Towards environmentally sustainable transport systems and services

Note by the secretariat

Summary

The rise in international and domestic trade in Asia and the Pacific, together with gradual yet significant population growth, especially in urban areas, has resulted in a surge in derived demand for passenger mobility and freight transport services. The increase in the intensity of transport activities, especially road transport, continues to position the transport sector as a leading emitter of greenhouse gases and pollution and as a major consumer of fossil fuels, reversing progress towards the implementation of the 2030 Agenda for Sustainable Development.

The present document provides a review of challenges in the transport sector and serves to highlight the need to accelerate low carbon transport actions in the region to achieve the Sustainable Development Goals, in particular Goals 7, 9, 11, 13 and 14. It also provides a discussion of measures and interventions that can drive the region’s transition towards low carbon transport communities, focusing on decarbonizing the regional supply chain and low carbon mobility. It further provides an exploration of lessons learned from the impacts of the coronavirus disease (COVID-19) pandemic and highlights the usage of advanced technology to support progress towards environmentally sustainable mobility.

The Fourth Ministerial Conference on Transport may wish to consider the policy directions, actions and activities described in the present document in light of the regional action programme for sustainable transport development in Asia and the Pacific (2022–2026), notably its thematic areas of urban transport, low carbon mobility and digitalization of transport. The Ministerial Conference may also wish to share updates and selected highlights with regard to national, bilateral and multilateral policies and initiatives related to environmentally sustainable transport systems and services.
I. Introduction

1. The Asia-Pacific region has seen a rapid increase in demand for both passenger and freight transport. The rise in international and domestic trade, together with the region’s gradual yet significant population growth, especially in urban areas, has resulted in a surge in derived demand for passenger mobility and transport services. According to *ITF Transport Outlook 2021*, published by the Organisation for Economic Co-operation and Development (OECD), global demand for passenger transport in 2050 is expected to have increased 2.3-fold, and freight transport will grow 2.6-fold compared to 2015.

2. The increase in the intensity of transport activities, especially road transport, continues to position the transport sector as a leading emitter of greenhouse gases and pollution and as a major consumer of fossil fuels. According to the International Energy Agency database, road freight transport continues to rely mostly on fossil fuel, with diesel accounting for 90 per cent of energy consumed and gasoline accounting for 10 per cent, and no notable changes were observed in the consumption pattern between 2000 and 2018. Furthermore, most countries across Asia, and notably their densely populated cities, suffer from severe air pollution in the form of particulate matter, which adversely affects the health and well-being of all populations, including women and children.

3. However, the world saw that trend reversed with the sharp decline in transport activities in 2020 and 2021. Among the hardest-hit sectors by the coronavirus disease (COVID-19) pandemic, the transport sector accounted for the largest share of the unprecedented drop in carbon dioxide and other emissions in 2020 due to the lockdowns. While the decline in emissions did not reflect structural changes and, thus, was likely to be temporary, it provided some lessons learned.

4. The present document provides an exploration of the rise in transport demand, the status of energy consumption, emissions and air pollution from the transport sector and the impacts of the COVID-19 pandemic and its environmental externalities. It also contains a discussion of measures and interventions in focus areas that can contribute towards preventing transport sector emissions from rebounding to their pre-COVID-19 levels and that can drive the region’s transition towards low carbon transport communities.

II. Asia-Pacific region: status and challenges

A. Rising transport demand

5. The Economic and Social Commission for Asia and the Pacific (ESCAP), in its *Review of Sustainable Transport Connectivity in Asia and the Pacific 2019: Addressing the Challenges of Freight Transport*, indicated that among all the factors directly influencing the capacity of Asia and the Pacific to implement the 2030 Agenda for Sustainable Development, freight transport stands out as a continuous challenge and a tremendous opportunity for the transition to economic, social and environmental sustainability. Owing to economic development and population growth, the region is expected to face substantial increases in trade shares and, thus, freight volumes. Estimates from *ITF Transport Outlook 2017* suggested that in Asia, ton-kilometres from

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1 Corinne Le Quéré and others, “Temporary reduction in daily global CO2 emissions during the COVID-19 forced confinement”, *Nature Climate Change*, vol. 10, No. 7 (July 2020).
surface freight alone would increase by 261 per cent between 2015 to 2050 and account for more than two thirds of surface freight globally.

6. As explained in the ESCAP publication, transport and mobility already consumed a major part of the region’s natural resources, and the demand, compounded by the emergence and continued development of geographically dispersed supply chains, was continually on the brink of exceeding capacity. From an infrastructure perspective alone, ESCAP estimated that the Asia-Pacific region required a total investment of $126 billion to upgrade the regional transport systems and construct missing links in the identified rail, road and intermodal networks.

7. Furthermore, population growth has surged. The Asian continent comprises 60 per cent of the world population, but only 30 per cent of the world’s landmass. The number of people in Asia is projected to continue to rise to reach an estimated 5.3 billion in 2050. Table 1 contains data on passenger transport activity in selected Asian countries since 2010. The number of passenger kilometres travelled in India and China are higher owing to the size of their populations. India experienced the fastest growth in passenger transport activity by far, at a rate of 122 per cent since 2010. Japan had the slowest growth rate of the group, at 11 per cent.

Table 1
Passenger transport activity in selected Asian countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Passenger transport activity (millions of passenger kilometres)</th>
<th>Increase compared to 2010 (percentage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>3 534 920</td>
<td>27</td>
</tr>
<tr>
<td>India</td>
<td>20 879 333</td>
<td>122</td>
</tr>
<tr>
<td>Indonesia</td>
<td>114 202</td>
<td>43</td>
</tr>
<tr>
<td>Japan</td>
<td>611 250</td>
<td>11</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>635 000</td>
<td>32</td>
</tr>
</tbody>
</table>


Note: Passenger transport data are for 2019 apart from India (2017) and Indonesia and Japan (2018).

8. Most of the population growth will take place in urban areas. The Asia-Pacific region has been witnessing rapid urbanization. In 2019, the United Nations demographers estimated that the regional population became majority urban for the first time, with more than 2.3 billion people living in cities. These urban populations are expected to grow to nearly 3.5 billion by 2050. With the economic boom in Asia, increased personal income has enabled citizens to buy private cars or motorcycles to meet their mobility needs. Owing to the pattern

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of urbanization and motorization in Asia, demand for passenger transport is expected to double between 2015 and 2050.⁴

9. While the growth in trade, populations and urbanization are sources of global economic growth, the derived demand for transport has also exacerbated congestion, pollution and greenhouse gas emissions. The following section contains a discussion of the energy consumption, emissions and air pollution of the transport sector.

B. Energy consumption, emissions and air pollution of the transport sector

1. Energy consumption

10. The Asia-Pacific region has witnessed sustained economic growth and rapid urbanization. With rising disposable incomes, demand for both freight and passenger transport has been growing, which has contributed to increased energy demand. The transport sector, which is primarily powered by fossil fuels, was responsible for 52 per cent of total oil consumption in 2018 (see figure I), up from approximately 40 per cent in 1990.

Figure I
Final consumption of oil products in the Asia-Pacific region by sector, 2018 (Percentage)

![Energy Consumption Pie Chart]


11. Within the region’s transport sector, freight and logistics account for a significant portion of total energy use, upward of 40 per cent in many countries. Freight movements accounted for 39 per cent of total global transport energy consumption in 2012, of which road freight trucks made up the largest share, namely 23 per cent.  

2. Emissions and pollution

12. The rapid pace of urbanization and motorization is also driving transport sector energy demand, placing a considerable strain on urban transport infrastructure, which has been unable to keep up with the increase in the number of vehicles in some cases. Traffic congestion is now a daily occurrence in many cities in Asia and the Pacific. Eight of the top 10 highly congested cities in the world are in Asia: Moscow; Mumbai, India; Manila; Istanbul, Turkey; Bengaluru, India; New Delhi; Novossibirsk, Russian Federation; and Bangkok, and they had the highest levels of traffic congestion in 2020, although a huge drop in congestion levels was observed compared to 2019. At the same time, a high motorization rate also resulted in more road crashes, higher vehicle emissions and noise pollution, and deteriorating air quality in many cities in the region.

13. Globally, the transport sector is responsible for approximately 24 per cent of direct carbon dioxide emissions from fuel combustion, with road transport responsible for the bulk of the emissions. At the same time, transport sector emissions are expected to rise at a faster rate than in other sectors, which undermines efforts aimed at reducing overall emissions in line with climate goals. According to ITF Transport Outlook 2021, current policies will cause carbon emissions to increase 16 per cent by 2050; however, ambitious decarbonization policies could reduce carbon emissions by almost 70 per cent. The transport sector in the Asia-Pacific region was responsible for approximately 13 per cent of carbon dioxide emissions in 2018 (see figure II).

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Figure II
Percentage of carbon dioxide emissions from fuel combustion in the Asia-Pacific region by sector, 2018


14. Cities produce more than 70 per cent of greenhouse gas emissions and pollution.\(^8\) An analysis of available data on 20 cities in the region using the sustainable urban transport index, a mobility assessment tool developed by ESCAP to assess the sustainability of urban transport systems, found that the annual mean value of coarse particulate matter (PM10) exceeded the ceiling set by the World Health Organization (WHO) in its guidelines. Transport emissions are a public health concern, as they contribute to deteriorating air quality, respiratory ailments and premature deaths. International Council on Clean Transportation research indicates that despite the adoption of more stringent vehicle regulations in many countries, the transportation sector remained a major contributor to the global burden of morbidity and mortality related to air pollution.\(^9\)

15. Transport policymakers have had to find solutions that address the increasing demand for freight and mobility while simultaneously reducing the carbon footprint of the transport sector. Efforts are currently under way to reduce transport sector emissions by setting stricter vehicle emissions standards, reducing demand for transport, reinforcing better fuel economy standards and increasing the uptake of cleaner fuels. With regard to urban mobility, efforts thus far have included inducing a modal shift from private motor vehicles to public transport systems, promoting active and

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non-motorized transport and improving the fuel economy of motor vehicles. While improvements in vehicle technology have resulted in efficiency gains, these gains have often been offset by rising transport demand and increased vehicle miles travelled. Public transport, which is central to sustainable transport strategies, has seen a decline in users as a result of the reduced demand and the shift to private and non-motorized transport due to the pandemic.

C. Coronavirus disease and its environmental externalities

16. The COVID-19 pandemic has transformed daily life and changed the way people work, study, shop and travel, and its impact will be felt for a long time to come. As of 17 August 2021, more than 4 million deaths had been recorded globally as a result of the pandemic. With rising infections and the emergence of new variants, morbidity and mortality will continue to rise until a significant proportion of the global population is vaccinated. The transport sector has been hit hard, as governments around the globe closed borders and enforced lockdowns, quarantines and social distancing measures to reduce the spread of COVID-19, resulting in reduced movement of people and a decline in economic activity.

17. Nevertheless, lockdowns that were initiated across the globe in 2020 in response to the pandemic had an unintended positive effect on the environment: air pollution declined. Reduced economic activity, border closures and fewer vehicles on the road led to a sharp drop in energy demand from the transport sector, which in turn resulted in reduced transport sector emissions. According to the International Energy Agency, road transport in regions under lockdown dropped between 50 and 75 per cent, with global average road transport activity falling to approximately 50 per cent of the 2019 level by the end of March 2020.\(^{11}\)

18. The International Energy Agency has also indicated that global energy demand decreased by approximately 4 per cent in 2020, and the 5.8 per cent annual drop in global energy-related carbon dioxide emissions was the largest on record since the Second World War.\(^{12}\) In a review published in 2021, the Agency indicated that oil demand was the hardest hit, with restrictions on mobility causing demand for transport fuels to fall by 14 per cent from 2019 levels.\(^{13}\) An analysis of data on air quality during government-mandated lockdowns in 10 cities across the globe found that 9 of the 10 cities experienced reductions in fine particulate matter (PM2.5) compared to the same period in 2019, and PM2.5 reductions were in the range of 25–60 per cent in 7 of those cities.\(^{14}\) While the transport sector is not the sole contributor to deteriorating air quality, it is a source of air pollutants, such as carbon monoxide, nitrogen


dioxide and particulate matter, that are released by internal combustion engines.

19. The significant improvements in air quality witnessed during the 2020 COVID-19 lockdowns in several cities in Asia and the Pacific are gradually receding as economic activity and transport demand increase. According to Agency estimates, while road transport activity has remained subdued through much of the year, it is expected to recover to pre-COVID-19 levels in the final months of 2021.15

20. While the temporary positive changes do not reflect structural changes, they provide some lessons learned. Section III provides a discussion of measures and interventions in focus areas that can contribute towards the prevention of a permanent rebound of transport sector emissions to pre-COVID-19 levels and drive the regional transition towards low carbon transport communities.

III. Building back better and accelerating low carbon transport actions in Asia and the Pacific

21. The present section serves to highlight measures and interventions aimed at accelerating low carbon transport actions while building back better in the region. These measures pertain to the decarbonization of regional supply chains, integrated urban transport planning, electric and low carbon mobility, and advanced technologies such as smart transport technologies, which can contribute to preventing a permanent rebounding of the sector’s emissions and drive its low carbon transition.

A. Decarbonizing regional supply chains

22. Since much of the growth in carbon emissions is expected to be concentrated in Asia, the importance of proactive decarbonization policies can hardly be overemphasized. Moreover, as the effects of climate change have become more pronounced with widespread unusual weather patterns and intensifying natural disasters in recent years, the need to decarbonize the regional supply chain has become increasingly urgent.

23. Decarbonizing regional supply chains entails a combination of approaches that range from reducing carbon emissions through mode-specific policies to promoting the shift to more-sustainable modes of transport, such as rail and waterborne transport, and achieving the optimal integration of transport modes in delivering intermodal transport and logistics solutions.

1. Promoting mode-specific decarbonization policies

24. A variety of initiatives to decarbonize transport are under way in ESCAP member States. Many of these measures pertain to road transport, as it contributes disproportionately to carbon emissions. One of the most important initiatives is promoting electric mobility (see subsection III.B) and related infrastructure.

25. The national capacities and levels of willingness with regard to decarbonization, however, vary significantly. The range of national regulations on road transport emissions standards currently applied along the Asian Highway network is equivalent to European emissions standards (Euro

standards) II–VI. It would be difficult to designate a common emissions standard for the region since the application of Euro standards II–VI varies among member States. If the recommended emissions standard was equivalent to Euro standards V or VI, member States applying lower standards would have to pay for newer engines or vehicle pollution control devices to meet the higher standard. Conversely, if a lower emissions standard were recommended for the region, member States applying higher standards would most likely deny entry to vehicles that meet only the lower standard because of the environmental impacts of vehicle emissions. Therefore, instead of designating a region-wide harmonized emissions standard along the Asian Highway network, it is more pragmatic to have a flexible step-by-step approach that would allow for each member State to raise its standard gradually in accordance with national specificities. For example, the Republic of Korea raised its standard gradually, from Euro III in 2003 to Euro VI in 2014.

26. Apart from emissions standards, other vehicle-related decarbonization measures include eco-driving training programmes and vehicle inspection, maintenance and scrapping. Related fiscal measures to remove subsidies for fossil fuels or impose congestion charges are being implemented among the member States to decarbonize road transport. Recently, the Government of India announced a policy for the scrapping of vehicles to create a viable circular economy to reduce pollution, improve fuel efficiency and encourage the use of electric vehicles.

27. In addition, a reduction in carbon emissions can be achieved by improving the performance of road vehicles through technology upgrading, enhancing operational performance and the continuous development of highly automated and fully automated vehicles. Other measures that inhibit carbon emissions relate to fuels, such as fuel economy standards and the use of alternate fuels, including renewable hydrocarbon biofuels and green hydrogen fuel.

28. Member States are moving towards more energy efficiency and zero carbon emissions in railway transport. While electrification remains the preferred method of rail decarbonization, new technologies can be used where electrification is challenging for economic or technological reasons. To further the decarbonization of rail transport, the usage of state-of-the-art batteries, hydrogen fuel cells, biodiesel and other solutions are becoming viable alternatives to diesel traction.

29. Given the increasing recognition of the importance of further decarbonizing rail transport, the secretariat has developed recommendations for member States on pathways for rail transport decarbonization. The recommendations include the clustering of countries according to a set of acceptable geographical, economic and operational criteria to develop

16 ESCAP, Strengthening the Capacity of ESCAP Member States to Harmonize Standards on Weights, Dimensions and Emissions of Road Vehicles for Facilitation of Transport along the Asian Highway Network: Study Report (Bangkok, 2020).


20 ESCAP, “Enhancing shift towards sustainable freight transport in Asia and the Pacific: opportunities through railway decarbonization” (Bangkok, 2021).
decarbonization pathways that identify specific solutions and appropriate supporting policies to achieve low carbon rail freight. The secretariat has provided a maturity assessment matrix as a strategic tool for mapping the maturity level and capabilities of individual railways for rail decarbonization according to four parameters, namely sources of electric supply, supporting infrastructure, financing availability and management priorities.

30. Turning to maritime transport, which accounts for approximately four fifths of world merchandise trade carriage and approximately 3 per cent of total carbon emissions in 2018, the International Maritime Organization (IMO) has set a goal of reducing the total annual greenhouse gas emissions from international shipping by at least 50 per cent by 2050 compared to 2008 levels. Member States are implementing a variety of shipping policies focused on technological innovations to achieve high efficiency and low emissions in shipping activities. Eco-friendly technological innovations in shipbuilding and ship operations are reflected in low-carbon and high-efficiency triple E class ships, so named for the design principles of economy of scale, energy efficiency and environmental impact improvement. Information and communications technology, high-efficiency and low-emissions technologies and environmental conservation technologies are expected to further promote such changes in the future.

31. States members of ESCAP have a key role to play in global maritime decarbonization efforts, given the concentration of shipping operations in Asia and the fact that Asian countries are major shipbuilding, ship-owning and ship-demolition economies, and some Pacific island countries are among the leading flags of registration by deadweight tonnage.

32. Many countries in the region lack the ability to invest in eco-friendly vessels, and the national environmental standards for domestic vessels are often not up to international standards. This means that applicable technical alternatives and policy recommendations are needed to assist member States in designing, planning and developing decarbonization policies for sustainable maritime connectivity. Furthermore, such policies would strongly benefit from cooperation between member States through a regional dialogue and reinforced partnerships, including with the private sector.

2. Decarbonizing regional supply chains through modal shift

33. One of the potent ways to decarbonize supply chains is through a shift to more sustainable modes of transport that include rail and waterborne transport. Road transport is the dominant mode in both freight and passenger transport in most countries in the region, with a share of up to 80 to 90 per cent in some countries.

34. Modal shift to more sustainable modes of transport is a policy priority for many member States to mitigate the negative externalities of transport. For example, the aim of the national transport strategy of Thailand is to increase the proportion of freight transported by rail from 1.5 per cent to 5 per cent. Railways in India have committed to increasing the amount of freight transported by rail from approximately 35 per cent in 2015 to 45 per cent by 2030.
However, for most countries, there are multiple challenges that need to be addressed, including the challenge of financing, and there may be no uniform prescription for decarbonization across the region. While some generic suggestions would be beneficial at the regional level, each railway network is distinct in size, capacity, traffic mix and competition. Therefore, a granular analysis is needed to understand the pattern and volume of existing domestic, international and transit traffic along individual railways, and major work streams, modalities and costs of implementation should be taken into account when developing specific recommendations on the basis of the analysis.

35. In addition to rail, waterborne transport has immense potential in the region. It is low cost, low pollution and low carbon, and has a high potential to reduce logistics costs, fuel consumption, air emissions, traffic congestion, noise and road accidents. China already has the world’s largest inland water navigation system in terms of length and freight volume. Significant efforts are being made in many countries of the region to increase the use of their waterways for freight operations.

3. Decarbonizing regional supply chains through integrated intermodal transport

36. Building on the above-mentioned benefits of decarbonization and modal shift, intermodal (multimodal) transport is, in its nature, a decarbonized solution. Intermodal interchanges such as dry ports can play an enabling role in lowering the carbon footprint of the supply chain. Reducing the environmental impact of intermodal transport operations includes reducing the time required for intermodal interchange and vehicle dwell time at intermodal facilities (seaports, dry ports and rail and road terminals), decreasing empty or inefficient vehicle journeys and minimizing other possible delays in transport that result in non-productive greenhouse gas emissions.

37. These targets can be, to a great extent, pursued through further development, deployment and implementation of digital systems and solutions that can rationalize the planning of transport operations and reduce unnecessary delays. In addition, the vehicles and equipment (e.g. tractors, self-propelled cranes and reach-stackers) serving intermodal facilities such as dry ports should be equipped with low-emissions engines in the medium term, or zero-emissions engines in the longer term, subject to the availability of such equipment from the manufacturers.

38. In the Busan Declaration on Transport Development in Asia and the Pacific, adopted in 2006, the Ministerial Conference on Transport articulated the shared vision of ESCAP members and associate members of an integrated, international and intermodal transport and logistics system in Asia and the Pacific. Since then, the secretariat has actively supported Asia-Pacific countries in developing such a system through its regional action programmes on transport.

25 E/ESCAP/63/13, chap. V.
4. **Leveraging the Commission’s intergovernmental mechanisms to support the decarbonization of the regional supply chains**

39. The region’s integrated intermodal network, formalized by the Intergovernmental Agreement on the Asian Highway Network, the Intergovernmental Agreement on the Trans-Asian Railway Network and the Intergovernmental Agreement on Dry Ports and with secretariat functions fulfilled by ESCAP, provides a platform for supporting further decarbonization initiatives.

40. There is already a reference to the environmental dimensions of design and construction standards under annex II to the Intergovernmental Agreement on the Asian Highway Network, entitled “Asian Highway Classification and Design Standards”, which stipulates that an environmental impact assessment, following national standards, should be carried out when new road projects are prepared. While the Intergovernmental Agreement on the Trans-Asian Railway Network and the Intergovernmental Agreement on Dry Ports do not contain specific environment-related provisions, they contribute towards decarbonization by promoting more sustainable modes of transport, such as railways, and facilitating intermodal integration.

41. Member countries of the respective networks could further leverage the platforms established by the Intergovernmental Agreements to explore good practices in decarbonizing transport when designing and constructing land transport infrastructure facilities in the region and beyond, as well as to identify means of implementing such good practices. Given the urgency of the shift towards sustainable freight transport in the decade of action for the Sustainable Development Goals, a blueprint or plan to decarbonize regional supply chains could be contemplated within the framework of the networks.

42. Furthermore, under the Paris Agreement, Governments have agreed to work to limit global warming to 2°C, with an ideal limit of 1.5°C, to work towards related mitigation and adaptation strategies and to make available required funding. However, proper planning of actions to reduce the carbon emissions of regional supply chains requires data on freight transport and related emissions, and such data collection needs to be strengthened in many countries of the region. Moreover, freight transport initiatives that reduce emissions are seldom mentioned in the nationally determined contributions of the countries in the region. Therefore, there is a need to further deepen the understanding of policymakers with regard to the potential of the freight sector to reduce emissions and related externalities and expand the role of freight transport mitigation actions in nationally determined contributions.

**B. Accelerating low carbon mobility**

43. Ongoing rural-urban migration in the region, as people move to urban areas in search of economic opportunities and a better quality of life, has meant that transport policymakers need solutions that address the increasing demand for mobility in urban areas while simultaneously reducing the carbon footprint of the transport sector. Efforts thus far have included integrated urban development planning that induce a modal shift from private motor vehicles to public transport systems; promoting electric and low carbon mobility, as well as active and non-motorized transport; and improving the fuel economy of motor vehicles.
1. Integrated urban transport development

44. Cities are hubs and drivers of economic activity; they provide employment and economic growth. By enabling urban populations to access jobs, goods and services, urban transport systems are integral to urban development and planning and enable urban growth. As Asian cities develop urban transport systems and infrastructure to cater to the needs of growing urban populations, the rise in transport demand and the use of personal vehicles has led to traffic congestion, which has caused significant growth in negative externalities in urban areas, such as economic losses, increased energy consumption and greenhouse gas emissions, and worsening air quality.

45. Asian cities face multiple challenges in meeting Sustainable Development Goal target 11.2, including with regard to enhancing mobility, ensuring accessibility and providing high quality and inclusive mobility services while minimizing emissions, congestion and pollution. The sustainability and liveability of a city are considerably affected by how mobility is managed.26 Thus, there are opportunities for countries and cities to accelerate progress on low carbon development.

46. Asia is leading in efforts to improve urban mobility in cities. The second edition of the Transport and Climate Change Global Status Report 2021 of the Partnership on Sustainable, Low Carbon Transport serves to highlight new mass transit routes that have been opened in Lahore, Pakistan, Jakarta and Nagpur, India, and the expansion of urban transit networks is progressing in many cities in China, as well as in Bangkok. However, the mode share of public transport is still low in many cities and the usage of personal vehicles is still dominant.

47. The onus is on national and municipal authorities to plan and implement low carbon urban mobility pathways that are holistic and comprehensive. In order to enhance the overall sustainability of urban mobility and monitor progress, these authorities need to develop and implement plans that integrate urban development and public transport. Using the sustainable urban transport index and guidelines to assess the existing state of urban mobility can support countries and cities in overall mobility planning, allocating resources to improve weak performance against indicators and monitoring improvements. The Bangkok Declaration, adopted at the regional meeting on the theme “City and transport: safety, efficiency and sustainability”, held in June 2021, affirmed that the key objective of sustainable urban transport policy was to effectively and harmoniously meet public demand for transport services, ensuring a high quality of urban transport system services and a decent level of accessibility in urban areas, as well as promoting an integrated multimodal urban transport network to serve the urban transport demand effectively.

2. Electric mobility and low carbon mobility

48. The transport sector is almost completely reliant on fossil fuels. Emissions from the transport sector are rising faster than in any other sector. Transport demand is on the rise, in particular in developing countries, and policymakers are increasingly seeking to reduce the carbon footprint of transport while ensuring sustainable mobility for all. In that regard, the deployment of electric vehicles is increasingly viewed as a solution to meet

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26 Centre for Liveable Cities and Urban Land Institute, Urban Mobility: 10 Cities Leading the Way in Asia-Pacific (Singapore, 2017).
mobility needs while reducing transport sector emissions. Indeed, electric vehicles have zero tailpipe emissions, and when paired with electricity generated from renewable sources, electric vehicles could drastically reduce overall greenhouse gas emissions and contribute towards transport decarbonization.

49. Electric vehicles represent a very small share of the global vehicle fleet, despite their benefits, and a rapid uptake of electric vehicles would be required to reduce vehicle emissions at the scale needed to meet climate goals. The accelerated deployment of electric vehicles could also lead to improvements in air quality, in particular in urban areas, and provide other co-benefits, such as reduced noise pollution and the improved health and well-being of urban residents.

50. Several member States have introduced government policies to promote electric vehicles and the deployment of charging infrastructure. The Government of China, for example, has been implementing a scheme to promote the transition towards electric mobility, and the number of electric buses has reached more than a half million. The policies aimed at promoting electric vehicles have been rolled out since 2009, beginning with large scale pilot projects under the “ten cities, thousand vehicles” programme. Three cities in China, namely Guangzhou, Shenzhen and Xi’an, operate public transport systems that are 100 per cent electric. In India, phases I and II of a scheme on the faster adoption and manufacturing of hybrid and electric vehicles were introduced to support the development of the hybrid and electric vehicle market. More recently, the Government of Thailand launched its electric vehicle policy, aimed at accelerating electric vehicle production in the country. Under the plan, 30 per cent of all vehicles made in Thailand would be electric by 2030. The plan also provides for financial and fiscal incentives and safety standards for electric vehicles and battery manufacturers.27

51. Initiatives on electric mobility in the region provide huge opportunities for the countries to advance towards low carbon mobility. However, experience suggests that the successful introduction of electric vehicles would require careful planning with supportive policies in a range of areas, including financial and fiscal issues, regulatory frameworks and energy policies. Therefore, countries in the region would benefit from experience sharing, norms setting and capacity-building.

3. **Active mobility and non-motorized transport**

52. The traditional approach to urban transport policy is focused on generating physical movement and increasing speeds as opposed to guaranteeing access. That approach has often resulted in induced demand, which has exacerbated congestion, pollution and greenhouse gas emissions. Automobile-oriented expansion has also compromised public transport and facilities for walking and bicycling, with land allocated to roads and road space predominantly utilized by private vehicles. A focus on private motorized transport also tends to exacerbate inequality and social exclusion.

53. An inclusive and sustainable urban transport system responds to the mobility and accessibility needs of city dwellers from different income groups. Non-motorized transport, which includes walking, bicycling and other forms of human-powered transport, is used by the majority of people to commute to

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27 “Thailand unveils roadmap to 30% EV production in 10 years”, *The Nation Thailand*, 13 May 2021.
work and move around cities every day. It is the most environmentally friendly form of transport and it generates minimal carbon dioxide emissions.

54. Non-motorized transport used to be associated with poverty alleviation and the utilization of local technologies. However, with the increasing awareness of environmentally friendly transport, non-motorized transport is now considered a convenient, low-cost and non-polluting mode of transport. Studies have shown that one ton of carbon dioxide emissions is generated by a car travelling only 26,200 km, compared to more than 170,000 km of walking or bicycling. It is also obvious that active mobility contributes towards multiple health benefits.

55. Given the associated social, health and environmental benefits of non-motorized transport, many cities have included it and its associated infrastructure in the regular transport planning process. Exclusive bicycles lanes in Bangkok and Ho Chi Minh City, Viet Nam, and separate rickshaw lanes in Dhaka are not new concepts. Bicycle-sharing schemes helped to reduce carbon emissions by approximately 7 million tons in 2017, according to the forty-first Statistical Report on Internet Development in China. There are numerous successful examples of this in cities in China. For example, the Huilongguan-Shangdi bicycle lane (the first exclusive bicycle lane in Beijing) has helped to ease traffic congestion between Huilongguan and Shangdi for the commuting population of approximately 11,600.

56. In the Regional Action Programme for Sustainable Transport Connectivity in Asia and the Pacific, phase I (2017–2021), it was indicated that even though cities in the region feature a mixed array of urban transport modes, including non-motorized transport, there are plenty of opportunities for improvements. The General Assembly, in its resolution 74/299 on improving global road safety, encouraged Member States to make efforts to ensure the safety and protection of all road users through safer infrastructure by taking into account the needs of motorized transport and non-motorized transport, and vulnerable road users. It also encouraged Member States to promote environmentally sound, safe, accessible and affordable modes of quality transport, in particular public and non-motorized transport.

C. Leveraging from advanced technology

57. Smart transport (including intelligent transportation systems) has been leading the digitalization of transport. Smart transport shifts the paradigm by disrupting the existence and legacy of traditional transportation systems and services through advanced technologies. Smart transport has attracted growing interest over the past few decades as a means to make transport safer, cleaner and more efficient, which directly contributes towards the achievement of Sustainable Development Goals 3, 7, 9 and 11. Moreover, considering its great impact in terms of promoting economic growth and decreasing inequalities,
smart transport also indirectly contributes towards Sustainable Development Goals 5, 8 and 10.

1. **Smart transport: applications and potential roles**

58. Smart transport refers to the hardware, technologies and strategies that enable sustainable transport services. Smart transport includes intelligent transportation systems, which are defined as an agglomeration of diverse technologies that enhance the sustainability of transport systems in a safer, smarter and greener way.\(^ {\text{31}}\) Smart transport has evolved in various forms in response to transport needs. Table 2 contains a description of representative types of smart transport technologies, including emerging technologies that have been widely adopted or are to be introduced in the region. The table also lists the applications of each technology and their suitability for use in passenger and freight transport.

### Table 2
**Types of smart transport technologies**

<table>
<thead>
<tr>
<th>Category</th>
<th>Main functions</th>
<th>Application</th>
<th>Suitability</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Passenger transport</td>
<td>Freight transport</td>
</tr>
<tr>
<td>Advanced traffic management systems</td>
<td>Improving traffic operations through traffic management centres where real-time traffic data are collected, processed and distributed by diverse information/dissemination devices</td>
<td>Advanced traffic signal control</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatic traffic enforcement</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electronic toll collection</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Real-time traffic monitoring</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Active traffic management</td>
<td>✓</td>
</tr>
<tr>
<td>Advanced traveller information systems</td>
<td>Offering updates with pre-trip and en-route traffic information to travellers through various distributors of processed information</td>
<td>Mobile/online/roadside traffic information</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Real-time parking information</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-vehicle information</td>
<td>✓</td>
</tr>
<tr>
<td>Advanced transportation systems</td>
<td>Improving efficiency and reliability of public transportation services, users’ safety and convenience by employing diverse information technologies and traffic management strategies</td>
<td>Automatic fare collection</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatic passenger information</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatic vehicle location</td>
<td>✓</td>
</tr>
<tr>
<td>Commercial vehicle operations</td>
<td>Improving efficiency of operations and activities associated with moving goods and passengers by commercial vehicles</td>
<td>Fleet/freight administration</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electronic clearance</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazardous material planning and incident response</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>In-transit freight monitoring and terminal management</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Main functions</th>
<th>Application</th>
<th>Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperative-intelligent transportation systems/connect vehicles</td>
<td>Utilizing the concept of transport modes, infrastructure and devices communicate with one another to mitigate congestion, reduce fuel consumption and emissions, and increase reliability, mobility and road safety</td>
<td>Vehicle-to-everything, including vehicle-to-vehicle and vehicle-to-infrastructure</td>
<td>✓</td>
</tr>
<tr>
<td>Smart mobility</td>
<td>Encompassing various transport technologies, services and modes to enhance travel experience by providing user-customized transport services</td>
<td>Ride-sharing/car-sharing</td>
<td>✓</td>
</tr>
<tr>
<td>Autonomous vehicles</td>
<td>Travelling without human intervention by using satellite positioning systems and sensors to determine appropriate paths that consider obstacles and traffic signage</td>
<td>Autonomous vehicles (also known as self-driving vehicles, automated vehicles and driverless vehicles)</td>
<td>✓</td>
</tr>
<tr>
<td>Transport-specific big data</td>
<td>Collecting and analysing all types of data from transport and providing integrated solutions on a real-time basis for transport planning, operations and management</td>
<td>Database from automatic fare collection systems (smart cards)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data for dynamic optimization on smart mobility services</td>
<td></td>
</tr>
</tbody>
</table>

2. **Benefits of wider deployment of sustainable smart transport**

59. As mentioned above, smart transport can contribute towards the achievement of the Sustainable Development Goals in many ways. With regard to safety, considering the high casualty rate in many member States, various monitoring, operation and management applications can contribute towards reducing the number of crashes and other incidents. In the areas of accessibility and connectivity, smart transport can improve transport accessibility and connectivity with user-oriented transport services. To enhance efficiency, traffic bottlenecks (e.g. traffic congestion, waiting times for loading/unloading goods) can be minimized, and overall transport management can be enhanced by traffic management and operations centres. Smart transport can maintain consistent capacity between different transport modes. For the environment, optimized traffic management and operations can reduce greenhouse gas emissions and empty vehicle journeys, and smart transport can improve route planning and increase operational efficiency in transport.

60. The efficiency and environmental benefits of smart transport are of paramount importance to achieve environmentally sustainable transport systems and services. According to the ESCAP report entitled *Using Smart Transport Technologies to Mitigate Greenhouse Gas Emissions from the Transport Sector in Asia and the Pacific*, the combined energy and emissions benefits of smart transport in South-East Asia, North and Central Asia, South and South-West Asia and the Pacific could amount to approximately
$3.2 million to $57 million in savings. In Baku, Bangkok, New Delhi and Suva, the combined energy and emissions benefits of smart transport range from $88,430 to approximately $4.1 million in savings. On the basis of their potential benefits, intelligent transportation systems were included as transport emissions mitigation strategies in the nationally determined contributions of member States, as shown in table 3. While terminology varied, several member States had already made references to smart transport as a mitigation measure in their nationally determined contributions.

Table 3
Examples of smart transport in nationally determined contributions of member States

<table>
<thead>
<tr>
<th>Country</th>
<th>Excerpts from nationally determined contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azerbaijan</td>
<td>“…improvement and expansion of the scope of intellectual transport management system…”</td>
</tr>
<tr>
<td>China</td>
<td>“To promote the development of dedicated transport system for pedestrians and bicycles in cities and to advocate green travel; and to accelerate the development of smart transport and green freight transport.”</td>
</tr>
<tr>
<td>Cook Islands</td>
<td>“Additionally, the Cook Islands is looking to embrace proven low carbon transport technologies and is currently exploring the most effective incentives for promotion of transition towards clean energy transportation.”</td>
</tr>
<tr>
<td>Japan</td>
<td>“…making vehicle transport business more eco-friendly by eco-driving, promotion of collective shipment, promotion of Intelligent Transport Systems ITS (centralized control of traffic signals), development of traffic safety facilities (improvement of traffic signals, and promotion of the use of [light emitting diode] LED traffic lights), promotion of automatic driving, eco-driving and car sharing)…”</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>“…improving the energy efficiency of transportation and vehicle technology (focused on system efficiency, trip efficiency, and vehicle efficiency)…”; “Introduce intelligent transport management systems…”</td>
</tr>
<tr>
<td>Tuvalu</td>
<td>“…the growing emissions in the transport sector, as evidenced from the increased numbers of vehicles on land and vessel for sea transport, needs to be addressed through technological innovations.”</td>
</tr>
</tbody>
</table>

*Source: United Nations Framework Convention on Climate Change, “Interim NDC Registry”. Available at www4.unfccc.int/sites/NDCStaging/Pages/All.aspx (accessed on 25 August 2021).*

61. Moreover, some member States have devoted their efforts towards the development of emerging technologies, such as cooperative-intelligent transportation systems, connected vehicles, smart mobility, autonomous vehicles and transport-specific big data. Thus, good practices in utilizing smart transport technologies can be found across the region. A study on the implementation of bus information systems over 8.3 km between Daejeon and
Chungju in the Republic of Korea led to an estimated reduction of 39.45 tons of carbon dioxide per kilometre.\textsuperscript{32} Traffic management systems in Moscow contributed towards the reduction of the number of daily trips by passenger cars by one third, the reduction of travel time to the city centre from the outskirts during peak morning hours by one fifth and the increase of the average speed of traffic during peak hours by 16 per cent.\textsuperscript{33} Throughout the 50 cities in China that utilize smart mobility technology in bicycle-sharing schemes, the total number of car trips has fallen since the service was adopted. A study conducted in Shanghai, China, provided an estimate that the environmental benefits of bicycle-sharing in 2016 alone saved 8,358 tons of petrol, reduced carbon dioxide emissions by 25,240 tons and reduced emissions of nitrogen oxides by 64 tons.\textsuperscript{34} In Australia, in an analysis of multiple scenarios for the period 2021–2050, the estimated benefits of using cooperative-intelligent transportation systems in South-East Queensland in the moderate scenario would amount to fuel savings of 448.3 million Australian dollars and emissions savings of 298.2 million Australian dollars.\textsuperscript{35}

62. At the subregional level, a variety of initiatives include smart transport components. The Association of Southeast Asian Nations (ASEAN) smart cities network, the Greater Mekong subregion transport sector strategy 2030\textsuperscript{36} and the ASEAN intelligent transport system policy framework\textsuperscript{37} are among recent examples. Such initiatives can be the basis for the wider deployment of smart transport at the regional level.

63. A growing percentage of younger people in the region are able to easily adopt new technologies. For example, the number of mobile Internet users in Asia and the Pacific is expected to increase to 2.7 billion by 2025, from 2 billion in 2019.\textsuperscript{38} An increase in the need for and usage of smart transport can be expected as a result. Nevertheless, challenges remain, in particular the gaps in technological readiness among ESCAP member States to formulate and implement smart transport technologies. Some member States have emerged as world leaders in the field, while others are still in the early stages of adopting intelligent transportation systems or have yet to initiate the adoption process.\textsuperscript{39}


\textsuperscript{33} Business New Media, “The city will never be the same, or what are intelligent transportation systems?”, 20 April 2020. Available at www.vedomosti.ru/salesdepartment/2020/04/20/gorod-nikogda-ne-budet-prezhnim-ili-chto-takoe-intellektualnie-transportnie-sistemi.


\textsuperscript{35} Australia, Department of Infrastructure and Regional Development, Bureau of Infrastructure, Transport and Regional Economics, Costs and Benefits of Emerging Road Transport Technologies, research report 146 (Canberra, 2017).

\textsuperscript{36} Greater Mekong Subregion (GMS) and ADB, GMS Transport Sector Strategy 2030: Toward a Seamless, Efficient, Reliable, and Sustainable GMS Transport System (Manila, ADB, 2018).


\textsuperscript{39} ESCAP, Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific.
To leave no one behind, the following steps are necessary: increase awareness of the benefits of smart transport, especially its potential to mitigate adverse environmental impacts, and enhance knowledge about its application; provide timely policy and regulatory support and guidance with regard to governance; enhance the technical readiness for smart transport by building technical expertise and capacity in countries in need of assistance; and promote multilateral consensus for a strategy that encompasses all players in both the private and public sectors and at the national, subregional and regional levels to ensure interoperability and compatibility of smart transport applications within and among countries.

IV. **Issues for consideration**

64. The Fourth Ministerial Conference on Transport may wish to consider the policy directions, actions and activities described in the present document in the light of the regional action programme for sustainable transport development in Asia and the Pacific (2022–2026), notably its thematic areas of urban transport, low carbon mobility and digitalization of transport.

65. In this context, the Ministerial Conference may also wish to share updates and selected highlights with regard to national, bilateral and multilateral policies and initiatives related to environmentally sustainable transport systems and services.