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Review of the implementation of the 2030 Agenda for Sustainable Development in Asia and the Pacific and issues pertinent to the subsidiary structure of the Commission: transport**Transitioning to the digitalization of transport for a sustainable future in Asia and the Pacific****Note by the secretariat***Summary*

Over recent decades, the Asia-Pacific region has experienced rapid increases in urbanization, population and motorization rates. In the transport sector, digitalization is transforming the way people move and interact with other systems and its realization has become pivotal for the region as part of the fourth industrial revolution. Transport digitalization has the potential to make transport safer, more efficient, inclusive and more sustainable while providing users with increased convenience and choices.

With a drastic change in technologies, transport digitalization has brought about various new forms of applications and technologies, which include cooperative-intelligent transport systems, connected and autonomous vehicles, smart mobility, transport big data analytics, mobility as a service and smart ports. It is expected that each emerging technology will drive unprecedented changes in the transport sector, which will affect every corner of people's lives. Furthermore, in view of the unique nature of transport digitalization, its successful implementation will depend upon technological development and related policy support being considered jointly. However, several challenges still impede the wider implementation of transport digitalization in the region, as identified and addressed in the Regional Action Programme for Sustainable Transport Development in Asia and the Pacific (2022–2026).

Considering the importance of transport digitalization as one of the thematic areas identified in the Regional Action Programme, the present document contains an outline of the status of transport digitalization in Asia and the Pacific, including the issues currently being faced in the region and recent activities and initiatives of the secretariat that are being carried out to enhance transport digitalization for sustainable development.

* ESCAP/80/1.

The Economic and Social Commission for Asia and the Pacific may wish to take note of the document and encourage the active engagement and continued support of its members and associate members in the planned activities, including promoting the regional road map for smart transport systems in Asia and the Pacific and rail digitalization. In addition, members and associate members of the Commission may wish to share information on innovative policies and actions being taken at the national, subregional and regional levels to enhance the digitalization of transport for the achievement of sustainable and inclusive development.

I. Introduction

1. While the Asia-Pacific region has experienced rapid increases in urbanization, population and motorization rates in recent decades, it has also witnessed a rise in the negative externalities of increased transport demand, including traffic congestion, road accidents and greenhouse gas emissions. With the advent of the fourth industrial revolution, such transport issues are largely being looked at through the lens of transport digitalization, including smart transport systems and other innovative technologies. Digitalization has indeed ushered in remarkable progress in terms of a transformative shift in the transport landscape to more accessible, interconnected, inclusive and sustainable transport systems that cater to the evolving needs of societies. It will eventually contribute to mitigating sustainability concerns and enhancing the quality of life of the region's inhabitants. Transport digitalization encompasses a wide range of aspects of the transport sector, including transport system design and planning, transport operations, transport technology and manufacturing, and transport system maintenance.

2. The specific roles of transport digitalization in achieving sustainable development are guided by how effectively they address the overarching objectives of the Sustainable Development Goals, which put people at the centre. While there is not a dedicated Goal that is focused exclusively on transport, transport digitalization plays a crucial role in advancing sustainable development by transforming traditional transport systems into more intelligent and efficient ones in response to the needs of individuals and societies. In essence, with transport digitalization, the power of digital technologies, data analysis, and information and communications technology connectivity is leveraged to meet transport demand in terms of both goods and passengers within and beyond cities, and environmental performance and social development objectives.

3. With these trends, the interest in transport digitalization is expected to increase continuously in the region, which can be indirectly understood through the growth of the market size of smart transport systems. As of 2022, the Asia-Pacific market size of those systems was estimated to be \$6.42 billion, and it is expected to be valued at up to \$28.07 billion by 2031. It is estimated that the Asia-Pacific market will be the largest in the world. In addition, as the annual rate of growth is expected to be 17.8 per cent, it would also be the fastest growing market.¹ The introduction of digitalization has fundamentally reshaped the dynamics of mobility for both individuals and goods, revolutionizing the way borders and regions are traversed. However, due to the extensive geographical scope of the Asia-Pacific region, distinct differences between countries emerge in terms of government structures, economic growth

¹ Transparency Market Research, "Intelligent transportation system market" (n.d.). Available at www.transparencymarketresearch.com/intelligent-transportation-system-market.html.

rates, population sizes and geopolitical frameworks. Within the realm of transport, those differences translate into diverse degrees of embracing, implementing and formulating local policies for transport digitalization. That spectrum spans from more advanced deployments to elementary traffic management systems within individual countries. Consequently, disparities in the maturity of transport digitalization have become noticeable across the region.

4. For those issues to be addressed, the implementation of transport digitalization needs to advance the establishment of harmonized national and regional policies in accordance with the principles identified in the Sustainable Development Goals. Accordingly, the secretariat assists member States in enhancing the digitalization of transport infrastructure and services. Under the Regional Action Programme for Sustainable Transport Development in Asia and the Pacific (2022–2026), endorsed by the Economic and Social Commission for Asia and the Pacific through its resolution 78/3 of 27 May 2022, seven thematic areas are outlined under three overarching objectives. The overarching objectives are geared towards efficient and resilient transport and logistics networks and mobility for economic growth; environmentally sustainable transport systems and services; and safe and inclusive transport and mobility. The seven thematic areas are regional land transport connectivity and logistics; maritime and interregional transport connectivity; the digitalization of transport; low-carbon mobility and logistics; urban transport; road safety; and inclusive transport and mobility. The thematic area of the digitalization of transport is focused on the digital transformation of transport, which directly contributes to the achievement of all the overarching objectives. Under the Regional Action Programme, an array of activities and intended outcomes were set out that rely on technology, innovation, automation, digitalization, regional and multi-stakeholder cooperation, relevant data analysis and technical assistance tools to address the following priority areas:²

- (a) Wider deployment of smart transport systems to improve the efficiency, resilience and social and environmental sustainability of transport;
- (b) Increased awareness of innovative technologies and the use of big data to improve traffic and other urban transport issues;
- (c) Interconnection of maritime and port systems;
- (d) Shift towards regional transport networks with smart transport systems.

5. Against that background, in the present document, the secretariat examines the status of transport digitalization in Asia and the Pacific and presents its recent activities and initiatives to enhance transport digitalization. It also highlights how those efforts are expected to contribute to the implementation of the Regional Action Programme and further the achievement of the Sustainable Development Goals through various analytical, intergovernmental and capacity-building activities.

II. Status of transport digitalization in Asia and the Pacific

A. Major challenges relating to smart transport systems for transport digitalization

6. The emergence of transport digitalization in Asia and the Pacific has presented an opportunity to address various transport issues. Through a range

² See ESCAP/78/15/Add.2.

of trends and initiatives, transport digitalization is aimed at enhancing safety and mobility, mitigating congestion and minimizing adverse environmental effects. Smart transport systems are a major part of the digitalization of transport. While the digitalization of transport encompasses technologies and systems, smart transport systems are focused on the methodical merging of digital technologies and data-centric solutions into multiple dimensions of the transport sector to optimize and elevate transport systems to enhance the efficiency, safety and sustainability of transport by using digital innovations. In that regard, smart transport systems can be defined as “an agglomeration of diverse technologies that enhance the sustainability of transport systems in a safer, smarter and greener way”.³

7. The driving force of digital transformation within the transport ecosystem has given rise to the creation of a multitude of initiatives defined as smart transport systems. Those systems are typically classified into advanced traffic management systems, advanced traveller information systems, advanced public transport systems and commercial vehicle operations, with a multitude of emerging technologies poised to revolutionize and reshape the entire transport industry. However, there are still several difficulties that need to be addressed in order for transport digitalization to be widely adopted. It is important to consider the part played by smart transport systems in transport digitalization because their role is pivotal.

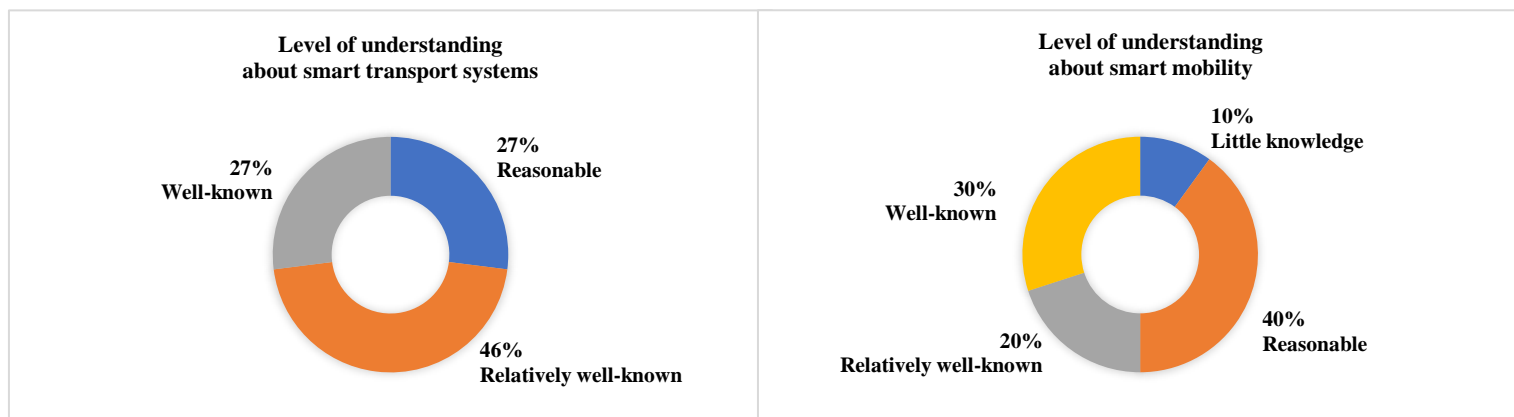
8. The first challenge is that a general awareness of the benefits of smart transport systems is still not widespread in the region, especially in least developed countries and small island developing States. For example, during the expert group meeting on promoting the utilization of transport big data from smart transport systems held in Seoul and online on 12 and 13 July 2023, delegations from Fiji, Tonga and Vanuatu pointed out that one of the challenges was the low awareness of the role of smart transport systems in sustainable development.⁴ The need for awareness extends across the public and private sectors and to the general public. Despite the advantages that smart transport systems provide, without a wide awareness of them, the systems may fail to be used or implemented. According to a survey carried out by the secretariat, only 27 per cent of transport experts knew the concept of smart transport systems well, whereas 30 per cent of transport experts knew the new concept of smart mobility well (see figure); smart mobility is the part of smart transport systems that is focused on offering efficient mobility services in urban areas.⁵ For the full merits of smart transport systems to be grasped, the awareness of policymakers and professionals who address transport problems needs to increase. In addition, a certain level of expertise is required to implement smart transport systems effectively. Without a thorough understanding of the nuances of the technology or an appropriate governance strategy, there is a potential for policymakers to implement related systems incorrectly or ineffectively. Consequently, increased technical capacity is also essential to further the implementation of smart transport systems as they contribute to transport digitalization across the region.

³ Economic and Social Commission for Asia and the Pacific (ESCAP), *Guidelines for the Regulatory Frameworks of Intelligent Transport Systems in Asia and the Pacific* (Bangkok, 2019).

⁴ For information on the expert group meeting, see www.unescap.org/events/2023/regional-meeting-developing-regional-road-map-support-regional-cooperation-wider.

⁵ ESCAP, *Increasing the Use of Smart Mobility Approaches to Improve Traffic Conditions in Urban Areas of South-East Asia: Policy Guidelines* (Bangkok, 2022).

Level of understanding of transport experts about smart transport systems and smart mobility



Source: ESCAP, *Increasing the Use of Smart Mobility Approaches to Improve Traffic Conditions in Urban Areas of South-East Asia: Policy Guidelines* (Bangkok, 2022).

9. The second challenge is establishing strong policy frameworks with inclusive design and planning for the full adoption of new technologies. They would need to be designed to guide the smooth integration of new technologies into existing systems and to harmonize the economic, social and environmental aspects of the Sustainable Development Goals, given that smart transport systems contribute to the realization of sustainable and inclusive transport. It has been observed that smart transport systems do not fall within the political sphere but are rather within the technical domain. That means expertise at the intersection of policy and technology is needed to embed digital technologies within existing transport systems. In terms of emerging technologies in particular, Governments are placed in a unique position to provide policy support and leadership, as they can determine how the private sector provides services and how users consume them. Mobility as a service, including ride-hailing and other application-based mobility services, has transformed the transport sector within a relatively short period of time, especially with the increasing use of mobile applications in the Asia-Pacific region. The governance of such new and emerging technologies, including policy related to them, is required in order to integrate them into existing transport systems. Accordingly, institutional capacity to do so is needed in many countries in Asia and the Pacific so they can fully benefit from smart transport systems for transport digitalization.

10. Third, smart transport systems still require supporting infrastructure, including traditional road elements, new transport facilities and a digital backbone. The problem is that the basic infrastructure, including digital infrastructure, still needs to be expanded in many countries in the region. For example, fifth generation (5G) technologies have gained popularity around the globe, but, by 2025, it is expected that 65 per cent of all mobile phone users in Asia and the Pacific will still use fourth generation (4G) technologies and another 12 per cent of users will remain with second generation (2G) or third generation (3G) technologies.⁶ That particular digital blockage prevents the wider implementation of smart transport systems, and the adoption of emerging technologies, such as application-based mobility services, cooperative-intelligent transport systems, and connected and autonomous vehicles, will

⁶ Infrastructure Asia, “The catalytic role of digital connectivity” (n.d.). Available at www.infrastructureasia.org/Insights/The-catalytic-role-of-digital-connectivity.

become a critical issue. Investments in telecommunication infrastructure will also be critical to increase the quality coverage of fixed and mobile broadband services cost-effectively in both rural and urban areas.

11. Fourth, although the role of data has become, with the advancement of digital technologies, important for developing transport policies and strategies for sustainable development, there are still gaps among member States in collecting, storing, sharing and analysing transport-related data. The gaps in data availability and use are a cross-cutting issue in all fields in Asia and the Pacific, not only the transport sector.⁷ Furthermore, it is expected that new mobility solutions, such as cooperative-intelligent transport systems, autonomous vehicles, mobility as a service and shared mobility, will generate an abundance of information, which could further contribute to the development of evidence-based policies and strategies. However, the low awareness of and insufficient technical capacity relating to data use for transport policies, the low prioritization of data collection, dissemination and analysis, and ineffective collaboration among stakeholders continue to interrupt the full use of transport data for sustainable transport policies and strategies. Without any action, those issues will worsen and eventually divide the region into those member States that acquire and use data from smart transport systems for transport digitalization and those that do not.

12. Lastly, apart from the technical and policy aspects discussed above, smart transport systems have a powerful impact in terms of changing the workforce and increasing access to new skills and knowledge simultaneously. For example, connected and autonomous vehicles will replace labour and, at a minimum, reduce the number of required drivers. Similarly, on-demand transport will reduce the number of public transport drivers, as it does not follow fixed routes or service intervals. Service operators and providers should be reskilled or upskilled to manage new systems; the skills required for smart transport systems will be entirely different, as digital technologies will be integrated into traditional transport services. Unfortunately, that drastic change in the workforce and massive reskilling and upskilling for smart transport systems have not been widely discussed in the Asia-Pacific region because of limited awareness and understanding. Accordingly, timely efforts need to be made through regional cooperation.

B. Urban mobility, inclusive transport, low-carbon mobility and road safety with digitalization in Asia and the Pacific

13. Despite the above-mentioned roadblocks, many countries in Asia and the Pacific are actively investing in and adopting digital technologies to enhance their transport systems because of the benefits for sustainable transport development. In addition to subregional initiatives, including the ASEAN Digital Masterplan 2025, several countries have developed national digitalization strategies that support transport digitalization.^{8,9} They include the Smart Nation initiative of Singapore; the digital initiatives of Indonesia and Malaysia; the “digital Bangladesh” strategy of Bangladesh; and the vision of Thailand to become a digital hub in South-East Asia. A general overview of how transport digitalization relates to trends and initiatives in urban mobility,

⁷ *Asia and the Pacific SDG Progress Report 2022: Widening Disparities amid COVID-19* (United Nations publication, 2022).

⁸ Simon Lin, “3 ways to build a sustainable and digital Asia-Pacific”, World Economic Forum, 16 June 2022.

⁹ Association of Southeast Asian Nations (ASEAN), *ASEAN Digital Masterplan 2025* (Jakarta, 2021).

inclusive transport, safety and low-carbon mobility is outlined below, as is the development status in the region.

14. The digitalization of transport in the Asia-Pacific region is reshaping urban transport, which is now called “urban mobility”, ushering in a transformative era characterized by efficiency, connectivity and sustainability. Urban mobility typically encompasses the movement of people and goods within a city or town, involving various modes of transport, including walking, cycling, public transit and personal vehicles.¹⁰ Furthering that concept, emerging advanced technologies and digital platforms are playing a pivotal role in addressing the complex challenges posed by rapid urbanization. For example, smart city initiatives incorporating smart transport systems, with real-time traffic management, integrated data systems and various smart applications, reflect a commitment to seamless urban mobility, which is now called “smart mobility”.¹¹ That relatively new concept, with its paradigm shift from transport to mobility, has yielded positive outcomes. Smart mobility includes ride-sharing, bike sharing, demand-responsive transport and personal mobility, such as e-scooters, mobility as a service and carpooling, all of which have demonstrated improvements in vehicle availability in peak hours in busy areas and reduced travel distances. Noteworthy endeavours are also found in the region, such as the “mobility-on-demand” service in Singapore and the “electric vehicle shared mobility” initiative in Thailand. The widespread use of digital fare payment, mobile applications for real-time information and micromobility solutions, which provide commuters with seamless and efficient mobility services facilitated through digital platforms, further characterize urban mobility transformations. Other digital technologies, such as intelligent traffic lights, predictive data analytics and the integration of data from sensors and Internet-of-things devices, also contribute to optimized urban mobility services.

15. As a crucial element of sustainable transport, inclusive transport is vital for economic and social integration. Persons with disabilities, older persons, women and low-income households, among others, face challenges that include high transport costs, inadequate public transit, poor non-motorized infrastructure and unsafe travel environments, all of which contribute to social inequality and hinder the achievement of sustainable transport. A significant portion of travel in the region relies on non-motorized and informal motorized modes, with only 34 to 38 per cent of people having access to public transport in many cities.¹² An expanding digital gap is also evident in equitable transport services, underscoring the imperative for Governments to allocate resources to digital infrastructure. In particular, that involves enhancing connectivity and lowering usage costs in less connected areas within cities and countries.

16. Addressing those diverse transport needs, especially for vulnerable groups and those in underserved areas, is crucial for effective and safe transport. Smart transport systems with universal digital infrastructure play a role in bridging inclusivity gaps in transport services by offering innovative solutions. Overcoming barriers to inclusive transport in the region is a significant challenge, requiring education, collaboration and dialogue to provide countries

¹⁰ Ferrovial, “Mobility” (n.d.). Available at www.ferrovial.com/en/resources/mobility/.

¹¹ Daniela Müller-Eie and Ioannis Kosmidis, “Sustainable mobility in smart cities: a document study of mobility initiatives of mid-sized Nordic smart cities”, *European Transport Research Review*, vol. 15, No. 36 (October 2023).

¹² ESCAP, “Concept note”, prepared for the Virtual Expert Group Meeting on Enhancing Social Inclusion and Innovations in Urban Transport Systems in Asia-Pacific Cities, Bangkok, 11 October 2023.

with knowledge and regulatory foundations.¹³ Inclusive transport with smart transport systems encompasses a range of initiatives that are focused on inclusivity with enhanced accessibility, mobility and safety for vulnerable groups and those in underserved areas. It also includes wheelchair accessibility, the provision of real-time information and monitoring, and data analytics to analyse ridership patterns and service gaps for vulnerable groups, with multilingual options and universal design principles. Barrier-free services for vulnerable road users are aimed at removing the physical and psychological barriers that encumber vulnerable groups. Such an initiative has been implemented in Busan, Republic of Korea, where a barrier-free station provides both public transport and ride-sharing services. The city of Busan also implemented a barrier-free navigation project that included voice recognition navigation, navigation through indoor positioning and information provision using intelligent barrier-free kiosks.¹⁴

17. In the Asia-Pacific region, the digitalization of transport is catalysing a paradigm shift towards low-carbon mobility solutions. In 2019, the region saw the transport sector responsible for over 50 per cent of total oil consumption. The sector contributed to nearly 14 per cent of the region's total carbon dioxide emissions, with road vehicles remaining the primary contributors.¹⁵ The integration of advanced technologies and digital platforms into transport is instrumental in promoting eco-friendly transport options. Electric vehicles are gaining prominence, with Governments implementing policies and incentives to encourage their adoption. Digital platforms play a crucial role in supporting electric vehicle infrastructure, offering services such as charging station locators, real-time monitoring and smart charging solutions. Mobility-as-a-service platforms are also contributing to a more sustainable transport ecosystem by providing users with integrated access to various low-carbon options, including public transit, bike sharing and ride-sharing.¹⁶ In addition, data analytics and modelling are being leveraged for Governments to assess and plan for sustainable mobility solutions that optimize energy use and to identify opportunities for the integration of low-carbon modes of transport. The region is at the forefront of leveraging digital innovations to usher in a new era of low-carbon mobility, in alignment with global efforts to reduce carbon emissions and build environmentally conscious transport networks. The Government of Malaysia established the Low Carbon Mobility Blueprint 2021–2030¹⁷ and, in Georgia, the Tbilisi Green City Action Plan 2017–2030 was established as a sustainable city mobility plan with low-emission public transport.¹⁸ The Beijing mobility-as-a-service workplan, released in June 2023, is also a low-carbon transport strategy that emphasizes green and inclusive mobility by integrating intelligent mobility services. The plan is aimed at providing green and inclusive mobility services to over 6 million people daily

¹³ ESCAP, *Regional Road Map to Support Regional Cooperation for the Wider Deployment of Sustainable Smart Transport Systems in Asia and the Pacific* (Bangkok, 2023).

¹⁴ Republic of Korea, Ministry of Land, Infrastructure and Transport, “2022 Busan Smart City Challenge: barrier-free station” (in Korean).

¹⁵ ESCAP, “Transport: low carbon mobility and logistics”.

¹⁶ Warwick Goodall and others, “The rise of mobility as a service: reshaping how urbanites get around”, *Deloitte Review*, No. 20 (2017), p. 112. Available at www.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-ths-rise-of-mobility-as-a-service.pdf.

¹⁷ See ESCAP, “Regional Cooperation Mechanism on Low Carbon Transport: South and Southwest Asia and Southeast Asia Subregional Consultation and Capacity Building Workshop”, Bangkok, 12 and 13 December 2022.

¹⁸ *Electrification of Public Transport Fleet in Georgia* (Bangkok, 2023).

by 2025 and at reducing 1 million metric tons of carbon dioxide emissions within three years of programme inception (June 2023).¹⁹ Based on the trends described above, the integration of digital solutions into transport holds immense potential for advancing low-carbon alternatives to propel the region towards a greener future. For example, it was shown that integrated intelligent transport systems in Shanghai, China, contributed to a reduction of 3 per cent in vehicle emissions, an increase of 3 per cent in the average speed in the central area and an increase of 7 per cent in the average time for gridlock-free traffic.

18. The digitalization of transport in the Asia-Pacific region has also ushered in transformative changes in the area of safety. Ensuring road safety poses a significant sustainable development challenge in the region, as it has nearly 60 per cent of total road crash fatalities worldwide, with over 700,000 fatalities in 2019.²⁰ Smart transport systems that address those concerns use real-time data analysis and traffic monitoring to prevent accidents and improve overall safety on road networks. Cooperative-intelligent transport systems and connected vehicles enable communication between vehicles (vehicle-to-vehicle) and between vehicles and the road infrastructure (vehicle-to-infrastructure) and offer advantages for pedestrians, cyclists and motorcyclists (vehicle-to-everything). They are aimed at facilitating the exchange of transport-related data, extending beyond isolated systems. The use of those technologies fosters safer journeys by providing real-time information about road conditions and potential hazards.²¹ Good examples can be found in Queensland, Australia, where the Cooperative and Automated Vehicle Initiative has been launched to test cooperative-intelligent transport system technologies, including vehicle platooning and intersection safety applications.²² In addition, through the integration of collision-avoidance systems, smart crosswalks and sensor-equipped intersections, facilitated by digital platforms, the safety of pedestrians and cyclists is prioritized. In Singapore, ride-sharing services demonstrated safety levels 1.2 times and 1.9 times higher than taxi industry standards for driver-related crashes and offences, respectively.²³ Furthermore, the region is witnessing a rise in the use of data analytics and modelling in assessing and planning sustainable transport solutions, where safety is emphasized in every facet of the evolving digital transport landscape.

C. Digitalization and regional transport connectivity in Asia and the Pacific

19. Digitalization also remains a priority along the Asia-Pacific regional transport network, composed of Asian highways, trans-Asian railways, dry ports of international importance and maritime ports, where digital transport solutions have become an integral part of strategies to achieve a more integrated, resilient and sustainable inland multimodal transport system. Best practices and lessons learned in transport digitalization are shared by countries at the biennial sessions of relevant intergovernmental working groups and the annual regional dialogue on sustainable maritime connectivity. Those

¹⁹ Su Song, Miaoqing Zhong and Ding Tan, “Mobility-as-a-service platforms: a new trend in low-carbon transport”, World Resources Institute, 6 December 2023.

²⁰ ESCAP, “Transport: road safety” (n.d.). Available at www.unescap.org/our-work/transport/road-safety.

²¹ Cerebrumx, “The future of road safety: how connected vehicles are leading the way”, 4 May 2023.

²² For further information, see www.qld.gov.au/transport/projects/cavi/cavi-project.

²³ Grab, “Social impact report 2018–2019” (n.p., n.d.).

exchanges have illustrated not only the quick pace of transport digitalization in the region but also the high diversity in the level and scale of transport digitalization efforts, as well as the technical solutions chosen.

20. The secretariat's survey of smart and digital solutions employed along the Asian Highway Network, especially during the coronavirus disease (COVID-19) pandemic, demonstrates that a wide range of digital solutions are used, including electronic queues, applications for real-time updates on operational conditions along routes, the remote approval and registration of road permits, automated real-time remote monitoring and control of the parameters of vehicles, remote electronic customs control with navigation seals and smart containers, smart tachographs, information systems for interactions at transport terminals and unmanned transport technology.²⁴ In some Asian Highway Network countries, including China, the Republic of Korea, the Russian Federation and Singapore, the first wave of digitalization is giving way to advanced transport systems based on automation, artificial intelligence and big data analytics, while other countries continue to implement more traditional transport digitalization solutions that are focused on the digitalization and automation of information flows.

21. The area in which transport digitalization is especially important is the facilitation of transit transport, which has been a constant challenge for countries in the region, especially landlocked developing countries. Electronic tracking systems, coupled with automatic transit transport systems, have the potential to provide secure transit and reduce its costs. The secretariat has developed numerous knowledge products on establishing an automated customs transit transport system²⁵ and on paperless transit.²⁶ They support countries in their efforts to implement regional customs transit solutions, such as the ASEAN Customs Transit System, as well as collaboration between India and Nepal on electronic cargo tracking and cooperation among North and Central Asian countries on the enhanced digitalization of land transport in Central Asia.

22. Digitalization has become a central element of strategies for railways to be repositioned in the post-pandemic era, maximizing their resilience and competitiveness and further reducing their environmental footprint. As highlighted during the high-level conference on accelerating rail digital transformation in the Asia-Pacific region, held in New Delhi on 5 and 6 April 2023, major rail digitalization efforts are under way in Azerbaijan, Bangladesh, Kazakhstan, Kyrgyzstan, the Lao People's Democratic Republic, the Republic of Korea, the Russian Federation, Sri Lanka, Thailand and Viet Nam.²⁷ Rail digitalization takes a variety of forms, covering rail traffic management, assets management, customer experience, rail safety, interface with other governmental services, electronic data exchange and many others. Examples of rail digitalization efforts include the development by Azerbaijan Railways of a vision for digitalization, a geographic information system-based railway track and bridge management information system and train tracking system in

²⁴ ESCAP, *Seamless and Smart Connectivity along the Asian Highway Network in the Time of COVID-19* (Bangkok, 2020).

²⁵ For further information, see ESCAP, *Guide on Establishing an Automated Customs Transit Transport System* (Bangkok, 2016).

²⁶ For further information, see ESCAP, "Study on paperless transit", Monograph Series on Transport Facilitation and Logistics Development in Asia and the Pacific (Bangkok, 2015).

²⁷ For further information, see www.unescap.org/events/2023/high-level-regional-conference-accelerating-rail-digital-transformation-asia-and.

Bangladesh, an information system for international rail freight in the Republic of Korea and a digital application for rail crossings in Thailand.

23. The digitalization of dry ports and multimodal transport hubs in Asia and the Pacific is also developing at a rapid pace, transforming the way logistics operations are conducted through enhanced efficiency. In recent years, the application of advanced tracking and monitoring systems in dry ports and multimodal transport hubs has increased steadily, including the use of technologies such as satellite positioning systems, radio frequency identification systems and sensors to provide real-time visibility of cargo movements. Another rapidly developing type of digital solution comprises digital platforms and port community systems, which are being implemented for dry ports and other inland multimodal transport facilities to enhance information-sharing. The integration of Internet-of-things devices and automation technologies is also gaining momentum. Sensors and smart containers enable the real-time monitoring of freight, and automation technologies, such as automated stacking cranes and robotic process automation, reduce human error and improve productivity.

24. Lastly, in relation to maritime transport, Asia-Pacific ports are transitioning to “smart ports”, where new technologies and digitalization are used to manage activities. Many countries, including China, Malaysia, the Republic of Korea and Viet Nam, have established national master plans, strategies or other detailed action plans for smart ports, and some plans have already been implemented. Other countries, especially in the Pacific, continue using manual processing and paper documents and are implementing basic port informatization reforms. In addition, countries are exploring innovative autonomous navigation technologies, seeking to achieve better control of a ship’s position and speed, efficient communication with external systems, integrated control of on-board navigation systems, ship management through remote support and control, and risk management using advanced information and communications technology and artificial intelligence technologies, among others. An interesting development in maritime transport is the evolution of the green shipping corridor concept, as pledged in the Clydebank Declaration for Green Shipping Corridors, adopted at the twenty-sixth session of the Conference of the Parties to the United Nations Framework Convention on Climate Change, into green and digital shipping corridors. Since August 2022, initiatives applying that concept have been implemented at the ports in Rotterdam, Kingdom of the Netherlands, and Singapore. They are the first ports to share vessel arrival and departure timings in accordance with global standards, which enables the interoperability of systems. They also promote the use of electronic bills of lading and digital solutions, such as just-in-time planning and coordination, to enhance efficiencies and reduce greenhouse gas emissions.²⁸

III. Efforts for sustainable transport through digitalization in Asia and the Pacific

A. Recent initiatives and activities using smart transport technologies

25. The digitalization of transport needs to be encouraged through forward-thinking policies that help countries to fully employ new technologies in the transport sector. Such policies play a crucial role in advancing transport digitalization, which will profoundly and positively influence society and align

²⁸ Safety4Sea, “The Rotterdam-Singapore green and digital shipping corridor expands efforts”, 20 September 2023.

with the objectives of the Sustainable Development Goals. Accordingly, the secretariat has been implementing various analytical, intergovernmental and capacity-building activities to initiate policies related to transport digitalization in member States. Those activities are aligned with the Regional Action Programme for Sustainable Transport Development in Asia and the Pacific (2022–2026) and the relevant issues relating to the digital transformation of transport in the region.

26. Asia-Pacific cities are facing challenges in expanding and integrating urban public transport systems and improving the efficiency of their services to meet the increasing demand created by rapid urbanization. Many cities are operating a combination of different forms of urban public transport systems to meet the mobility needs of and enhance accessibility for urban residents. The use of digital technologies can help to significantly enhance the operational efficiency of urban public transport systems. In that context, the secretariat is implementing a project on building capacity for the integration and application of digital technologies in urban public transport systems in selected Asia-Pacific cities. The project is aimed at the evaluation of the existing state of urban mobility in pilot cities and countries and the preparation of recommendations for innovative solutions to be determined, including through the application of digital technologies, in the planning, development and operation of integrated urban public transport systems.

27. Under the project, the secretariat carried out an assessment of urban public transport systems using the sustainable urban transport index and assessed the use of digital technologies in public transport in four pilot cities: Chattogram, Bangladesh; Lautoka, Fiji; Almaty, Kazakhstan; and Dushanbe. The results of the mobility assessment were shared at an expert group meeting. The results indicated that there was a need to improve the sustainability of public transport systems, provide real-time information to public transport users, develop inclusive and accessible public transport systems, improve accessibility and inclusiveness, and use emerging digital technologies in fare collection, including by introducing a single digital payment card for all modes and areas. The assessment of urban public transport systems and the use of digital technologies in those systems in Bukhara, Uzbekistan, is progressing.

28. The expert group meeting on the integration of urban public transport systems and the application of digital technologies was held in Suwon, Republic of Korea, on 24 and 25 October 2023, in conjunction with the Eighth Asia-Pacific Urban Forum. The meeting was focused on ways to improve the overall sustainability, integration and use of emerging technologies in the planning, development and operation of urban public transport systems in Asia-Pacific cities. It facilitated the sharing of experiences of stakeholders at the local and national levels and of experts in the planning, development and operation of sustainable urban public transport systems and in the application of digital technologies in public transport systems. The finalization of methodological guidelines on the integration and application of digital technologies in urban public transport systems is progressing. The guidelines cover all aspects of the planning, development and operation of urban public transport systems, integration with urban planning, the selection of public transport systems, fare structures, institutional arrangements and the application of digital technologies. The meeting participants confirmed the usefulness and contents of the guidelines.

29. The secretariat is planning to implement the remaining activities of the project in 2024. The follow-up activities recommended during the expert group meeting are in line with some of the key recommendations contained in the methodological guidelines to improve the sustainability, accessibility and

integration of public transport in pilot cities. The activities proposed include traffic flow surveys, user satisfaction surveys, the deployment of public transport information management systems, the installation of air quality monitoring equipment, the strengthening of the capacity of public transport institutions for inclusive public transport planning, the improved enforcement of existing traffic rules, and the implementation of advocacy and awareness campaigns. Five national capacity-building workshops on the integration and digitalization of public transport systems will be held for pilot cities or countries in April and May 2024. The final regional meeting on the project is tentatively scheduled to take place in Almaty, Kazakhstan, in May 2024.

30. In the context of urban transport, there are increasing concerns related to social issues, such as a lack of accessibility, a lack of universal design, traffic safety and personal security concerns, and affordability. It is thus imperative that countries address those concerns, including by developing barrier-free accessibility and innovative mobility services, to ensure equitable socioeconomic development in urban areas. Specifically, considering increasing urbanization rates in the Asia-Pacific region, there are growing concerns in many cities about accessible public transport planning that responds to the needs of women, children, persons with disabilities, older persons and low-income households, and the provision of quality mobility services.

31. Delivering accessible and inclusive urban transport systems through innovative technologies will be an important means of improving transport sustainability and general well-being. The secretariat is therefore implementing a project on enhancing social inclusion and innovations in urban transport systems in Asia-Pacific cities. The objective of the project is to enhance the capacity of policymakers to plan for and operate more accessible, socially inclusive and innovative urban transport systems by integrating active mobility and using emerging technologies in selected Asian cities and countries. As part of the project, the secretariat held an online regional expert group meeting and a national workshop in Mongolia in 2023.

32. Also as part of the project, the secretariat will hold three national workshops in 2024 for the target countries, namely, Azerbaijan, the Lao People's Democratic Republic and Nepal. The objective of the workshops is to provide tailored support to enhance the capacity of the relevant stakeholders to plan for more accessible, socially inclusive and innovative urban transport systems by carrying out suitable changes in data collection and policy design and implementation. Regional guidelines on addressing social inclusion and innovation in urban transport are being developed and will be used as reference material to guide discussions at the workshops. A regional meeting on enhancing social inclusion and innovations in urban transport systems in Asia-Pacific cities is tentatively planned for June 2024.

33. A major issue slowing transport digitalization in Asia and the Pacific is the fact that many activities related to transport digitalization have been designed and pursued locally in silos. That approach, which lacks a harmonized policy direction at the regional level, eventually creates fragmented and geographically limited transport services among member States. It will also result in the benefits of smart transport systems being underutilized and ineffective in activities to realize the Regional Action Programme for Sustainable Transport Development in Asia and the Pacific (2022–2026) and to achieve the Sustainable Development Goals. Recognizing the need for a cohesive regional policy direction, the secretariat developed a regional road map to support regional cooperation for the wider deployment of sustainable

smart transport systems, which is one of the major activities under the Regional Action Programme.

34. The regional road map is inclusive, universal and versatile. It was developed for the transition towards and ideal use of sustainable smart transport systems and contains an outline of the five major strategies and corresponding policy plans that countries in Asia and the Pacific can refer to when devising or updating their policies, plans and strategies. The five strategies are: connectivity (“reaching anywhere”), integration (“moving as one”), inclusiveness (“access for all”), affordability (“withstanding burdens together”) and resiliency (“prepared for what may come”). Under the five strategies, 12 policy plans were proposed to set out the direction for the development of smart transport systems. The harmonized approach described in the secretariat’s regional road map will reap many benefits owing to the consistency in the plans, strategies, regulations and standards and greater interoperability of smart transport systems, employed across international boundaries, while many of the challenges and issues faced in the region will be addressed.

35. At the regional meeting held in Seoul and online from 11 to 13 July 2023, the regional road map and the Seoul Declaration on a Regional Road Map to Support Regional Cooperation for the Wider Deployment of Sustainable Transport Systems were adopted by participants from 32 member States. Representatives from various institutions and agencies also attended the meeting. The participants at the meeting recommended that the Committee on Transport endorse the regional road map at its eighth session, in November 2024. In the Seoul Declaration, it was emphasized that there was a need for substantive support from the secretariat to facilitate the establishment of a cooperative mechanism for smart transport systems to enhance dialogue among all stakeholders for further cooperation and partnerships. The details of the initiative will be discussed at an expert group meeting planned for 2024.

36. In the transport sector, together with the emergence of smart transport systems, a data revolution has already been initiated. Advances in data processing and analysis now make it possible to use transport big data from various smart transport applications for more reliable, efficient and evidence-based decision-making in sustainable transport policies and strategies. Because those benefits have been recognized, the use of transport big data is part of the indicators of achievement under the Regional Action Programme. At the expert group meeting on promoting the utilization of transport big data from smart transport systems in the Asia-Pacific region for the achievement of sustainable transport, held in Seoul and online on 12 and 13 July 2023, guidelines were shared to encourage policymakers to formulate policies and strategies using transport big data. A capacity-building workshop for North and Central Asia and East and North-East Asia was held in Ulaanbaatar on 14 and 15 September 2023 as a follow-up activity to increase the awareness and capacity of member States on innovative policies and technologies to promote the use of big data for transport issues.

B. Digitalization of the Asia-Pacific transport networks

37. The secretariat’s analysis of a wider deployment of digital solutions across the Asian Highway Network, such as highly and fully automated vehicles, flagged the need for a more coordinated regional approach to their implementation. Different levels of technological developments are an issue, in addition to large discrepancies in the understanding, knowledge and capacity of policymakers among countries along Asian Highway routes. Greater regional cooperation on new digital and technological solutions could help to

address those gaps.²⁹ That is especially important in relation to international road transport corridors, where transport performance could be significantly enhanced through, among others, the establishment of a specialized information and communication environment for transport participants, the digitalization of information flows, the use of digital technologies to increase the capacity of checkpoints, and the remote monitoring and management of road transport. In its technical note on the use of smart transport technologies along the Asian Highway Network, the secretariat highlighted the step-by-step development plan for the digital transport corridor ecosystem established by the Eurasian Economic Union, which includes a transition from the exchange of documents to the exchange of legally significant transport data, the maximum automatic reuse of data previously entered, and information integration among public and private stakeholders and with related functional information systems, such as digital trading platforms.³⁰

38. Due to the growing importance of digital information exchange and the need to harmonize the practices related thereto, a new annex to the Intergovernmental Agreement on the Trans-Asian Railway Network, entitled “General principles on electronic information exchange/data interchange among railways and between railways and control agencies along the Trans-Asian Railway Network” was adopted by parties to the Agreement in September 2023.³¹ The implementation of the guiding principles would pave the way for harmonized electronic data interchange practices among railways, leading to more streamlined rail border crossings, and would support countries in developing electronic information interchange processes for streamlined rail border crossing procedures, including by enhancing the capacity of border officials to integrate risk assessments, use new technologies and jointly execute control measures both behind and across borders. With the implementation of the general principles, it is expected that countries will be prepared to handle increasing transcontinental traffic, while the shift to rail will be promoted and many of the negative externalities of transport will be addressed, in particular by reducing the carbon footprint of transport and, in turn, countries will be supported in tackling climate change and realizing the 2030 Agenda for Sustainable Development.

39. To harness the full potential of rail digitalization, in particular for least developed and landlocked developing countries in the region, the Working Group on the Trans-Asian Railway Network adopted Strategy 2030 on Accelerating Rail Digital Transformation in the Asia-Pacific Region. The Strategy is aimed at accelerating rail digitalization in the region by: providing coherence and momentum to rail digitalization initiatives; fostering an ecosystem conducive to harnessing the full potential of rail digitalization; augmenting the operational performance, capacity, reliability, safety and security of rail assets; enhancing the experience of customers, including with regard to the ease of doing business; creating synergies through partnerships to digitalize rail; and ensuring high-level political support for rail digitalization.

40. In its discussion on trends in the digitalization of transport corridors and multimodal transport operations involving dry ports in Asia and the Pacific at its meeting in September 2023, the Working Group on Dry Ports, set up

²⁹ For further information, see ESCAP, *Facilitating the Deployment of Highly and Fully Automated Vehicles in Road Traffic along the Asian Highway Network* (Bangkok, 2022).

³⁰ ESCAP, *Seamless and Smart Connectivity along the Asian Highway Network in the Time of COVID-19*.

³¹ See ESCAP/TARN(8)/6, annex III.

through the Intergovernmental Agreement on Dry Ports, reaffirmed the continued need to develop a more comprehensive approach to the development of dry ports as components of multimodal transport corridors, including those providing connections between Asia and Europe and between the different subregions in Asia and the Pacific. It welcomed recent initiatives in that area, such as the finalization of the guidelines for the harmonization of national laws on multimodal transport in Asia and the Pacific, and continued to consider the possibility of formulating a new annex to the Agreement to address multimodal transport operations. To support the further development of dry ports, transport corridors and multimodal transport through the introduction of digital technologies, the secretariat has established an inventory of digital and innovative solutions that are of practical use for the operation of dry ports. The inventory covers major fields of application, including dry port infrastructure, cargo handling, multimodal traffic and trans-shipments, customs, security, maintenance, energy and the environment, autonomous vehicles, warehouse robots and artificial intelligence.

41. The transition to smart ports in Asia and the Pacific is a dynamic, diverse and fragmented process with significant challenges, such as the digital gap, a lack of professional manpower and limited investments. Reflecting that diverse situation, together with the need to support a transition to more sustainable shipping in the region, the secretariat has organized, since 2020, a regional dialogue on sustainable maritime connectivity and regular capacity-building workshops on smart ports. At the latest regional dialogue on sustainable maritime connectivity, held in Bangkok and online on 30 and 31 May 2023, participants extensively discussed the transition to smart ports, as well as promoting green (and digital) shipping corridor initiatives. At the annual capacity-building workshops on smart ports, the expert-level exchange of lessons learned and best practices continue to be supported, and a regional approach to measure performance in the implementation of smart port reforms is being considered. Lastly, the status of autonomous shipping in Asia and the Pacific will be reviewed at the first regional conference on autonomous shipping, to be held in Bangkok and online on 28 and 29 February 2024.

IV. Issues for consideration by the Commission

42. The Commission may wish to take note of the present document and encourage the active engagement and continued support of its members and associate members in the planned activities, including promoting the regional road map for smart transport systems in Asia and the Pacific and rail digitalization. In addition, members and associate members of the Commission may wish to share information on innovative policies and actions being taken at the national, subregional and regional levels to enhance the digitalization of transport for the achievement of sustainable and inclusive development.
