road transport is the low level of physical limitation. Road transport has operational flexibility, which means that it can be a crucial link in freight distribution for supplying door-to-door service. Rail and maritime transport are less competitive in terms of flexibility. Rail transport operates on fixed track facilities and schedule. It lacks flexibility as compared to road transport. It can only provide station-to-station service and is often slow. Maritime transport has similar constraints.

18. **Reliability.** Reliability of transit time is one of the most important variables influencing freight transport, according to shippers’ surveys.²¹ Large variability in travel time has several important economic effects. Unlike rail transport, which operates on fixed tracks and schedule, road transport often has multiple alternative routes. Because of this flexibility, the time-reliability of road transport is high, as when there is a delay, whether due to vehicle failure or congestion on selected route, a replacement vehicle or alternative route can be used. However, one of the critical issues involved in the reliability of road transport is the importance of securing shorter and predictable border-crossing times and limiting the resources spent on customs formalities. Maritime transport is also considered to have a high degree of reliability.²² Delays in maritime transport are often at port.

19. **Access.** Lack of access is a major constraint to the reduction of poverty. Several studies have shown the impact of lack of access to transport on health, education, employment and economic activities. In comparing modes of transport in terms of access, road networks have been found to be the most expansive and complex compared to other modes of transport. They reach out to most areas and have the largest geographic coverage. Rail transport operates on fixed tracks, meaning that physical access to its facilities is limited. However, its low cost makes it the preferred choice of the low-income group, especially for rural-urban connections. The cost of transport services discussed earlier has also been cited as an important

²¹ Ruth Banomyong, “International freight transport choices for Lao PDR: the dilemma of a less developed and land-locked country”, *Proceedings of the 9th World Conference on Transport Research* (Amsterdam, Elsevier, 2003), CD-ROM.

²² United States Chamber of Commerce, “Land transport options between Europe and Asia: commercial feasibility study”, July 2006. Available from www.osce.org/eea/41310?download=true.

dimension of accessibility,²³ as it has been documented as a factor in transport-related social exclusion.²⁴ Maritime transport is less accessible than rail transport. Moreover, it is the only means of international access for island countries. Air transport is sometimes the only means of transport to and from very remote areas, and promotes social inclusion by connecting those living in such communities with the rest of their country. The air transport network facilitates the delivery of emergency and humanitarian aid relief anywhere in the world, and ensures the swift delivery of medical supplies and organs for transplantation.²⁵ However, its high cost limits accessibility to only certain income groups or emergency cases. Inland waterways are also an important transport resource for people living in delta areas and those living along rivers, canals or lakes.

20. **Traffic injuries and casualties.** Casualties and injuries from crashes are probably the most commonly cited form of transport-related social impact. No mode of transport is completely safe, but the road remains the most dangerous, accounting for 90 per cent of all transport crashes on average.²⁶

21. **Congestion.** Congestion increases travel time and cost for both passengers and goods, worsens the reliability of delivery services, reduces productivity and competitiveness, inefficiently exploits energy resources and generates additional pollution which is harmful to health and the environment. Similarly to traffic injuries and fatalities, road transport is the mode of transport that generates the most congestion. For maritime shipping, delays are often at port. According to Containerisation International, congestion at key Asian ports is the worst that it has been over the last 20 years and the situation looks set to continue. Air transport corridors have also shown congestion in the region, which sometimes causes hours of delay.

22. **Energy consumption.** Out of all sectors, the transport sector is one of the largest consumers of energy. Road transport accounts for the majority of oil use. In terms of energy intensity, based on Environmental Statistics 2012 of the Ministry of the Environment of Japan,²⁷ the level of energy consumption intensity of rail is the lowest for both passenger and freight transport, and maritime transport is the second most efficient in Japan. Air and road transport are among the least energy efficient modes. Supported by various studies and statistics, rail is one of the leading modes of transport in terms of energy efficiency.

²³ Karst T. Geurs, Wouter Boon and Bert Van Wee, "Social impacts of transport: literature review and the state of the practice of transport appraisal in the Netherlands and the United Kingdom", *Transport Reviews*, vol. 29, No. 1 (January 2009), pp. 69-90. Available from www.tandfonline.com/doi/full/10.1080/01441640802130490.

²⁴ Social Exclusion Unit, Office of the Deputy Prime Minister, United Kingdom, "Making the connections: final report on transport and social exclusion", February 2003. Available from www.ilo.org/wcmsp5/groups/public/@ed_emp/@emp_policy/@invest/documents/publication/wcms_asist_8210.pdf.

²⁵ Air Transport Action Group, "The economic and social benefits of air transport" (Geneva, 2008). Available from www.icao.int/Meetings/wrdss2011/Documents/JointWorkshop2005/ATAG_SocialBenefitsAirTransport.pdf.

²⁶ Jean-Paul Rodrigue, Claude Comtois and Brian Slack, *The Geography of Transport Systems*, 3rd ed. (Oxford and New York, Routledge, 2013). Available at <https://people.hofstra.edu/geotrans/eng/ch7en/conc7en/ch7c2en.html>.

²⁷ See www.env.go.jp/en/statistics/contents/index_e.html#onshitukoukagasu.

23. **Carbon dioxide emission.** Within the transport sector, road transport is driving the growth of transport emissions. Based on a compilation by the Natural Resources Defense Council of the United States of America, table 3 presents carbon dioxide emissions factors for each transport mode. Maritime transport is the most environmentally sound mode of transport, followed by rail transport. Similarly, estimates by the European Environment Agency show that both passenger and freight transport by road emit the highest level of carbon dioxide per ton-kilometre compared to maritime transport and freight train, which are more environmentally friendly.²⁸

Table 3

Carbon dioxide emissions, by mode of transport
(Grams per ton-mile)

	<i>Truck</i>	<i>Rail</i>	<i>Ship</i>	<i>Air</i>
Emission	119	40	11	1 193

Source: Natural Resources Defense Council, “Case study: the emissions of one container” (www.nrdc.org/).

24. **Air pollution.** Transport-related air pollutants, such as particulate matter, nitrogen oxides, sulphur oxide, ozone and volatile organic compounds, cause damage not only to human health but also to ecosystems as well as buildings and materials.²⁹ Table 4 presents important emissions factors for each transport mode, compiled by the Natural Resources Defense Council of the United States of America. Air transport is by far the least environmentally sound mode of transport in terms of air pollution.

Table 4

Air pollution emissions, by mode of transport
(Milligrams per ton-mile)

	<i>Truck</i>	<i>Rail</i>	<i>Ship</i>	<i>Air</i>
Nitrogen oxides	318	367	158	3 944
Particulate matter (PM ₁₀)	92	13	25	119





Source: Natural Resources Defense Council, “Case study: the emissions of one container” (www.nrdc.org/).

25. As discussed above, each mode of transport has its comparative advantages and disadvantages, which are summarized in figure II. With these different characteristics, strengths and weaknesses, each mode can be better utilized for different types of transport operations.

²⁸ See www.eea.europa.eu/data-and-maps/figures/specific-co2-emissions-per-tonne-2.

²⁹ European Commission, “Handbook on estimation of external costs in the transport sector: internalisation measures and policies for all external cost of transport (IMPACT) – version 1.1” (Delft, 2008). Available from http://ec.europa.eu/transport/themes/sustainable/doc/2008_costs_handbook.pdf.

Figure II
Comparative advantages and disadvantages of modes of transport

	<i>Cost</i>	<i>Speed</i>	<i>Reliability</i>	<i>Flexibility</i>	<i>Access</i>	<i>Congestion</i>	<i>Accident</i>	<i>Energy intensity</i>	<i>Carbon dioxide emission</i>	<i>Air pollution</i>
	Moderate	Moderate	Very good	High	High	High	High	High	High	High
	Low	Moderate	Good	Low	Medium	Minimal	Low	Low	Low	Electric: Lowest Diesel: High
	Low	Slow	Good	Low	Low	Minimal	Low	Low	Low	Low
	High	Very high	Very good	Medium	Low	Minimal	Low	High	High	Low

26. These characteristics directly involve the three pillars of sustainable development and relate to the achievement of the Sustainable Development Goals. Cost, speed, reliability, access and flexibility contribute to the economic pillar and relate to the achievement of Goals 1, 2 and 9 in supporting economic development and human well-being, providing affordable access to all and reducing poverty. These characteristics, together with safety, energy intensity, carbon dioxide emission and air pollution factors, relate to the achievement of Goals 3, 7 and 11. Investment in the resilience of transport infrastructure and the facilitation of cross-border transport can also enhance the achievement of Goals 13 and 16.

IV. Integrated intermodal transport and logistics system

27. Balanced integration of the three pillars of sustainable development – namely economic, social and environmental – in the transport sector can be achieved through an integrated intermodal transport and logistics system that optimizes the comparative advantages of each mode of transport.

28. The Ministerial Conference on Infrastructure in 2001 requested the secretariat to give priority attention to the formulation, development and improvement of integrated intermodal international transport. This request was further articulated as the long-term regional vision of an international integrated intermodal transport and logistics system in the Busan Declaration on Transport Development in Asia and the Pacific in 2006. It was reaffirmed by the Ministerial Declaration on Transport Development in Asia and the Pacific in 2012.

29. The concept has also been widely recognized in other regions. The European Union's first sustainable development strategy, launched at the 2001 Gothenburg Summit, reinforced the need to limit the growth of road transport and called for a modal shift towards rail or waterborne transport. Throughout the first decade of the twenty-first century, other policy documents – including the 2006 midterm review of the European Commission's 2001 White Paper on transport, the European Union's 2007 Freight Transport Agenda or the European Commission's 2009 Communication on the future of transport – advocated intermodal transport as a means of curbing the

unsustainable growth of the transport sector, largely driven by road transport, without jeopardizing the economic, social and sustainable development of the European Union.³⁰

30. In its resolution 70/197 of 22 December 2015, entitled “Towards comprehensive cooperation among all modes of transport for promoting sustainable multimodal transit corridors”, the General Assembly recognizes the important role of environmentally sound, safe, efficient, reliable and affordable multimodal transport and transit corridors for the efficient movement of goods and people in supporting sustainable economic growth, improving the social welfare of people and enhancing international cooperation and trade among countries, and emphasizes the need to harmonize and improve transport and border-crossing infrastructure and facilities and services along the international transport and transit corridors. It also highlights the role of international roads and railways, intermodal logistics centres and dry ports, global logistics and supply chains, integrated transport modes, appropriate technologies and the maintenance and upgrading of infrastructure in promoting seamless international transit transport, and underlines the importance of cooperation among all modes of transport to create and maintain sustainable supply chains, especially in developing countries.

31. The integrated intermodal transport and logistics system is a transport system that optimizes the transportation of goods and passengers; minimizes consumption of energy, land and other resources; generates low emissions of greenhouse gases, ozone-depleting substances and other pollutants; and minimizes the adverse social impacts arising from transport operations. The system uses an intermodal/multimodal network of well-balanced, well-designed, well-built, well-maintained and interconnected highways, railways, inland waterways, seaports, river ports, airports or dry ports in order to:

(a) At the city level, provide safe, efficient, reliable, frequent, affordable and integrated public and private, motorized and non-motorized transport systems offering rapid transport times and access to all groups, including poor persons, women, children and persons with disabilities;

(b) At the national level, provide access to and between rural areas and deeper hinterlands, well served by safe, efficient, reliable, frequent, affordable and integrated intercity transport;

(c) At the regional and international levels, with capacities appropriate to traffic volumes, allow the safe, efficient and smooth flow of people, goods and transport means between and among countries of the region and across the borders of its subregions with an efficient and user-friendly transport facilitation regime, and allow unhindered and safe movement of people, goods and transport means with other regions.

V. Realizing the integrated intermodal transport and logistics system

32. In order to achieve such a system, the balanced development of the different transport modes must be complemented by the following key aspects.

³⁰ Vasco Reis, “Analysis of mode choice variables in short-distance intermodal freight transport using an agent-based model”, *Transportation Research Part A: Policy and Practice*, vol. 61 (March 2014), pp. 100-120. Available from www.sciencedirect.com/science/article/pii/S0965856414000032.

33. **Interconnected infrastructure.** The most basic and essential component of integration is physical integration. In order to make modal interchange possible, road, railway, seaport and airport systems must be interconnected. Interconnected infrastructure also includes the provision of physical infrastructure that allows and facilitates modal interchange. Such facilities may include intermodal terminals or dry ports for freight transport and transfer points or stations, transit shelters and park-and-ride facilities for passenger transport.

34. **Utilization of two or more modes of transport.** The system must draw on the comparative advantages of different modes of transport to encourage a shift to more environmentally friendly modes, especially from road transport. Rail transport has considerable potential in this region, and a number of the region's countries, including China, India and the Russian Federation, have extensive railway networks. Improving physical rail infrastructure and the operational efficiency of rail services and introducing competitive pricing are major policy measures that can influence a modal shift towards increased use of rail.³¹ In terms of passenger transport, non-motorized transport such as cycling and walking are considered the most environmentally friendly mode as they consume no fossil fuels and cause no emissions. Clearly, there is a need to improve public transport as well as infrastructure for non-motorized transport in order to encourage passengers to give up private vehicles and use public transport.

35. **Efficient operations at modal interchange points with minimum cost and time involved.** Modal change can happen only if it fulfils shippers' logistical needs and fits into their logistical chain requirements. The modal choice of individual shippers is largely determined by three factors: transport cost, transport quality (including safety, security, speed, frequency, reliability and accessibility) and habits.³¹ Cost and time spent at modal change points should therefore be kept at a minimum and must not exceed the savings gained from shifting modes, otherwise there would be no economic incentive for transport operators to use intermodal transport. Along with the integration of physical transport infrastructure, there is the need to formalize arrangements with regard to the operation and facilitation of modal interchange. At the national level, the availability of professional capacity must be ensured in terms of human resources that will support efficient land (road-rail) and land-sea intermodal transport and logistics.

36. **Facilitated border crossing for international freight transport.** At the regional level, the need to promote a harmonized legal regime for cross-border and transit transport across the region is important. Regional common facilitation frameworks as well as simplification and harmonization of transport documentation along all routes and across the region will yield immediate benefits in terms of efficiency in time, cost and reliability. There is a need for a uniform legal framework for an integrated intermodal transport and logistics system across the region. At the regional and international levels, there is no legal framework regime in force that specifically addresses the nature of an integrated intermodal transport and logistics system.

37. **Use of new technology to enhance capacity and operations.** There is an inherent complexity to integrated intermodal transport and logistics systems, since they are multifaceted in nature and involve multiple operators from various transport modes. Lack of information connectivity among these multiple operators can pose a potential obstacle to a smooth and transparent supply chain. Transport and logistics operators in the integrated intermodal

³¹ See E/ESCAP/MCT.2/7.

transport system will require full and real-time visibility of data as well as effective and efficient information connectivity. In the context of passenger transport, intelligent transport systems such as multimodal travel information and smart ticketing can be promoted and deployed to improve efficiency and encourage modal shift.

VI. Integration of the Sustainable Development Goals into the regional action programme for sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021)

38. The key to making the transport sector more sustainable is to encourage both passenger and freight transport to shift to more sustainable modes of transport. The draft regional action programme for sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021), outlines key milestones in realizing the vision of an integrated intermodal transport and logistics system. The key thematic areas include:

- (a) Regional transport infrastructure connectivity;
- (b) Regional transport operational connectivity;
- (c) Euro-Asian transport connectivity;
- (d) Transport connectivity for least developed countries, landlocked developing countries and small island developing States;
- (e) Sustainable urban transport;
- (f) Rural connectivity to wider networks;
- (g) Improving road safety.

39. Each thematic area contributes to the achievement of the Sustainable Development Goals and their targets. Table 5 shows the direct contribution of the thematic areas to the Sustainable Development Goals and their targets. In addition to the table, the implementation of the regional action programme for sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021), will also contribute indirectly to other targets listed in table 1, such as targets 1.1, 1.2, 2.3, 3.9, 11.6, 13.1 and 16.2.

40. Goal 17 – to strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development – is also imbedded in the implementation of the regional action programme for sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021).

Table 5

Contribution of the regional action programme for sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021), to the Sustainable Development Goals and targets

<i>Sustainable Development Goal</i>	<i>Targets with direct contribution from the transport sector</i>	<i>Contribution of the regional action programme on sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021)</i>
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture	2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	<p>Regional transport infrastructure connectivity</p> <ul style="list-style-type: none"> > Further development and utilization of the Asian Highway network, the Trans-Asian Railway network and the network of dry ports to enhance connectivity in rural areas. > Full utilization of inland dry ports as logistics centres for collection and distribution of rural production materials and products. > Inclusion of more road routes and railway lines in remote rural areas in the Asian Highway network and Trans-Asian Railway network and more inland dry ports in the regional dry port network. <p>Regional transport operational connectivity</p> <ul style="list-style-type: none"> > Promotion of border special zones in remote rural areas to attract investment. > Reduction of waste of agricultural products (better quality and higher efficiency of cross-border transport). <p>Urban and rural transport and road safety</p> <ul style="list-style-type: none"> > Examination and promotion of the role of the Asian Highway network, Trans-Asian Railway network and the network of dry Ports in poverty alleviation and rural development. > Formalization of further extension and expansion of the Asian Highway network, the Trans-Asian Railway network and the network of dry ports to include more road routes and railway lines in remote rural areas. > Rural transport development models.

<i>Sustainable Development Goal</i>	<i>Targets with direct contribution from the transport sector</i>	<i>Contribution of the regional action programme on sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021)</i>
Goal 3. Ensure healthy lives and promote well-being for all at all ages	3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents	<p>Regional transport infrastructure connectivity</p> <ul style="list-style-type: none"> > Regional standards on road safety facilities along the Asian Highway network. > Intelligent transport systems on the Asian Highway network. > Design and construction standards for the Asian Highway network. <p>Regional transport operational connectivity</p> <ul style="list-style-type: none"> > Safety of cross-border road transport along the Asian Highway network, including mutual assistance in road accidents and an emergency call system in transport facilitation tools. <p>Urban and rural transport and road safety</p> <ul style="list-style-type: none"> > Updating and monitoring of regional goals, targets and indicators on road safety. > Regional standards and handbooks on road safety. > Regional intelligent transport system models for road safety.
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all	7.3 By 2030, double the global rate of improvement in energy efficiency	<p>Regional transport infrastructure connectivity</p> <ul style="list-style-type: none"> > Promotion of a more energy-efficient Trans-Asian Railway network and its related intermodal transport. > Promotion of dry ports as an efficient intermodal interchange. > Promotion of intelligent transport systems along the Asian Highway network and the Trans-Asian Railway network for energy efficiency. > Promotion of intermodal transport corridors incorporating economic, social and environmental dimensions. <p>Regional transport operational connectivity</p> <ul style="list-style-type: none"> > Promotion of the operationalization of a more energy-efficient Trans-Asian Railway network and its related intermodal transport. > Promotion of the operationalization of dry ports as an efficient intermodal interchange.

<i>Sustainable Development Goal</i>	<i>Targets with direct contribution from the transport sector</i>	<i>Contribution of the regional action programme on sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021)</i>
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	<ul style="list-style-type: none"> > Promotion of intelligent transport systems in cross-border transport along the Asian Highway network and the Trans-Asian Railway network for energy saving. > Facilitation, logistics and maritime sections of intermodal transport corridors incorporating economic, social and environmental dimensions. <p>Urban and rural transport and road safety</p> <ul style="list-style-type: none"> > Promotion of more energy-efficient urban public transport and related intermodal transport. > Promotion of the deployment of urban intelligent transport systems.
	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities	<p>Regional transport infrastructure connectivity</p> <ul style="list-style-type: none"> > Further development of a resilient Asian Highway network, Trans-Asian Railway network and network of dry ports. > Promotion of more energy-efficient public transport infrastructure and related intermodal facilities. > Promotion of dry ports as an efficient intermodal interchange. > Infrastructure part of integrated intermodal transport corridors. <p>Regional transport operational connectivity</p> <ul style="list-style-type: none"> > Operational support to further develop a resilient Asian Highway network, Trans-Asian Railway network and network of dry ports. > Promotion of the operationalization of more energy-efficient Trans-Asian Railway network and related intermodal transport. > Promotion of the operationalization of dry ports as an efficient intermodal interchange. > Institutional part of integrated intermodal transport corridors. > Assistance to landlocked developing countries and small island developing States.

<i>Sustainable Development Goal</i>	<i>Targets with direct contribution from the transport sector</i>	<i>Contribution of the regional action programme on sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021)</i>
	9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States	<p>Urban and rural transport and road safety</p> <ul style="list-style-type: none"> > Promotion of urban integrated intermodal transport infrastructure connections. > Promotion of more energy-efficient public transport infrastructure and related intermodal facilities. > Assistance to least developed countries.
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable	11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons	<p>Regional transport infrastructure connectivity</p> <ul style="list-style-type: none"> > Regional standards on road safety facilities along the Asian Highway network. > Intelligent transport systems on the Asian Highway network. > Design and construction standards of the Asian Highway network. <p>Regional transport operational connectivity</p> <ul style="list-style-type: none"> > Safety of cross-border road transport along the Asian Highway network, including mutual assistance in road accidents and an emergency call system in transport facilitation tools. <p>Urban and rural transport and road safety</p> <ul style="list-style-type: none"> > Updating and monitoring of regional goals, targets and indicators on road safety. > Regional standards and handbooks on road safety. > Regional intelligent transport system models for road safety. > Promotion of the deployment of intelligent transport systems. > Development of urban sustainable transport indicators and monitoring of progress.

<i>Sustainable Development Goal</i>	<i>Targets with direct contribution from the transport sector</i>	<i>Contribution of the regional action programme on sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021)</i>
		<ul style="list-style-type: none">> Promotion of integrated intermodal transport to make urban transport safe, affordable, accessible, sustainable and socially inclusive.> Assistance in enhancing sustainable links between urban, peri-urban and rural areas based on the Asian Highway network, the Trans-Asian Railway network and the network of dry ports.

VII. Issues for consideration

41. Attainment of the Sustainable Development Goals will be accelerated through timely policy direction at the ministerial level in moving towards the realization of an integrated intermodal transport and logistics system in the region. The Ministerial Conference may wish to comment on the views expressed in the present note and provide further guidance on elements of the draft regional action programme on sustainable transport connectivity in Asia and the Pacific, phase I (2017-2021), that could be implemented over the coming period to promote sustainable transport connectivity in the region and to achieve the Sustainable Development Goals.
